

Chapter 15

An Introduction to the Birds of the United Arab Emirates



Oscar Campbell

15.1 Introduction

The avifauna of the United Arab Emirates (UAE) is of interest for a multitude of reasons, belying the country's small size and inhospitably hot, arid environment. It is surprisingly varied and constantly evolving, in response to both anthropogenic landscape modifications and longer term climatic changes. Lying at the juxtaposition of four great biogeographic realms, the bird communities of the UAE represent a melting pot of species, whilst its position on the edge of the great intercontinental stepping stone that is the Arabian peninsula guarantees the biannual through passage of millions of birds of some 140 species, on journeys that span from western Europe, the Siberian Arctic and Eastern China to India, southern Africa, and all points between. Birds, being predominately diurnal, relatively large and hence conspicuous have been well-studied over many years in the UAE. This chapter will outline the composition of the country's avifauna, discuss a selection of species that characterize important habitats, discuss adaptations exhibited by resident species in response to the challenging environmental conditions prevalent and summarize aspects of migration through the country. Finally, conservation issues are considered and selected recent discoveries showcased.

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15.2 Biogeographical Aspects of the UAE's Avifauna

The list of birds recorded in the UAE as wild (including those with established populations originating from escapes or releases) is currently 468 species, of which over a fifth, 102 species, typically breed annually. Of the regular breeders, 83% are of native origin (Pedersen et al. 2022). Many breeding species (including all those introduced) are resident (i.e. present all year) but a small proportion of species migrate to the UAE to breed, then depart to spend the non-breeding season elsewhere (usually Africa). The UAE's much larger community of non-breeding species primarily comprises passage migrants (usually en-route from Eurasia to Africa, or, in a few cases, India) or winter visitors. Within a given species, some individuals may occur in the UAE as migrants only, whilst others remain the entire non-breeding season, some of which may remain year-round without attempting to breed. This occurs particularly amongst shorebirds and herons and usually involves individuals that are too young to breed.

The UAE's avifaunal diversity, measured as numbers of species recorded and/or breeding, compares favorably to other Arabian peninsula countries (Fig. 15.1), reflecting a diverse range of habitats (see Chap. 2) in a comparatively small area. Most important, compared to similarly sized Qatar and Kuwait, are the Hajar mountains and Jebel Hafit, both exceeding 1000 m elevation, and 60 km of coastline on the Gulf of Oman. Breeding species diversity is greatest in the north east, declining westwards and, particularly, southwards into the desert interior. Aspinall (2010) maps the distribution of the UAE's breeding birds by 50 × 50 km² and provides totals for each square. In the three most north-easterly squares, 60–65 species have been recorded as breeding (or likely breeding) but this declines to 18 in the most westerly square on the Arabian Gulf coast, and a maximum of ten on the northern fringes of the Rub Al-Khali (Empty Quarter). An analysis of 167 species (breeding, migrant and wintering) produced a similar pattern (Burfield et al. 2021). This cline reflects landscape and habitat availability, including diverse anthropogenic habitats, but also matches national climate trends, in particular that for

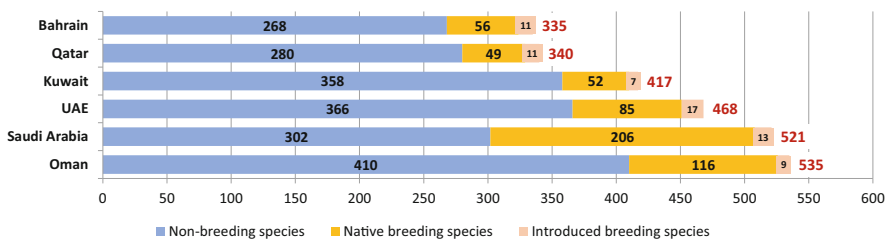


Fig. 15.1 Numbers of native non-breeding and breeding species, and non-native species (all of which breed) recorded in the UAE and five neighbouring Arabian countries. Data sources: Pedersen et al. (2022); Eriksen and Victor (2013), J Eriksen in litt; Qatar Birds Records Committee (www.qatarbirds.org/); H King in litt; Pope and Zogaris (2012), A Al-Sirhan in litt; Boland and Alsuhaibany (2020), J Babbington in litt

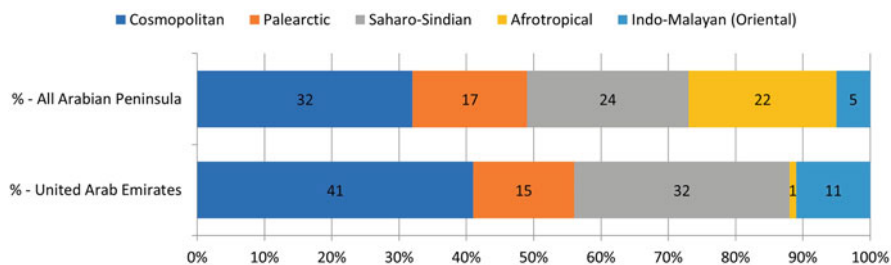


Fig. 15.2 Biogeographic affinity of regularly breeding species in the UAE (85 species) and the Arabian Peninsula as a whole (273 species) based on their breeding distribution out with the Arabian peninsula. Data source: Jennings (2010) for Arabian Peninsula data. *Cosmopolitan* refers to species occurring widely in two or more biogeographic zones; for terrestrial birds breeding in the UAE this is mainly Palearctic/Indo-Malayan or African/Indo-Malayan. A few species have a much wider distribution. *Palearctic* refers to species whose main breeding distribution encompasses some or all of the temperate zone of the Old World (i.e Eurasia, excluding south and south east Asia). *Saharan-Sindian* refers to species' whose main breeding distribution encompasses the general Saharan region (North Africa, Arabia, Iran to north western India) or some part thereof. It is also termed *Eremic* and is of relatively recent geological origin (dating from late Miocene, 5–10 million years ago). Species included may have distributions that extend marginally into arid East Africa or central Asia. *Afro-tropical* refers to species whose main breeding distribution encompasses some or all of sub-Saharan Africa. *Indo-Malayan (Oriental)* refers to species whose main breeding distribution encompasses some or all of tropical Asia

precipitation (see Chap. 3). Urban areas have noticeably greater diversity than surrounding hinterlands, reflecting increased habitat variety and availability of food and water sources on local scales. Thus, the square incorporating Abu Dhabi island has 47 breeding species, compared to 9–12 species for the three squares immediately south (Aspinall 2010).

The biogeographical affinities of the 85 species regularly breeding in the UAE are presented in Fig. 15.2, with four selected examples illustrated in Fig 15.3. This excludes 17 naturalized species now well established. Of regular breeding species, 55% have fairly wide-ranging UAE distributions (although in some cases at very low densities); the remainder are extremely local (generally restricted to very few sites). In terms of biogeography, 41% species breeding in the UAE are widespread across two or more biogeographical regions. A significant proportion of these are large species such as raptors, herons and certain seabirds. Of the remainder, perhaps most interesting are the 32% classified as Saharo-Sindian. Being species whose main distribution lies between western Sahara and north western India, they are highly adapted to extreme heat and aridity and include four (of five) of the UAE's regularly breeding larks. Almost half of Saharo-Sindian species occurring in the UAE have a mainly Arabian distribution and are endemic, or nearly so, to the Arabian peninsula. Given geographical proximity, Indo-Malayan species are poorly represented; the Arabian distribution of this group generally only encompasses the far north and east of the peninsula, although several (e.g. Red-wattled Lapwing *Vanellus indicus*, Indian Roller *Coracias benghalensis*, Purple Sunbird *Cinnyris asiaticus*) are



Fig. 15.3 Species breeding in the UAE with different biogeographical affinities. Clockwise from top left: Bridled Tern (*Onychoprion anaethetus*, Cosmopolitan), Blue-cheeked Bee-eater (*Merops superciliosus*, Palearctic), Pharaoh Eagle-Owl (*Bubo ascalaphus*, Saharo-Sindian), Indian Roller (*Coracias benghalensis*, Indo-Malayan). Photographer: Oscar Campbell

conspicuously common and have spread widely across the UAE in recent decades, concomitant with the country's greening. The Empty Quarter is clearly an effective barrier to African species characteristic of south west Arabia and Dhofar (southern Oman); only one UAE breeding bird, Namaqua Dove (*Oena capensis*), is of Afrotropical origin. Unrecorded until 1988, this species first bred in 1997 as part of a general spread across the Arabian peninsula from its core range in the south west (Jennings 2010). The foregoing data are not dissimilar to a recent biogeographical analysis on the butterfly fauna of the UAE (Feulner et al. 2021). Jennings (2010) presents a comparable analysis for breeding birds of the Arabian peninsula which, as a whole, has a much greater proportion of Afrotropical species but a somewhat smaller proportion of Saharo-Sindian and Indo-Malayan species.

The biogeographic origin of 17 naturalized species is summarized in Fig. 15.4. These species mainly originate from deliberate releases, although accidental introductions have also occurred. Such species constitute a greater proportion of the UAE's breeding avifauna than in neighbouring countries (Fig. 15.1). Although naturalized species concentrate in urban areas, they have spread relatively further

Fig. 15.4 The biogeographic origin of 17 species now naturalized and breeding annually in the UAE

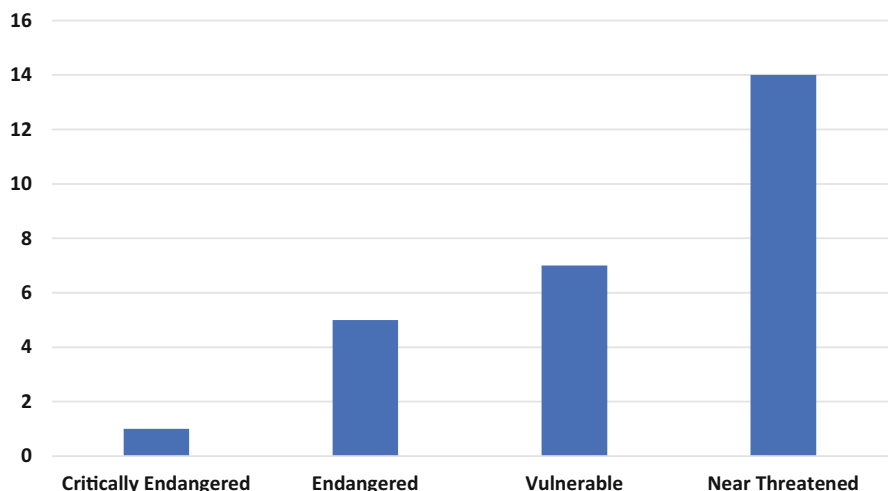
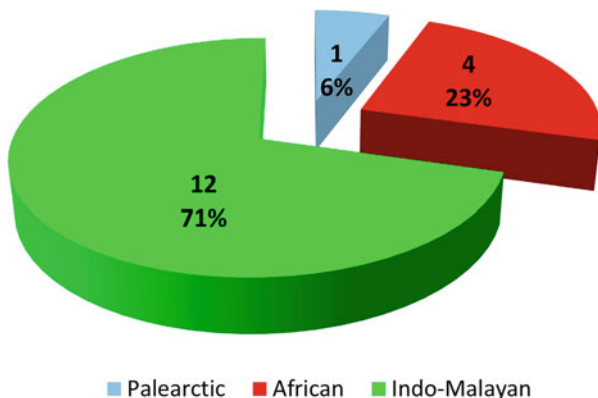


Fig. 15.5 The threat status of 27 globally threatened and Near Threatened bird species that occur in the UAE. Data source: BirdLife International (2022a)

in the UAE than elsewhere regionally (Jennings 2010). Unsurprisingly given geographical proximity and historical ties over millennia, the majority originate in southern Asia, especially Pakistan and India. Half have spread spectacularly since introduction and several (e.g. Grey Francolin *Francolinus pondicerianus*, White-eared Bulbul *Pycnonotus leucotis*, Common Myna *Acridotheres tristis*) are now amongst the UAE’s most abundant and conspicuous species.

Twenty-seven species occurring in the UAE are of global conservation concern with 13 classified as globally threatened (Fig. 15.5; see also SOM Tables 15.1 and 15.2), including one Critically Endangered (Sociable Lapwing *Vanellus gregarius*) and five that are Endangered (BirdLife International 2022a). A further fourteen are Near Threatened. Seven globally threatened species occur in winter or on migration

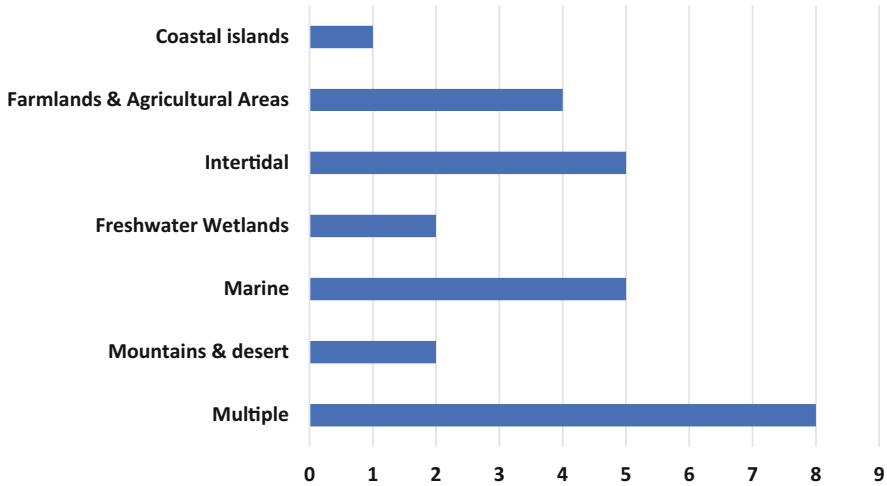


Fig. 15.6 Main habitat usage of 27 globally threatened and Near Threatened bird species that occur in the UAE. Data source: BirdLife International (2022a)

and habitats used include intertidal mudflats and extensive agricultural areas. Five species have bred, although only two (European Turtle Dove *Streptopelia turtur*, Socotra Cormorant *Phalacrocorax nigrogularis*) are widespread or numerous. Broad habitat preferences in the UAE for all 23 globally threatened and Near Threatened species are summarized in Fig. 15.6.

A number of other species, whilst not of global conservation concern, are particularly significant from a local perspective, in that the UAE is amongst the easiest countries in the world to observe them. Such species are globally range-restricted or breed in remote parts of countries where tourism is underdeveloped. These species are of great interest to visiting birdwatchers and include Ménétries's Warbler (*Sylvia mystacea*; common migrant; breeding Turkey to south-central Asia), Hypocolius (*Hypocolius ampelinus*; uncommon passage migrant and winter visitor to coastal lowlands of the Arabian Gulf, mainly breeding Iraq) and four species characteristic of the UAE's mountains and adjacent plains: Hume's Wheatear (*Oenanthe albonigra*, common resident breeder, otherwise mainly breeding Iran) and Variable Wheatear (*O. picata*), Persian Wheatear (*O. chrysopygia*) and Plain Leaf Warbler (*Phylloscopus neglectus*), all locally common short-distance winter visitors from south-central Asia. Figure 15.7 depicts four species occurring in the UAE that are either globally threatened or range-restricted. Also notable are two seabirds that are Arabian breeding endemics: Jouanin's Petrel (*Bulweria fallax*) and Persian Shearwater (*Puffinus persicus*), breeding Socotra Island and along the south Arabian coast respectively. They both occur as non-breeding visitors to UAE waters of the Gulf of Oman.



Fig. 15.7 Globally threatened and restricted-range species. Clockwise from top left: Eastern Imperial Eagle (*Aquila heliaca*, Vulnerable), Great Knot (*Calidris tenuirostris*, Endangered), Hypocolious (*Hypocolius ampelinus*, range-restricted) and European Turtle Dove (*Streptopelia turtur*, Vulnerable). Photographer: Oscar Campbell

15.3 A Survey of the UAE's Key Bird Habitats

The present section considers characteristic bird species of seven broad habitats, from natural to wholly anthropogenic, ranging from mountains and deserts to intertidal shorelines and the offshore islands of the Arabian Gulf. Species discussed have been selected to give a flavour of those more characteristic or interesting, put into a regional context. Five natural habitats are discussed first, followed by two that owe their existence to human activities. The avifauna of urban areas is discussed in Chap. 23; that occurring in the offshore waters of the Gulf of Oman in Box 15.1.

15.3.1 *Natural Habitats*

15.3.1.1 *Mountains and Adjacent Stony Plains*

Despite occupying a small portion of the country, montane regions significantly boost the UAE's avian diversity, although not to the same extent as they do for floral and invertebrate diversity (Chaps. 13 and 17). Both breeding and wintering bird communities in the UAE mountains are moderately distinctive and represent a somewhat impoverished subset of communities found in the more extensive Zagros chain of Iran. Elevations are not high enough, nor available land at such altitudes extensive enough, to support contrasting vegetation zones with distinctive avifaunal communities, as occur at the greater elevations of Jebel Shams, Oman, or Asir, Saudi Arabia. Thus, UAE montane bird diversity shows no clear altitudinal gradient. Although densities are often low (as in all natural terrestrial habitats of the UAE), certain species occur exclusively in montane habitats e.g. Hume's Wheatear and Lichtenstein's Sandgrouse (*Pterocles lichtensteinii*). Habitat destruction and disturbance, often in the form of road-building, quarrying and rock-crushing operations continues to threaten areas locally, but there are still extensive areas of relatively undisturbed habitat. Localities to observe species characteristic of UAE montane habitats include Wadi Wurayah National Park and the nearby Masafi area (both Fujairah), the mountains of Ras al Khaimah (e.g. Wadi Bih) and, of course, the outlying inselberg of Jebel Hafit (Abu Dhabi). Typical resident species include White-spectacled Bulbul (*Pycnonotus xanthopygos*), an Arabian near-endemic, Striolated Bunting (*Emberiza striolata*), easy to hear but often hard to locate when singing motionless from small promontories, the poorly named Desert Lark (*Ammomanes deserti*; in the UAE found almost exclusively in rocky montane areas) and the strikingly pied Hume's Wheatear, a globally range-restricted species easily found when singing in the early mornings from November to March.

Equally characteristic and widespread, but much less numerous and conspicuous are the cryptic Sand Partridge (*Ammoperdix heyi*) and virtually nocturnal but exquisitely patterned Lichtenstein's Sandgrouse. The latter, difficult to find during day, is commonly heard after sunset as small groups fly to drinking pools. Box 15.2 illustrates that there is still much to learn about birds occurring in the Hajar Mountains, not least at night.

From October to March, resident species are complemented by others arriving to overwinter in the Emirates. Notable are the widespread Persian Wheatear and Plain Leaf Warbler (in rocky wadis with some vegetation, particular *Acacia* and *Euphorbia larica*) and the extremely localized Variable Wheatear, a species with a preference for *Acacia*-dominated gravel plains on the flanks of the northern Hajars. All three are united by their remote and desolate breeding habitat, mainly in Iran and Afghanistan. Figure 15.8 illustrates four species typical of mountains and adjacent stony plains.

All species occurring in the main Hajar chain extend their ranges south into Oman and, via the Ruus al Jibal of the Musandam peninsula, almost all range north into Iran. The majority are also found on the geologically distinct outlying massif of Jebel



Fig. 15.8 Species characteristic of mountains and adjacent stony plains; all featured species are range-restricted in a global context. Clockwise from top left: Hume's Wheatear (*Oenanthe albonigra*), White-spectacled Bulbul (*Pycnonotus xanthopygos*), Persian Wheatear (*Oenanthe chrysopygia*), Plain Leaf Warbler (*Phylloscopus neglectus*). Photographer: Oscar Campbell

Hafit, which lies 30 km off the main Hajar range. A notable exception is Streaked Scrub-Warbler (*Scotocerca inquieta*), a unique small warbler with no close relatives in the UAE, most reliably found in the Masafi area of the Hajars but never reported from well-studied Jebel Hafit.

15.3.1.2 Coastal Deserts

Descending westwards from the Hajars, one traverses gravel outwash plains which soon merge into the sandy, rolling desert of the coastal plain. This broadens southwards into interior deserts (see below) on the western side of the country but on the eastern side the narrow gravel plain soon reaches the Gulf of Oman. As elsewhere in Arabia (e.g. Kuwait; Brown 2009), many areas have been degraded by severe over-grazing, off-road driving and rampant development, particularly on the coastal fringes. However Al-Marmoom (Qudra) and Dubai Desert Conservation Reserve (both Dubai) are good localities to experience this habitat. Bird



Fig. 15.9 Species characteristic of coastal deserts. Clockwise from top left: Black-crowned Sparrow Lark (*Eremopterix nigriceps*), Cream-coloured Courser (*Cursorius cursor*), Egyptian Nightjar (*Caprimulgus aegyptius*). Photographer: Oscar Campbell

communities are less diverse than those of montane areas but nevertheless hold interesting species. These include Greater Hoopoe-Lark (*Alaemon alaudipes*) and Black-crowned Sparrow-Lark (*Eremopterix nigriceps*), both of which have adapted to the lack of song posts with display flights given in early spring. That of the former makes Greater Hoopoe-Lark one of the most spectacular denizens of the Arabian desert—a near vertical rise from a low perch followed by an abrupt plummet, accompanied by the purest of whistles and a vivid flash of black and white wings and tail that are otherwise concealed. Other Saharo-Sindian species such as Chestnut-bellied Sandgrouse (*Pterocles exustus*) and Cream-colored Courser (*Cursorius cursor*), both representatives of two classic arid landscape families, are typical of sandy coastal deserts, although densities of all aforementioned resident species are greatest in the vicinity of agricultural areas (see below). It has recently been established that Egyptian Nightjar (*Caprimulgus aegyptius*) breeds annually in the UAE (Campbell and Smiles 2018) with a population that may number many tens of pairs. Elsewhere in Arabia, this species is currently known to breed only in Bahrain. Figure 15.9 presents three species typical of coastal deserts.

In winter, areas of coastal desert with sufficient scrub support wintering Desert Wheatears (*O. deserti*), which perch prominently on low bushes. They are often accompanied by the much less conspicuous Asian Desert Warbler (*Sylvia nana*) which assiduously follow the ‘sentinel’ wheatears, presumably to benefit from early warning of potential predators. What, if anything, the wheatear gains is not clear. Both species breed in the deserts of central Asia and occur in the UAE from October to March; their associative behavior has been noted widely across Arabia to north-west India (Shirihai et al. 2001).

15.3.1.3 Interior Deserts

Much of the southern UAE is covered in extensive sand sheets and, in places, large wind-blown dunes on the northern edge of the Empty Quarter. Examples of such habitat can be found south of the Liwa Crescent (Abu Dhabi). Reflecting sparse vegetation and limited foraging opportunities, bird diversity and densities are extremely low, even in winter. Certain species characteristic of coastal deserts (e.g. Cream-colored Courser) are scarce or absent. However, Greater Hoopoe-Lark remains widespread and the few breeding records of two rare raptors, Long-legged Buzzard (*Buteo rufinus*) and Golden Eagle (*Aquila chrysaetos*) are all from this area. Pharaoh Eagle-Owl (*Bubo ascalaphus*), which if undisturbed, can use the smallest of cliffs or sparsest of vegetation to nest, is widespread and probably greatly under-recorded. Recently established plantations, most obvious along the Abu Dhabi to Al Ain highway and in parts of the Western Region have doubtless assisted the spread of species such as White-eared Bulbul, Delicate Prinia (*Prinia lepida*), Purple Sunbird and Shikra (*Accipiter badius*). The latter, a small predatory hawk, was until 2014 largely restricted to urban Dubai but since has expanded its range spectacularly (Campbell et al. 2022). Such plantations also support many of the UAE’s breeding European Turtle Doves and Rufous-tailed Scrub-Robins (*Cercotrichas galactotes*), as well as doubtlessly being the difference between life and death for many an exhausted migrant.

15.3.1.4 Intertidal Areas

The shallow, low-energy environment of the southern Arabian Gulf is ideal for the development of intertidal mudflats and the varied network of low, fringing islands and shallow shoals ensure extensive intertidal habitat along the coastline from Abu Dhabi island westwards. Further north, intertidal areas are best developed in sheltered creeks, such as at Ras Al-Khor (Dubai) or where barrier islands provide additional shelter, such as Siniyah Island, sheltering the complex site of Khor al-Beida (Umm al Quwain) (see Chap. 8). Such areas are extremely important for large numbers of shorebirds, Greater Flamingoes (*Phoenicopterus roseus*), herons and gulls. Depending on species and time of year, birds present will be a combination of those remaining for the non-breeding season, others making temporary

refueling stopovers during long migratory journeys, and a relatively small proportion present to breed. The vast, complex nature of such habitats makes assessing waterbird populations labor-intensive and logistically difficult, to the extent that there are no reliable estimates of populations, let alone monitoring of trends. Some early work was carried out in the mid-1990s, concentrating at Ras Al-Khor, Dubai, (Keijl et al. 1998) whilst Environment Agency–Abu Dhabi have organized January counts of various wetland sites, as part of the International Waterbird Census coordinated by Wetlands International. As well as the Endangered Great Knot (*Calidris tenuirostris*), of ten Near Threatened species occurring in the UAE, five (Eurasian Oystercatcher *Haematopus ostralegus*, Eurasian Curlew *Numenius arquata*, Black-tailed Godwit *Limosa limosa*, Bar-tailed Godwit *L. lapponica* and Curlew Sandpiper *C. ferruginea*) are migrant shorebirds almost wholly dependent on intertidal habitats. Regrettably, such habitat is under increasing threat in the UAE, as elsewhere, from development and reclamation (see Burt 2014).

In intertidal areas, shorebirds dominate in both variety and absolute numbers; over 20 species co-occur at the richest sites. Almost all nest from central Asia northwards to the Arctic Ocean and make long migratory journeys to reach the food-rich Arabian Gulf. These include the Great Knot, for which the Arabian Gulf constitutes the westernmost edge of its wintering range and, as indicated by a ringing recovery, reaches the UAE from Kamchatka, Russia (Dorofeev and Campbell 2017). This very localized species is best sought amongst extensive flocks of the more numerous Bar-tailed Godwit and Grey Plover (*Pluvialis squatarola*). Numerically most abundant are small sandpipers (e.g. Dunlin *C. alpina*) and plovers (particularly Kentish *Charadrius alexandrinus* and Tibetan Sand Plover *C. atrifrons*). Crab Plover (*Dromas ardeola*) and Kentish Plover represent rare examples of intertidal shorebirds that breed locally. The former has a number of unique characteristics for a shorebird, not least its striking, pied plumage and habit of excavating nesting burrows. It occupies its own monospecific family and is very much an Arabian breeding speciality. The 1400–1500 pairs that breed very locally in the UAE may represent over 30% of the Arabian population (Table 15.1; Javed et al. 2012). Kentish Plovers are much more widespread, breeding year round alongside saline shores, in areas where disturbance is limited.

Greater Flamingo occurs in many intertidal areas of the UAE, with the waters surrounding Abu Dhabi Island and Ras al-Khor particularly favored. Satellite tracking of UAE birds reveals that some summer as far north as Turkmenistan and move between multiple intertidal sites on the UAE coast (Javed and Khan 2007). Other characteristic species of intertidal habitats include the numerous Western Reef Heron (*Egretta gularis*) and the much less conspicuous Striated Heron (*Butorides striata*). Both require large stands of gray mangroves (*Avicennia marina*, see Chap. 7) for nesting. The globally Vulnerable Greater Spotted Eagle (*Clanga clanga*) also favors areas with extensive mangroves, where it roosts and forages on injured or sickly waterfowl. Winter concentrations of up to 20 individuals occur at Ras al-Khor, Dubai, providing a spectacular sight as the cool morning air warms and they soar on developing thermals, against a backdrop of city skyscrapers.

Table 15.1 Population estimates of eight breeding species characteristic of offshore islands in the Arabian Gulf

	Estimated UAE population, breeding pairs	Estimated Arabian Population, breeding pairs
Crab Plover <i>Dromas ardeola</i>	1400–1500 (Javed et al. 2012)	4000
Bridled Tern <i>Onychoprion anaethetus</i>	40,000–45,000 (Aspinall 2010)	300,000
White-cheeked Tern <i>Sterna repressa</i>	25,000 (Aspinall 2010)	75,000–80,000
Saunders's Tern <i>Sternula saundersi</i>	300–500 (Aspinall 2010)	4000
Sooty Gull <i>Ichthyaeetus hemprichii</i>	2100 (Aspinall 2010)	28,000
Socotra Cormorant <i>Phalacrocorax nigrogularis</i>	60,000–70,000 (Khan et al. 2018)	110,000
Osprey <i>Pandion haliaetus</i>	72 (Khan et al. 2007)	850
Sooty Falcon <i>Falco concolor</i>	5–6 (Shah et al. 2008; Aspinall 2010)	500

Source: Jennings (2010); updated information for UAE populations as indicated

The high energy Gulf of Oman shoreline is almost bereft of extensive intertidal areas, with the notable exception of Khor Kalba (Sharjah). This site has evocative forests of old growth mangroves and is the only location in the UAE for Collared Kingfisher (*Todirhamphus chloris*), of endemic subspecies *kalbaensis*. This requires holes in old trees for nesting and recent surveys have revealed a population of over 100 birds. Kalba is further unique in UAE terms for supporting regular wintering Indian Pond Herons (*Ardeola grayii*) and a small resident population of Sykes's Warbler (*Iduna rama*), a species otherwise breeding mainly in inland central Asia. This important site is now fully protected as Al Qurm Nature Reserve and is open to the public for visiting. Figure 15.10 depicts four species typical of the intertidal areas of the UAE.

15.3.1.5 Offshore Coastal Islands of the Arabian Gulf

Small islands pepper the Arabian Gulf coastline, both inshore (particularly in the vicinity of Abu Dhabi) and further offshore. Some harbor internationally important populations of breeding seabirds, especially terns and Socotra Cormorants. Compared to terrestrial bird populations, these have been relatively well-studied. Population estimates for eight nationally important species, five of which are predominately Arabian in breeding distribution, are given in Table 15.1 and four characteristic species of this habitat are presented in Fig. 15.11. Most islands are distant from shore and thus inaccessible to the casual visitor, a remoteness vital for ground-nesting birds. However, many have been subject to development in recent decades, particularly for the petroleum industry. This causes increased disturbance at



Fig. 15.10 Species characteristic of intertidal areas. Clockwise from top left: Collared Kingfisher (*Todirhamphus chloris*), Greater Spotted Eagle (*Clanga clanga*), Bar-tailed Godwits (*Limosa lapponica*), Western Reef Heron (*Egretta gularis*). Photographer: Oscar Campbell

best and, in many cases, extensive habitat destruction and the introduction of mammalian predators such as feral cats.

Characteristic breeding species include five species of terns of which three, Saunders's (*Sternula saundersi*), White-cheeked (*Sterna repressa*) and Bridled Terns (*Onychoprion anaethetus*) are conspicuous in inshore waters around Abu Dhabi island during the breeding season. Saunders's Tern breeds at low densities but the other two may occur in large colonies. Saunders's Terns nest earliest and often have juveniles fledged by mid to late May; as with White-cheeked Tern it nests in bare scrapes above the high tide line. Bridled Terns do not return until late April and nest later, generally under the protection of shrubs or rock crevices. All three winter in the Indian Ocean and are generally absent from the Arabian Gulf when not breeding. An important species, nesting in very dense colonies, is the Arabian endemic Socotra Cormorant. This globally Vulnerable species, which makes spectacular early morning mass feeding flights, has undergone a recent population increase nationally; the UAE may now hold almost half the world population (Khan et al. 2018). A colony at Siniyah Island (Umm al Quwain) has been intensively studied (e.g. Muzaffar et al. 2017) but to date has no formal protection.



Fig. 15.11 Species characteristic of offshore coastal islands of the Arabian Gulf. Clockwise from top left: Socotra Cormorant (*Phalacrocorax nigrogularis*), White-cheeked Tern (*Sterna repressa*), Osprey (*Pandion haliaetus*), Sooty Falcon (*Falco concolor*). Photographer: Oscar Campbell

One species of shorebird and two raptors are characteristic of Arabian Gulf islands. Crab Plover is an Arabian near-endemic breeder, confined to two colonies in the UAE, with Abu Al Abyad (Abu Dhabi) holding the vast majority. The population here is well-protected, in contrast to some of the sites used by non-breeding birds (Javed et al. 2012, and references therein). Birds from Abu Al Abyad have been satellite-tracked to the Seychelles. The cosmopolitan Western Osprey (*Pandion haliaetus*) occurs at high densities in the vicinity of Abu Dhabi Island where it is conspicuous, readily using artificially provided nesting platforms, as well as natural outcrops on low headlands. Nests are reused annually, resulting in vast, bulky structures. In contrast, the globally Vulnerable and nationally extremely rare Sooty Falcon (*Falco concolor*) is now restricted to breeding sites in the far west of the Abu Dhabi emirate and, having undergone a severe decline (five pairs in 2007; two or three pairs since then; Shah et al. 2008; Javed et al. 2020) faces a bleak outlook.

Box 15.1: Seabirds in UAE Waters of the Gulf of Oman

A concerted effort to survey the UAE's deeper offshore waters was initiated in 2010, when local birdwatchers initiated trips out from Kalba, Sharjah, on the UAE's east coast. The results to 2016 were summarized by Campbell et al. (2017) and resulted in revision of the known UAE status of eleven species, including two species recorded for the first time. The waters off the Omani coast are extremely rich biologically, due primarily to an upwelling of cold, nutrient rich water from May to October as south westerly winds of the Indian monsoon blow warm surface water offshore (Chap. 4). Although the main upwelling does not reach UAE waters, many seabird species that breed or move into Omani waters as a result of the foraging opportunities offered overspill into UAE waters, at least occasionally. As most occur some way offshore (in excess of 40 km), land-based observations could never establish the true status of such species. Those occurring include four Near Threatened seabirds, three of which make remarkable journeys to reach UAE waters. The diminutive Swinhoe's Storm-Petrel (*Hydrobates monorhis*) breeds only in islands in the Korean archipelago yet occurs regularly throughout the North Indian Ocean. Large numbers of Flesh-footed Shearwaters (*Ardenna carneipes*), presumably from colonies on St Paul Island, southern Indian Ocean and western Australia migrate to the Gulf of Oman to spend the non-breeding season and use the rich feeding opportunities presented by the monsoon to moult. Sooty Shearwaters (*A. griseus*) come from even further afield; UAE birds likely originate in New Zealand but have migrated north west through the Indian Ocean, instead of the Pacific Ocean, so reaching the UAE instead of Japan, where they normally spend the early summer. All three species occur annually in small numbers in UAE waters. The fourth species, Jouanin's Petrel (*Bulweria fallax*) is rather different; known to breed only on Socotra Island, Yemen, it occurs erratically in UAE waters, mainly autumn and early winter. Over 600 have been counted on occasion. With a world population estimated at less than 10,000 (BirdLife International 2022c), local offshore waters are clearly of global significance for this poorly known species.

Other notable seabirds occurring in UAE waters of the Gulf of Oman include the Arabian breeding endemic Persian Shearwater (sometimes common, close inshore), Wilson's Petrel (*Oceanites oceanicus*, a common non-breeding visitor, from Antarctic islands), large numbers of the Arctic-breeding Red-necked Phalarope (*Phalaropus lobatus*, which stage in UAE waters mainly in spring and early autumn; wintering further offshore) and Arctic Skuas (*Stercorarius parasiticus*) which winter in and migrate through UAE waters, before making high altitude overland flights from the Iranian coastline, to breeding grounds on the Siberian tundra.

15.3.2 *Anthropogenic Habitats*

The growth of anthropogenic habitats, here broadly defined as those whose existence is more or less wholly due to human activities e.g. agricultural areas, wetlands associated with treated water discharge, has been responsible for large changes in the UAE's avifauna in modern times. Whilst such habitats generally attract widespread generalist species, they nevertheless support a high diversity, often at densities exceptional in natural terrestrial habitats. Some species using such areas, particularly extensive fodder fields, may be of high conservation value (see SOM Tables 15.1 and 15.2) and even Saharo-Sindian specialists use such habitats for part of the year, concentrating in numbers unknown elsewhere. It is a striking fact that, of the ten sites with the longest bird species lists in the UAE, all are almost wholly anthropogenic (eBird 2022). This clearly constitutes part of what Callaghan et al. (2018) term 'unnatural history' and which Cowan (2018) further discusses, based on avian observations from the Arabian Peninsula.

15.3.2.1 *Farms and Agricultural Areas*

Agricultural areas, ranging from small-scale, relatively unmechanized farming plots to vast, industrial-scale grasslands, support more bird species, at higher densities, than any other UAE habitat. Figure 15.12 illustrates four characteristic species of such habitats. Particularly important are areas of extensive fodder fields, cultivating species such as Lucerne (*Medicago sativa*) and watered by large, rotating irrigation booms. Sites with fields in a variety of tillage states, where native vegetation such as *Leptadenia pyrotechnica* is allowed to grow on the fringes, and with adjacent wetland areas (from released water associated with agricultural operations) are particularly rich, supporting abundant breeding and wintering species, numbers of which may rise rapidly after establishment (Campbell and Smiles 2019). Virtually all the UAE's breeding Collared Pratincoles (*Glareola pratincola*), Common Starlings (*Sturnus vulgaris*) and Western Yellow Wagtails (*Motacilla flava*) breed at such sites which have also facilitated the recent, rapid status change of Black-winged Kite (*Elanus caeruleus*) from vagrant to breeding resident (Campbell et al. 2022). These species are typical of warm temperate climates; their occurrence as Arabian breeders is reliant on sites providing a comparatively humid, sheltered microclimate. However, even quintessential desert dwellers, such as Cream-colored Courser, Egyptian Nightjar and Greater Hoopoe-Lark breed on the fringes, or more distantly, from such sites but then concentrate at them during the hottest months of the year, dispersing back into the desert in late autumn as temperatures ameliorate. Another desert denizen, Chestnut-bellied Sandgrouse, uses ephemeral pools in such areas for drinking, making conspicuous flights mid-morning. Wintering species include large numbers of shrikes, stonechats, wagtails, pipits and larks from breeding areas across much of central and northern Asia. Multiple species in each group are represented, but more significant still are several shorebirds which favour bare, tilled



Fig. 15.12 Species characteristic of farms and agricultural areas. Clockwise from top left: Black-winged Kite (*Elanus caeruleus*), Arabian Babbler (*Argya squamiceps*), Collared Pratincole (*Glareola pratincola*), Sociable Lapwing (*Vanellus gregarius*). Photographer: Oscar Campbell

ground. These include the high Arctic breeding Pacific Golden Plover (*Pluvialis fulva*), which in the UAE is at the western extremity of its regular wintering range, and the Sociable Lapwing, the UAE's only regularly occurring Critically Endangered species. Now restricted to nesting in small areas of Kazakhstan, and subject to severe declines caused by changes to agricultural practice on its steppe breeding grounds and hunting pressures on migration and wintering grounds, small numbers of Sociable Lapwing migrate through and winter annually in the UAE. Recent observations suggest that increasing numbers now remain each winter, as noted elsewhere in Arabia (Babbington and Roberts 2017). A record flock of 34 were discovered at one agricultural site in Abu Dhabi Emirate in February 2021, and almost 80 individuals were recorded at five sites during winter 2022-23.

High densities of prey and, doubtless, limited disturbance due to restricted access, attract wintering and migrant predators. The UAE's most extensive agricultural areas regularly support up to three species of harrier and both Greater Spotted and Eastern Imperial Eagles (*Aquila heliaca*). Pallid Harrier (*Circus macrourus*) and both eagles are species of global conservation concern.

In the late 1990s, areas of small-scale farming amidst mature Ghaf (*Prosopis cinerea*) woodland in Ras al-Khaimah, in the far north of the UAE, temporarily hosted a number of breeding species unique in a UAE and Arabian context (Aspinall 2010). These included small populations of three species typical of warm temperate latitudes: European Roller (*Coracias garrulus*), European Bee-eater (*Merops apiaster*) and Spanish Sparrow (*Passer hispaniolensis*), all of which no longer occur as breeding species in the UAE. The attractive wooded, farmland landscape they inhabited is still present, as are previously documented co-occurring species such as Arabian Babbler (*Argya squamiceps*) and Common Starling. It is possible that climatic changes account for the loss of such species, all of which were at the southern extremity of their global breeding range in the northernmost UAE (see Chap. 3).

15.3.2.2 Freshwater Wetlands

Non-saline wetlands of any type are very infrequent in the UAE and are thus of prime importance for a number of species, many of which are, by definition, highly localized nationally (although often with very extensive global ranges). The origin of such wetlands is often linked to agricultural operations or discharge of treated waste water. Many are ephemeral, perhaps the consequence of a flash flood or accidental leakage. They are also prone to rapid succession, becoming choked in vegetation and drying out, particularly by the rapidly colonizing reed *Phragmites australis*. However, even temporary shallow pools, if not hypersaline, rapidly attract at least small numbers of shorebirds and waterfowl, some of which, such as Black-winged Stilt (*Himantopus himantopus*) and Kentish Plover, may remain to breed. The presence of early successional fringing vegetation, providing additional cover and microhabitat variety, soon draws in Little Grebe (*Tachybaptus ruficollis*), Common Moorhen (*Gallinula chloropus*) and Clamorous Reed Warbler (*Acrocephalus stentoreus*), all of which have greatly increased ranges and populations in the UAE in recent decades. The most permanent and extensive sites, such as Al Wathba Wetland Reserve, Abu Dhabi, (which results from the release of treated waste water eutrophication a naturally saline, shallow waterbody) hold large numbers of wintering wildfowl and shorebirds (e.g. Northern Shoveler *Anas clypeata*, Eurasian Teal *Anas crecca* and Little Stint *Calidris minuta*). Wintering Western Marsh Harriers (*Circus aeruginosus*) may congregate to roost in groups of up to 50, although most disperse into the surrounding desert and plantations to hunt during the day. Two species worthy of particular mention are the very uncommon, breeding White-tailed Lapwing (*Vanellus leucurus*) and the Near Threatened, wintering Ferruginous Duck (*Aythya nyroca*). Unlike the superficially similar but much more generalist Red-wattled Lapwing, the former is restricted to shallow wetland fringes, and despite colonizing the UAE from 1996 onwards (Aspinall 2010), has remained extremely localized in its distribution. Ferruginous Duck is reliant on wetlands with extensive fringing vegetation and may occur in small flocks at favored sites; over-summering has occurred but breeding not yet been confirmed. Four species



Fig. 15.13 Species characteristic of freshwater wetlands. Clockwise from top left: Western Marsh Harrier (*Circus aeruginosus*), Ferruginous Duck (*Aythya nyroca*), White-tailed Lapwing (*Vanellus leucurus*), Little Grebe (*Tachybaptus ruficollis*). Photographer: Oscar Campbell

typical of freshwater wetlands are depicted in Fig. 15.13. In addition to their intrinsic worth for biodiversity, freshwater wetlands are extremely significant for their great educational value, an opportunity currently being effectively realized at Al Wathba Wetland Reserve and Al Wasit, Sharjah. Despite promising signs in the early stages, one similar opportunity that was spectacularly missed was at Al Warsan Lakes, Dubai, which has now been lost to development.

15.4 Adaptations

The UAE's resident and migratory birds must be able to survive the climatological extremes prevalent for much of the year; only the small proportion that are solely winter visitors, occurring November to early March, will avoid these extremes. Intense solar radiation and high ambient temperatures exacerbated by high humidity levels make maintaining a safe body temperature challenging and increase water demand at a time of year when freshwater availability is particularly limited. Severe

wind conditions such as the well-known ‘Shamal’ storm events are less of a threat, although they may add to general desiccation and resulting dust storms may disorientate migrants. This section discusses adaptations, both behavioral and physiological, of resident breeding birds to the climate of the UAE.

15.4.1 Behavioural Adaptations

An obvious general strategy, employed by many desert organisms, is avoidance of temperature extremes. Most are active at dawn and prior to dusk; in between, activity is reduced to a minimum, with most birds resting in shade where possible. Whilst sparse desert vegetation offers limited shade, solid objects such as rocks or buildings offer more; various larks and even Cream-colored Courser have been observed seeking shade from vehicles and even animals (Jennings 2010). Sheltering underground, characteristic of mammals and reptiles (see Chaps. 14 and 16, respectively) is less typical of birds, although Williams et al. (1999) recorded four species of larks, mainly Greater Hoopoe-Lark, using burrows of the Spiny-tailed Lizard (*Uromastix aegypticus*). This behavior was routinely observed 11:00–16:00 hrs and birds remained underground for much of that period, reducing water loss by as much as 81%. The burrow-nesting Crab Plover (Fig. 15.14) is another example, although not quite for the same reasons as the Greater Hoopoe-Lark. A study in Eritrea (De Marchi et al. 2008) revealed the relatively constant temperature (35 °C) and humidity

Fig. 15.14 Crab Plover (*Dromas ardeola*), a taxonomically unique burrow-nesting shorebird. This species forages in extensive areas of intertidal mud but requires undisturbed sandy islands for breeding. Photographer: Oscar Campbell



(60%) of two burrows studied would be near-optimum for embryo development and permitted very low incubation attendance of adults.

In the absence of shade, various larks aid thermoregulation by prostrating themselves into depressions, particularly where the ground is moist or covered with vegetation such as the mat-forming, large-leaved Desert gourd (*Citrullus colocynthis*) (Cowan and Brown 2001; Brown 2009). Birds remained prostrate for long periods, despite being fully exposed to the sun. Prostrating has also been observed by Greater Hoopoe-Larks within burrows, where it was interpreted as an attempt to conduct heat away from the body that would otherwise require evaporative water loss (Williams et al. 1999). Evaporative water loss by panting is frequently observed in birds during the hotter months. However, it seems to be mainly performed by temperate zone species migrating through the UAE, or those resident in relatively moist habitats (where such water may be easily replaced), rather than by true desert specialists.

Many species breed early in spring, so particularly sensitive stages of the life-cycle (eggs or chicks which cannot thermoregulate effectively) are fledged before the highest temperatures arrive. These include species from a wide variety of habitats (e.g. montane Hume's Wheatear, the widespread Great Grey Shrike (*Lanius excubitor*), reedbed-haunting Clamorous Reed Warbler and the coastal Saunders's Tern) but also Saharo-Sindian species of sandy deserts, such as Cream-colored Courser, Greater Hoopoe-Lark and Brown-necked Raven (*Corvus ruficollis*), all of which may have young fledged by April. Some then change habitat post-breeding, concentrating in comparatively moist agricultural areas until September/October, before dispersing back into the surrounding desert (see Farms and Agricultural areas, above). Rather than switching habitats within a discrete area, species such as Black-crowned Sparrow-Lark and the Bar-tailed Lark (*Ammomanes cinctura*) vacate large areas for extended periods. Although nomadism is inevitable for birds that feed on profusely seeding plants that grow rapidly but irregularly (Dean 2004), such nomadism is less frequent in Arabia, where seasonal distinctions are well-defined, than it is in, for example, interior Australia. Many nomadic species in Arabia are granivorous, have minimal reliance on water sources and typically occupy sandy plains, avoiding montane areas where they are likely outcompeted by sedentary species (Jennings 2010). They may appear suddenly in areas subject to good rainfall to take advantage of the glut of seeds available for several months and then vanish for years as conditions deteriorate. Two further species, the uncommon resident Trumpeter Finch (*Rhodopechys githaginea*) and the migratory Pale Rock Sparrow (*Carpospiza brachydactyla*) are interesting in that they occur, albeit highly erratically, in rocky areas including both rocky outcrops in sandy deserts and in true montane regions. The former is likely nomadic yet highly dependent on regular access to water; the latter certainly is nomadic and highly unpredictable in both distribution and numbers both as a migrant and breeder.

A few species take adjustment to timing of breeding further still, restricting nesting to winter. Osprey and Socotra Cormorant share this strategy, the latter also having chicks covered in white down, improving thermoregulation by enhanced reflection of radiation. However others, e.g. Chestnut-bellied Sandgrouse and White-

cheeked Tern habitually nest on bare ground from late spring to summer fully exposed to the full intensity of the sun and elevated ground temperatures, where shading by adults is critical to avoid eggs and chicks over-heating. Necessity of shade and cooling extends to when chicks start moving after hatching. It can be attained by standing over nests or chicks but also by adults wetting their belly feathers, a behavior observed in Chestnut-bellied Sandgrouse, Kentish Plover, Red-wattled Lapwing and Bridled Tern (Jennings 2010). Sandgrouse, three species of which breed in the UAE, are well-known for their ability to transport water to nests over long distances using modified belly feathers that are ultra-absorbent due to a unique barbule structure. In a study of the breeding ecology of Kentish Plovers at Al Wathba Wetland Reserve, Abu Dhabi, Kosztlányi et al. (2009) found that frequency of biparental care and site fidelity was greater than populations of the same species breeding in temperate latitudes, suggesting biparental care was likely selected for by the harsh local environment, where egg and chick survival is highly dependent on shade provision by parents.

Most Saharo-Sindian species seem not to require regular drinking, although some take advantage as the opportunity arises. Species such as Greater Hoopoe-Lark appear to drink rarely and presumably satisfy their water needs from dew or food. Others, some of which are highly sedentary in rocky, montane habitats such as Sand Partridge, Hume's Wheatear and Streaked Scrub-Warbler readily drink when possible but survive long periods when free water is unavailable. However, a third, much larger group of species must drink regularly and their UAE distributions reflects this need. This includes all non Saharo-Sindian species, but also Chestnut-bellied and Lichtenstein's Sandgrouse, both of which make daily flights to drink.

15.4.2 Physiological Adaptations

Williams and Tieleman (2005) review studies outlining evidence for physiological adaptations to extreme heat and aridity in desert birds. Such traits are less obvious than behavioral adaptations and are poorly studied in birds generally, compared to taxonomic groups such as insects or reptiles. However, they have been clearly demonstrated in Greater Hoopoe-Lark (Fig. 15.15) and are likely present in other Saharo-Sindian species. Such adaptations equate to significant overall distinctions in a species' life-history, compared to related species inhabiting more temperate, less arid environments. A lower rate of metabolism has been demonstrated both in the laboratory and the field for desert birds compared to non-desert species, and within a family (Larks) along an increasing aridity gradient from Western Europe to Arabia. Lower metabolism translates into a lower energy requirement and reduced food intake, an unsurprising adaptation of species living in environments such as deserts with low primary productivity.

Water balance is another critical issue for desert-dwelling organisms, in particular birds which are largely diurnal and, with a few exceptions, don't burrow. Desert-dwelling birds overall have lower total evaporative water loss than species from

Fig. 15.15 Greater Hoopoe-Lark (*Alaemon alaudipes*), a species highly adapted to life in Arabia, but which regularly forages and as seen here, collects nesting material, at anthropogenic sites. Photographer: Oscar Campbell



more moist environments, and this loss decreases within various species of larks along a gradient of increasing aridity (Williams and Tieleman 2005). A reduction of water loss through the skin rather than via respiration may be the reason for this overall reduction. It has been demonstrated that three species of Arabian larks, compared to two from the Netherlands, have subtly different combinations of lipids and cholesterol within the upper skin epidermis, thus reducing the movement of water vapor through the skin.

Other adaptations to living in extreme aridity include generalist diets that may shift opportunistically, smaller clutch sizes, fewer clutches per breeding season and relatively slow rates of nestling growth, meaning that adults do not risk having to continually forage (Dean and Williams 2004). Nestling fitness is also reduced, and this implies higher adult survival and greater longevity. In some especially dry years desert birds avoid breeding completely; this implies greater longevity, with birds only attempting to breed when conditions present little risk, compared to temperate zone species which breed annually. However, in response to sufficient rainfall, breeding attempts are then made very rapidly.

Box 15.2: Montane Owls

Perhaps the most remarkable discoveries concerning the UAE avifauna in the last decade have concerned the realization that two rare and little-known owl species are breeding residents of the Hajar mountains. Omani Owl (*Strix butleri*) a species missing since description of the first specimen in 1878 and

(continued)

Box 15.2 (continued)

long conflated with a very similar species resident in western Arabia, was rediscovered in northern Oman in 2013 and found in the UAE in 2015 (Judas et al. 2015), although with hindsight may have been recorded as early as 2006 (Tourenq et al. 2009). It is still known from only a single location but field studies are hindered by its quiet vocalizations and the remote terrain it favors. It may yet prove to be somewhat more widespread.

In 2017, two territories of Arabian Spotted Eagle Owl *Bubo milesi* were discovered in an area of the Hajars near Masafi (Fujairah). This Arabian endemic, most numerous in southern Oman and Yemen, is rare in northern Oman but was hitherto unrecorded, and unsuspected, in the UAE. Subsequent concerted survey work has detected a minimum of ten territories (J Judas pers comm) with birds even observed in and around village date plantations. The species is probably widespread at low densities throughout much of the Hajar mountains.

15.5 Bird Migration through the UAE

As a natural link between the vast, diverse breeding grounds of Eurasia and the food-rich wintering grounds of Africa, the entire Middle East is a superlative location to observe bird migration. Arid landscapes, leading lines formed by mountain chains, and avoidance of extended ocean crossings cause migrants to concentrate in certain locations where migration intensity can be globally exceptional. Radar-based studies, conducted nocturnally in Israel, suggest approximately four million migrant birds per 100 km per night, and overall some 4–5 billion individuals moving south each autumn (Bruderer 1996; Newton 2010). Smaller numbers (40–65%, due to mortality during migration and on wintering grounds) return northwards in spring. Density of migration declines eastwards across Arabia, so absolute numbers passing through UAE airspace, where quantification has never been attempted, are likely significantly lower. However, as the UAE lies within both the Central Asia and East Asia/East Africa flyways, but also on the eastern margin of the Mediterranean/Black Sea flyway (see BirdLife International 2010), species diversity is high. The vast majority of migratory birds transit on a north-south axis, but the Central Asia flyway includes species such as Yellow-throated Sparrow (*Gymnoris xanthocollis*) and Red-breasted Flycatcher (*Ficedula parva*), which breed in the Middle East and Eastern Europe respectively and winter in India, so transiting the UAE on an east-west axis.

With the extremes of spring passage spanning late January to late May, and that of autumn from late June to November, migration is ongoing throughout the UAE for much of the year. Indeed, as the latest winterers arrive in December, and sudden cold snaps in Iran force birds south across the Arabian Gulf in January, new arrivals may occur any month of the year. However, the vast majority of migration occurs March to mid-May and mid-August to October.

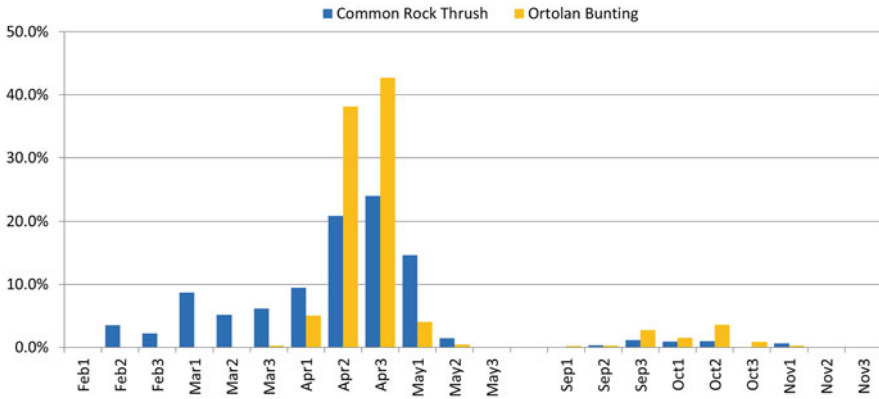


Fig. 15.16 Phenology and relative abundance of Ortolan Bunting (*Emberiza hortulana*) and Common Rock Thrush (*Monticola saxatilis*) through the UAE, expressed as percentage of total passage occurring in 10-day intervals. Sample sizes are 1539 bird-days (Ortolan Bunting) and 376 bird-days (Common Rock Thrush). Data from: Campbell and Smiles (2021). Ortolan Bunting is an example of a species in which spring migration is concentrated in a particularly narrow time period (mid to late April) whereas Common Rock Thrush has an unusually wide passage period. This may be explicable by breeding sites, whilst at comparatively low latitudes, encompassing a wide range of elevations and hence climates, from foothills in Iran to montane regions of Mongolia. Both species are much more frequent in spring (Ortolan Bunting 91% of passage occurring then; Common Rock Thrush 96%) than autumn. The two species discussed here are depicted in Fig. 15.19

In the UAE, the majority of migrants are active flyers which migrate nocturnally to avoid over-heating and dehydration. Diurnal migrants that are dependent on thermals for energy-efficient soaring (e.g. storks, eagles) tend to concentrate through the Levant and Kuwait rather than cross the Arabian Gulf directly, where the absence of thermals prevents passive soaring. The Straits of Hormuz are a surprisingly effective barrier to such species. Tracking data (e.g. McGrady et al. 2019) indicate marked detours to avoid crossing the Arabian Gulf, even in spring when the Hajar Mountains and Ruus al Jibal form a leading line of elevated land for north-bound birds. However, active flyers (e.g. songbirds, rollers, bee-eaters, shorebirds) are not deterred, and thus constitute the bulk of migrants using UAE airspace. Such nocturnal migrants must descend and pause migration soon after sunrise, when they may be forced to accept the first shelter available; such species are at risk of disorientation and collision in highly illuminated urban areas, especially if low-level mist is encountered. Some 140 species of birds regularly transit the UAE; Campbell and Moran (2016) and Campbell and Smiles (2021) provide phenological data and discussion on the more numerous species.

Whilst passage periods overall are prolonged, many species pass within a rather narrow time period and the date of peak passage is, in the absence of anomalous weather, rather constant from year to year (e.g. Ortolan Bunting *Emberiza hortulana*, Fig. 15.16). This is consistent with results from other well-studied migration hotspots in the Middle East (e.g. Shirihai 1996). Certain species show broader

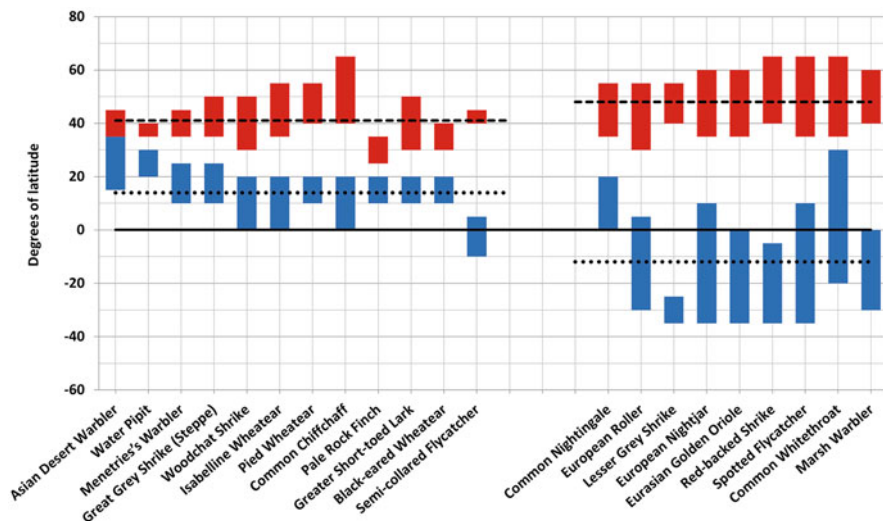


Fig. 15.17 Latitudinal ranges of breeding range (red bars) and wintering ranges (blue) for 21 migrant species that pass through the UAE, categorized as *Early* (main passage period mid-February–March; 12 species on left) or *Late* (main passage period late April–May; 9 species on right). Data sources: Birdguides (2008); Campbell and Smiles (2021); see data in SOM, Table 15.3 where scientific names for all species analysed are given. Dashed lines indicate the mean wintering and breeding latitude for each group of species

passage periods, presumably related to different populations migrating to breeding grounds which become hospitable at different times during the spring (e.g. Common Rock Thrush *Monticola saxatilis*, Fig. 15.16). This is further exemplified by Western Yellow Wagtail (*Motacilla flava*), four subspecies of which are readily distinguishable by male head pattern. The most southerly subspecies (breeding to 40°N) has peak passage early to mid-March whilst the latest, (breeding at 60–70°N) migrates through the UAE in early May. Migrants in late March and April mainly comprise two subspecies breeding at 50–60°N.

Another generality is that species with spring migration that peaks early (mid February–March) breed at lower average latitudes than those with spring migration peaking later (late April–May). Even more strikingly, early migrants tend to winter further north (generally north of the equator) than late migrants (Fig. 15.17; see also SOM Table 15.3), which may reach as far south as 35°S in southern Africa. This analysis, conducted for 21 UAE species, closely matches results for 132 species from a study in southern England (Newton et al. 2010).

As evident in Fig. 15.16 and further illustrated in Fig. 15.18, many species exhibit markedly different abundances in spring compared to autumn. Campbell and Smiles (2021), analyzing migration timing and relative seasonal scale of passage through the UAE, found that of 77 species studied, 40% were more frequent in spring (defined as 65% or more of total passage occurring in that season). These included

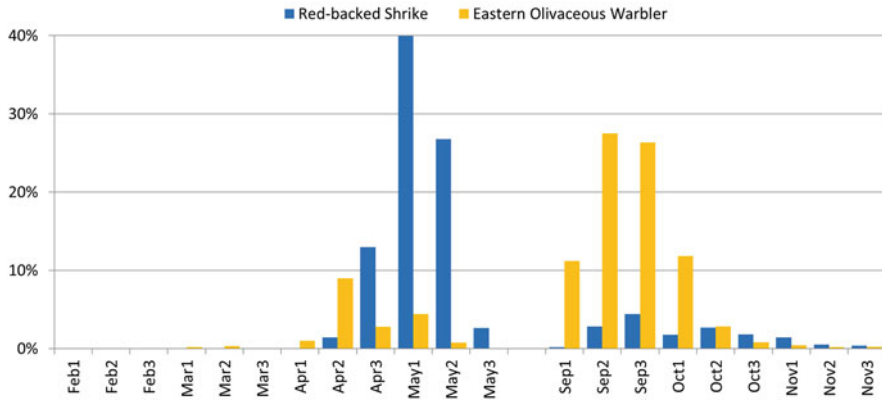


Fig. 15.18 Phenology and relative abundance in spring vs autumn of Red-backed Shrike (*Lanius collurio*) and Eastern Olivaceous Warbler (*Iduna pallida*) through the UAE expressed as percentage of total passage occurring in 10-day intervals. Sample sizes are 752 bird-days (Red-backed Shrike) and 487 bird-days (Eastern Olivaceous Warbler). Data source: Campbell and Smiles (2021). Red-backed Shrike is an example of a species in which spring migration is concentrated in a particularly narrow time period (May) and which is much more frequent then (85% of passage) than autumn. In contrast, Eastern Olivaceous Warbler is much more frequent in autumn (77% of passage) than spring. The two species discussed here are depicted in Fig. 15.19.

nine species that occurred almost exclusively in spring (defined as at least 98% of passage occurring then). Only 29% of species were more frequent in autumn, with only one species occurring almost exclusively then. Greater numbers of grounded migrants in spring than autumn (despite smaller total populations in the former season) has been demonstrated elsewhere in the Middle East and North Africa (e.g. Shirihaï 1996; Newton 2010). Reasons are multiple and complex. One is a greater need for recuperation and refueling immediately following an arduous desert crossing in spring (whereas in autumn birds lay down sufficient fuel stores in food-rich regions to the north to permit overflying, and then refuel again in southern Arabia or the sub-Saharan Sahel region, both of which experience late summer rainfall). Further, the UAE and central Asian deserts are more hospitable in spring than autumn due to cooler temperatures and winter rains. Avoidance of central Asian deserts in autumn for species breeding in the steppe and forest zones of the Asian Palearctic necessitates an initial westward migration at relatively high latitudes, before turning south well north-west of the UAE. The overall effect is a loop migration, with many species taking a more easterly route in spring, as demonstrated by ringing studies (e.g. Marsh Warbler *Acrocephalus palustris*; Birdguides 2008) and satellite-tracking (e.g. Red-backed Shrike *Lanius collurio*; Tøttrup et al. 2011).

Within a population, males migrate on average earlier than females, to reach the breeding grounds earlier and claim a better quality territory (Newton 2010). Data from Abu Dhabi Island (Campbell and Moran 2016) demonstrates this for Pied Wheatear, a species with strong sexual dimorphism (Figs. 15.20 and 15.21).



Fig. 15.19 Migrant species occurring in the UAE. Clockwise from top right: Common Rock Thrush (*Monticola saxatilis*), Ortolan Bunting (*Emberiza hortulana*), Eastern Olivaceous Warbler (*Iduna pallida*) and Red-backed Shrike (*Lanius collurio*). Photographer: Oscar Campbell

Although routine in that it is undertaken by billions of birds of hundreds of species annually, migration through deserts is one of the most extreme endurance feats undertaken by birds. Some of the adaptations for making this journey, both behavioral and physiological, are discussed by Newton (2010) who notes that each year the journey is taking longer to complete, due to desertification of the African Sahel. However, in the UAE it is likely the journey has become somewhat easier in recent decades, as formation of anthropogenic habitats, from urban gardens and parks to large scale agricultural areas, has yielded mesic, food-rich shelter that did not previously exist. Conversely, increased artificial illumination of urban and industrial areas, the latter particularly if associated with the oil industry in remote desert or offshore locations, have negative impacts on survival. As well as dehydration, and to a lesser extent starvation, migrating birds in the Middle East run the gauntlet of illegal, indiscriminate hunting, although this is a minor issue in the UAE compared to surrounding countries (Brochet et al. 2019). Disorientation due to sand and dust storms are another hazard and may precipitate remarkable fall-outs of birds, forced to temporarily pause their journeys. Such severe conditions are exceptional, however, and most individuals quickly re-orientate, often departing the following night if conditions allow.

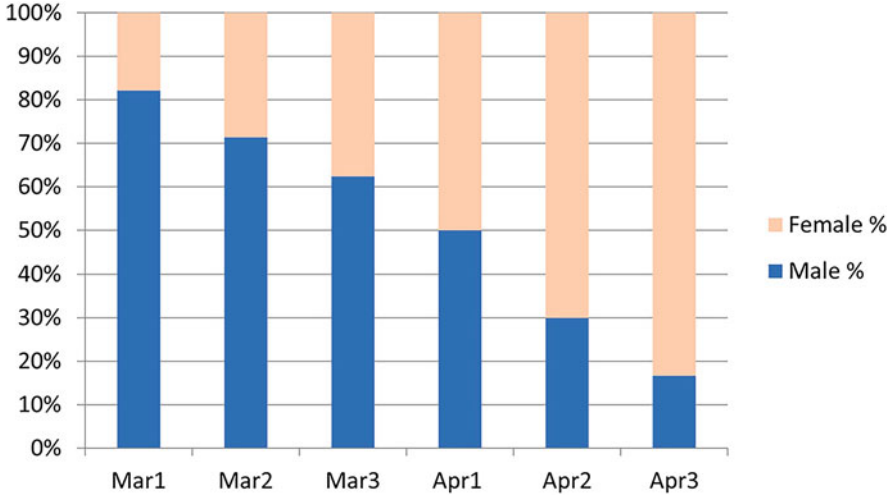


Fig. 15.20 Sex ratio data for Pied Wheatears (*Oenanthe pleschanka*; sample size 642 bird-days) migrating through Abu Dhabi Island on spring migration. Data are expressed as a percentage of male and female birds recorded in each 10 day period from 1 March to 31 April 2007–2014. Data source: Campbell and Moran (2016)

Fig. 15.21 Pied Wheatear male (*Oenanthe pleschanka*). Males of this species are easily distinguished from females, allowing relative timing of spring migration between sexes to be studied. Photographer: Oscar Campbell



15.6 Conservation

Although there has been welcome, much-needed progress in recent decades, efforts to conserve the UAE's avifauna still do not match its intrinsic interest and significance. Federal laws to prevent the hunting of birds have been in place since 1983 (Aspinall 2010) and, coupled with a limited hunting culture and the difficulty of obtaining firearms, have been broadly effective, although many species that occur seasonally are threatened by such activities outside the UAE (Burfield et al. 2021). However, threats to birds come from many sources other than direct persecution. Threats identified by Aspinall (2010), namely land-use changes (development, reclamation and agriculture), human disturbance, chronic over-grazing, over-abstraction of ground-water, pollution (including oil-related incidents), and introduction, inadvertent or otherwise, of mammalian predators (particularly to offshore islands) and exotic species, are still ongoing (Burfield et al. 2021). Establishment of government agencies, most notably the Environmental Research and Wildlife Development Agency (ERWDA; forerunner to the Environment Agency–Abu Dhabi) in 1996 (and with similar authorities in other Emirates) was a key step in the conservation of birds, their habitats and ecosystems generally in the UAE. Exercising regulatory powers, monitoring biodiversity and status of protected areas and ensuring compliance with various international conventions that the UAE is signatory to are amongst the critical roles undertaken.

One approach to conservation is to categorize species on the level of threat within a country, taking into account regional and global distribution and trends. This highlights priority species towards which funding, research, and action plans can then be targeted. Hornby and Aspinall (1997) identified 13 species or subspecies of global conservation interest, and a further 29 species which are either threatened or rare in the UAE and hence important in terms of national biodiversity. A similar list by EAD for the Emirate of Abu Dhabi only (Khan et al. 2020) assessed 49 species, of which 33 were classified as threatened. However, many species discussed therein were always likely to be extremely local and/or rare in the UAE, based on their dependence on naturally very rare habitats (particularly freshwater wetlands) whilst certain nationally declining or globally range-restricted resident species, such as Chestnut-bellied Sandgrouse, Arabian Babbler and White-spectacled Bulbul were puzzling omissions.

A more comprehensive analysis (Burfield et al. 2021) for the entire UAE assessed 167 regularly occurring species. In total over half (53%) were classified as nationally threatened and a further 14% Near Threatened. This extent of threat is a greater proportion for birds than for mammals or amphibians and reptiles. It is also a somewhat greater proportion of threatened species than the global average, although the situation for birds is deemed to have improved slightly based on retrospective estimations generated for 1996. Raptors, owls, shorebirds, terns and larks are particularly frequent amongst nationally threatened species. Some are threatened in the UAE due to naturally small ranges but others have undergone serious population declines. Most threatened species occur in areas where bird species

diversity is highest, particularly the northern and eastern coastlines and mountains, reflecting rapid, widespread land-use change due to development (residential and commercial) being the greatest risk to many species. Biodiversity loss due to development is unintentional and inevitable, at least to some extent, in all countries with developing economies but other major threats, such as invasive species and human intrusion and disturbance are readily soluble by recognition of the problem and then education, if necessary backed up by enforced legislation.

Another approach to bird conservation is identification of Important Bird Areas (IBAs). IBAs offer better protection to species that naturally concentrate (e.g. breeding terns, wintering shorebirds) rather than to wide-ranging, low density resident species (e.g. Arabian Babbler). However, an effective network of IBAs can go a long way to preserve national biodiversity and, as birds represent well-studied indicator species, habitat protection for them benefits many other taxa too. Twenty IBAs were first defined in the early 1990s, predominately islands in the Arabian Gulf and coastal wetlands (Evans 1994). Progress to protect such areas was evaluated by Aspinall and Hellyer (2006), who noted only faltering protection efforts, based mainly on ruling decree at an individual Emirate level and that, as effective protection for most important areas had not been achieved, some had suffered serious environmental degradation. An updated assessment of IBAs was released in 2018, representing the first official governmental-level evaluation of the IBA network (MoCCaE 2018). This upheld 14 of the original IBAs and announced the confirmation of 16 (out of a proposed 20) additional locations. The resultant 30 IBAs occupy 4200 km², 5% of the land area of the UAE. Most are coastal but also include several significant areas of interior desert and Fujairah's Wadi Wurayah National Park, the last, relatively untouched extensive portion of the Hajar Mountains in the UAE. Wadi Wurayah has also been recognised as a UNESCO Man and Biosphere Reserve. However, of the six IBAs identified in 1994 that subsequently lost their status, four were delisted as they no longer met the criteria for inclusion, so seriously had they been degraded. Further, 11 of the current 30 IBAs are unprotected in any way and some, including very significant locations for birds (such as Umm al Quwain's Khor al Beida and the adjoining Siniyah Island) face multiple threats. Even formally protected IBAs may face varying degrees of threat, including severe; in 2017 the condition of nine locations was deemed unfavourable or very unfavourable. Of the 30 IBAs, 19 were judged to be under medium to very high pressure, mainly from development, disturbance and invasive species. Such threats are still on-going.

For example, Jebel Hafit, a remarkable montane landscape amidst interior desert on the outskirts of Al Ain and holding important numbers of the globally Endangered Egyptian Vulture (Fig. 15.22), despite being decreed a National Park in 2017, is currently being subjected to tree planting at densities far beyond natural levels, as well as the deliberate release of large numbers of non-natives such as Arabian Partridge (*Alectoris melanocephala*). The proposed release of non-native ungulates has the potential to devastate the fragile vegetation and, hence the basis of the food chain. Ras Al-Khor, a remarkable 'green lung' in the heart of Dubai, has seen its important shorebirds populations decline due to misguided planting of mangroves (which replace highly productive mudflat areas) and currently is undergoing major

Fig. 15.22 Egyptian Vulture (*Neophron percnopterus*). This spectacular, globally Endangered species is present in the UAE only at Jebel Hafit, where it was finally confirmed to breed in 2017 (Williams et al. 2023). Its future at Jebel Hafit, despite the site having National Park status, remains uncertain. Photographer: Oscar Campbell



development on its immediate margins. In addition to the demise of their intrinsic conservation value, both sites represent missed opportunities in showcasing spectacular UAE natural history to large urban populations living in close proximity and to eco-tourists who visit for birdwatching. The admirable and highly successful efforts at sites such as Al Wathba Wetland Reserve (Abu Dhabi) and Khor Kalba, Wasit Nature Reserve and Wadi Shees (all Sharjah) notwithstanding, environmental education, both explicitly and by allowing people to simply visit and appreciate IBAs, is still a greatly underplayed aspect of conservation in the UAE.

To some extent, it is inevitable that the UAE faces major conservation challenges. The rapid increase in population, from less than 500,000 in 1971 to nearly 10 million in 2022 (Anon 2022a), has occurred overwhelmingly in coastal areas. The consequent impact on fragile coastal and island ecosystems and their birdlife has been enormous, and while somewhat ameliorated by the creation of new anthropogenic bird habitats, has been particularly challenging for specialist species whose native habitats have been degraded. At the same time, however, an understanding of the importance of conservation has become accepted as a key element of Government planning, at both the federal and local (Emirate) levels.

Although there is much work still to do, there are signs that things are moving in a positive direction. The national Red List Index generated by Burfield et al. (2021) indicates that, overall, there has been a slight improvement since 1996, which bucks the global trend and reflects the fact that there are 27 species whose status seems to have genuinely improved in the UAE between 1996 and 2019, compared to 18 species whose species has deteriorated. With regard to IBAs, overall the development-related pressure that they are under has declined slightly since 2006, partly caused by

significantly increased conservation planning and action. Consequently, overall IBA state has improved somewhat (MoCCaE 2018).

Other welcome developments include announcements in early 2022 concerning the establishment of formal structures to protect and manage Umm Al Quwain's Khor al Beida and Siniyah Island and creation of an independent Fujairah Environment Authority, with a dedicated mandate. This suggests that significant progress in terms of conservation continues to be made. The Convention of Wetlands ('Ramsar Convention') is one example of a number of important conservation treaties to which the UAE has become signatory in recent years and the country now has ten Ramsar sites, six designated since 2017 (Anon 2022b). Abu Dhabi's hosting of the Conservation of Migratory Species Secretariat since 2009 and BirdLife International's Global Flyway's Summit in 2018 are just two further examples of how the UAE is increasingly taking conservation in general, and that of birds in particular, increasingly seriously.

15.7 Further Reading

A readable early summary of the UAE's avifauna is provided by Richardson (1990), updated by Pedersen and Aspinall (2010) and Pedersen et al. (2022). Data on breeding bird distribution and ecology was summarized by Aspinall (2010); Jennings (2010) eloquently and comprehensively puts the UAE's breeding avifauna into a regional context. Dean and Williams (2004) summarize bird adaptations to life in deserts, particularly larks, with examples from research undertaken in Saudi Arabia.

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