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OSME

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Contents

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Activity and status of Cranes *Grus grus* wintering in Israel

NADAV LEVY and YORAM YOM-TOV

Summary The known wintering population of Cranes *Grus grus* in Israel has grown from several hundred in the 1960s to 4,000–7,000 now, in seven areas. The increase appears due to improved food supplies through agricultural changes, also to reduced hunting and improved conservation. Birds have wintered in Emeq Yizreel since at least the 1940s and numbers reached 1,700 in 1984–5. In Emeq Hefer on the central coastal plain wintering started in 1968–9 and 1,050 were present in 1991–2. The populations of Emeq Hefer and Emeq Yizreel were studied especially in 1984–5 and 1987–8. Main arrivals are from mid-October, numbers peak from early December to early February, and most leave by late March. First-years comprised 15·2% of birds. Through one winter, birds' activity was classified into movement, sociality, resting, preening, foraging, or vigilance: more time was spent moving in December and March and less preening, possibly due to the lower rainfall then and to restlessness at the beginning and end of winter; time spent in other activities did not differ significantly between months. At roosts, 74% of birds left within 15 minutes either side of sunrise and 70% returned between sunset and 90 minutes later. Birds were followed up to 35 km from roosts to feeding sites; mean air speed was 41·7 km per hour; most birds loafed at the roost around midday, so apparently flew out to feed twice per day. Predation by Spotted Eagles *Aquila clanga* apparently occurred.

THE EXISTENCE of wintering populations of Cranes *Grus grus* in Israel (formerly Palestine) was first documented in the nineteenth century (Tristram 1866, 1873, 1884). From at least the 1940s wintering occurred in Emeq Yizreel (the Yizreel valley) in the north of the country (Bodenheimer 1953; Meinertzhagen 1954; Smoli 1968), including the Ta'anach district which is now one of the main Israeli wintering areas, and since the mid-1960s birds have wintered also in Emeq Hefer in the central coastal plain (Levy 1985), as well as in other regions of Israel (Paz 1986; Levy 1989; see Figure 1). Since about 1967–8 the numbers in Israel have increased

Table 1. Changes in the size of the wintering population and in the number of wintering sites of Cranes *Grus grus* in Israel.

	Estimated winter population	No. of wintering sites	Source
End of 19th century	Dozens or more	1–2	Tristram (1866, 1873, 1884)
1900 to 1940s	Dozens or more	2	Meinertzhagen (1954)
Mid-1960s	Several hundred	3	Suaretz (1975), Levy (1985), Mendelssohn (1975)
Mid-1970s	c. 1,000	5	Suaretz (1975), Levy (1985), Paz (1986)
Early 1980s	c. 2,000	5–6	Levy (1985), Paz (1986)
1984–5	c. 2,500	7	Levy (1985)
1985–6, 1986–7	2,500–3,000	7	This study
1987–8, 1989–90	3,000–3,500	7	This study
1990–1	c. 4,000	7	This study
1991–2	6,000–7,000	at least 5	This study

considerably (Tables 1–3). The decline from a peak of 1,700 in Emeq Yizreel in 1984–5 was followed by growth elsewhere, particularly in Emeq Hula which is now the main wintering area. NL estimated the total Israeli winter population in 1984–5 to be about 2,500 and it is now at least 4,000–7,000 (Figure 2, Table 1). With the increase in numbers has come a spread to previously unoccupied parts of Israel, and from 1979–80 about 2,000 have wintered annually in the plains and valleys of central and northern parts of the country (Levy 1985) where they feed in cultivated areas (Mendelssohn 1975; Suaretz 1974, 1975).

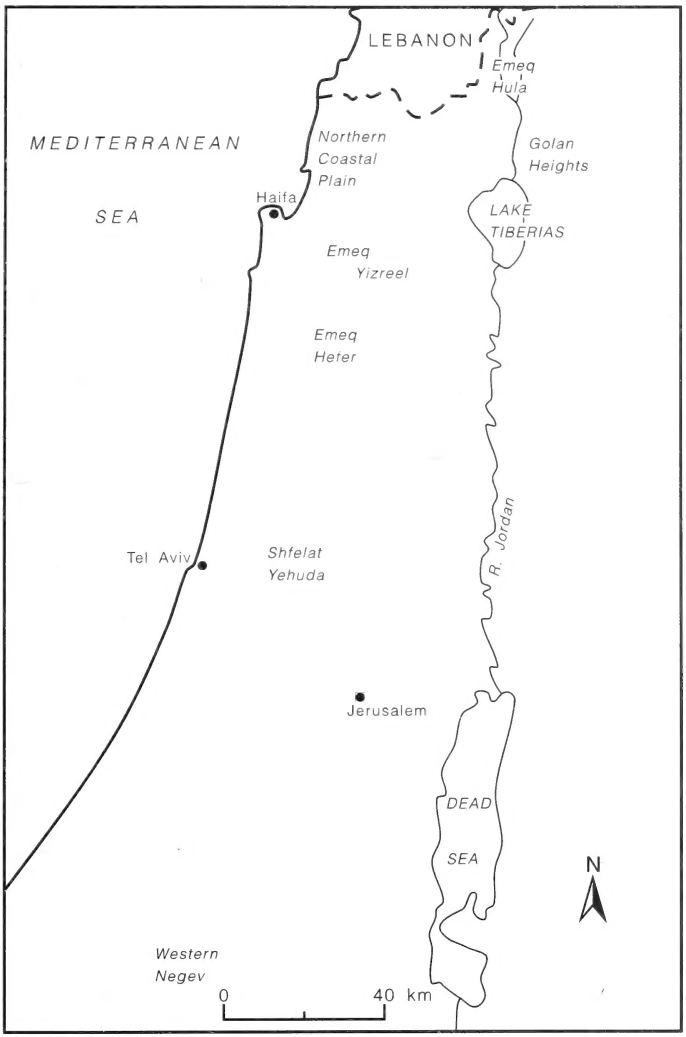

Figure 1. The seven major wintering areas of Cranes *Grus grus* in Israel.

Table 2. Development of the wintering population of Cranes *Grus grus* in Emeq Yizreel (Israel). Further data have been reported by Mendelssohn (1975) and Levy (1986a, 1986b, 1989).

	Peak no. wintering	Date of peak observation	Source
1936–60	Present	—	M. Zaharoni *in litt.*
1942	Present	—	E. Smoli pers. comm.
1946	Present	—	Meinertzhagen (1954)
1964–5	49	—	Paz (1986)
1967–8	500	—	Paz (1986)
1973–4	100	—	Suaretz (1975)
1977–8	800	—	Paz (1986)
1981–2	1,200	December	NL
1984–5	1,700	January	Levy (1985), Paz (1986)
1985–6	800	December	This study
1986–7	500–760	Dec–Jan	This study
1987–8	700	Dec–Jan	This study
1988–9	650–950	Dec–Jan	This study
1990–1	500	—	This study, Nov–Dec only
1991–2	500	—	This study, Nov–Dec only

Table 3. Dates of first, last, and peak observations of wintering Cranes *Grus grus* in Emeq Hefer (Israel), 1966–7 to 1991–2. Records involve only birds apparently wintering, not passage migrants.

	First observation	Peak no. wintering	Date of peak observation	Last observation
1966–7	—	0	—	—
1967–8	—	0	—	—
1968–9	1 Nov	19	8–15 Feb	1 Mar
1969–70	14 Oct	35	Oct–Feb	27 Feb
1970–1	18 Nov	68	10 Jan	28 Jan
1971–2	14 Oct	10	Oct–Dec	31 Mar
1972–3	20 Dec	18	16 Jan	07 Apr
1973–4	3 Nov	7	12 Jan	—
1974–5	4 Dec	35	7 Dec	28 Jan
1975–6	21 Nov	120	Jan–Feb	15 Mar
1976–7	20 Oct	185	9 Feb	28 Mar
1977–8	23 Oct	156	12 Jan	8 Mar
1978–9	25 Oct	440	17 Jan	15 Mar
1979–80	21 Oct	625	19 Jan	19 Mar
1980–1	24 Oct	550	4 Jan	31 Mar
1981–2	5 Nov	100	19 Jan	6 Mar
1982–3	5 Nov	150	12 Feb	28 Feb
1983–4	15 Oct	240	14 Jan	24 Mar
1984–5	15 Oct	630	9 Feb	21 Mar
1985–6	19 Oct	500	18–30 Jan	28 Feb
1986–7	9 Oct	300	18 Jan	28 Mar
1987–8	15 Oct	760	30 Jan	6 Apr
1988–9	28 Oct	550	14 Jan	19 Mar
1989–90	18 Nov	700	15 Jan	24 May
1990–1	29 Oct	360	22 Feb	22 Mar
1991–2	24 Oct	1,050	4 Jan	3 May

This paper describes the activities and status of two populations of Cranes, now totalling roughly 2,000–2,500 birds, that winter in Emeq Hefer on the central coastal plain and at Ta'anach in Emeq Yizreel.

STUDY AREAS

Emeq Hefer, formerly a wetland but now drained, covers about 75 km^2, whereas Emeq Yizreel occupies about 300 km^2. Both areas are composed mainly of orchards and agricultural fields, where wheat, legumes, and chickpeas are grown in the winter, and cotton, corn, onions, peanuts, and tomatoes from spring to autumn. The climate in Emeq Hefer is mild: mean winter temperatures range from 15°C in October to about 11°C in January; rainfall occurs only in winter (October–April), with a mean annual precipitation of 63 cm, and an average of 56 rainy days per year. Emeq Yizreel has a similar winter climate, but rainfall varies from 40 cm in the eastern part to 60 cm in the west. The climate is similar in most other Israeli wintering areas which have been checked, mainly in the winter of 1987–8. Day length in winter is 10–12 hours.

METHODS

Investigations were conducted mainly from mid-September to April 1984–5 and November–April 1987–8. Additional data come mainly from regular observations carried out by NL at Emeq Hefer over 25 consecutive winters from 1966–7 to 1991–2, and in Emeq Yizreel mainly from 1980–1 to 1991–2, as well as occasional observations from Emeq Hula in upper Galilee, the Golan Heights, and the western

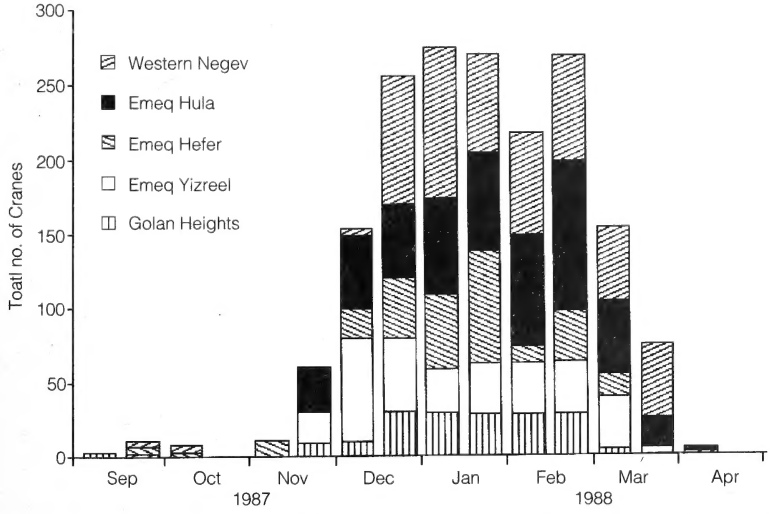

Figure 2. Accumulated numbers of Cranes *Grus grus* in the five main Israeli wintering areas, 1987–8. Observations at all sites were made on the same dates.

Negev from 1984–5 to 1991–2. From 1968 onwards observations were continued for two or three additional weeks after the Cranes had apparently left, in order to confirm the date of departure.

In 1984–5 observations to count and to determine the age and activity of the birds in Emeq Hefer and Emeq Yizreel were carried out over 12 full days (from before dawn until after sunset) and 28 partial days, totalling 149·7 hours when Cranes were present; partial days involved 1–8 hours of observations (1–5 hours in other years). Approximately 85% of this fieldwork was done in Emeq Hefer. All observations were made with the aid of 10×40 binoculars and a 24×80 telescope from a parked vehicle and sometimes also with 20×120 binoculars from selected observation points. The group of Cranes under observation was scanned at intervals varying from five to 20 minutes, each individual being categorized according to its age and its behaviour at the instant of observation. Behaviour was allocated to one of six mutually exclusive categories: (1) movement, including flight and walking short distances after landing, but excluding walking during foraging; (2) sociality, including various displays such as stalking, wing-flapping, jumping, stick-tossing, bowing, and playing (Cramp and Simmons 1980; Johnsgard 1983); (3) resting, including sleeping (with head and bill tucked under the back feathers while standing on one leg or lying on the ground); (4) preening, including comfort movements such as scratching and shaking the legs to remove mud; (5) foraging, including drinking; (6) vigilant watching, including standing in an upright posture with neck stretched. First-year birds are easily identifiable in winter; first-summer plumage is acquired at the end of the winter but even at this time there is no difficulty in recognizing first-years.

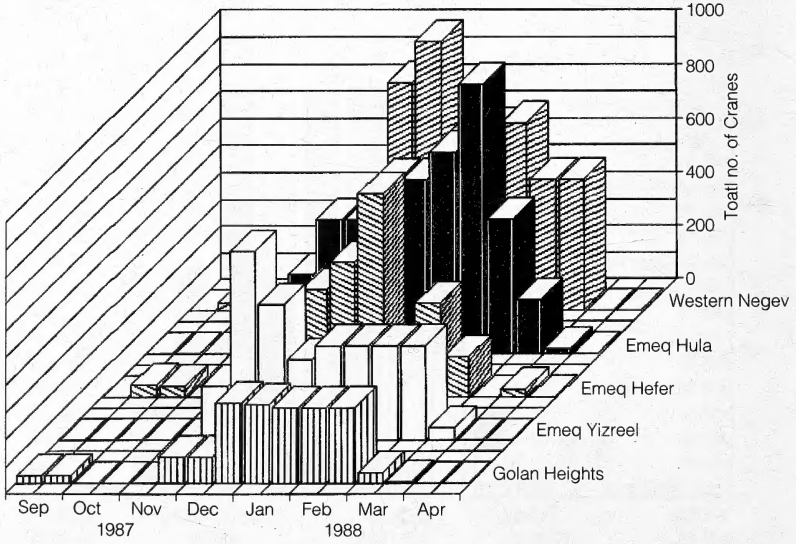

Figure 3. Numbers of Cranes *Grus grus* at the five main Israeli wintering areas, 1987–8. Observations at all sites were made on the same dates.

Plate 1. Cranes *Grus grus* in peanut field, Emeq Hefer (Israel), February. (*Ofer Bahat*)

During November–April 1987–8, with help from birdwatchers and local people, we conducted 85 further such counts in the seven Israeli wintering areas (results from the five main areas are shown in Figures 2–3). This fieldwork took place on two or three days each month, all seven areas being covered on the same days simultaneously.

RESULTS AND DISCUSSION

Wintering numbers and timing of movement

Surveys conducted in the seven regular wintering areas in Israel (Figure 1) since 1984–5 reveal a continuing gradual increase in wintering Cranes, from about 2,500 in 1984–5 to about 6,000–7,000 in 1991–2 (Table 1). The growth in the size of the wintering population as a whole has been attributed to an increase in irrigated agriculture (Langer 1982), the introduction of new crops such as peanuts and chick-peas, the creation of water reservoirs, and increased protection from illegal hunting (Levy 1985). More thorough counts by the Society for the Protection of Nature in Israel and by the Nature Reserves Authority have probably also contributed to the apparent increase.

Emeq Hula in the north has become the main wintering area in Israel only since 1987, but there is no exact explanation of this as yet, except for a possible decrease in or cessation of illegal hunting in the surrounding wetlands of Hula National Reserve, an area which is now managed for conservation (by the Nature Reserves Authority) more effectively than the other wintering regions in Israel. In terms of their extent, the cultivated fields and open areas of the western Negev have the greatest potential as wintering regions for Cranes in Israel, but the birds roost there in sand dunes which are difficult of access, and so the size of that population has not yet been properly gauged.

Some flocks seem to move between different wintering areas. Thus, data from simultaneous counts at the five main wintering sites during 1987–8 (Figure 3) sug-

gest that interchange between Emeq Hefer and Emeq Hula may well take place, birds moving to the more northern site during the latter part of the winter. That movement between the wintering areas does take place was demonstrated in 1985 by the appearance of an adult bird with a red wing-tag which was seen in Emeq Hefer from 19 to 28 February and then in Emeq Yizreel on 7–8 March (Levy 1985).

Crane migration through Israel takes place during April and September, when the birds fly over without landing except on very rare occasions. The wintering birds generally arrive from mid-October (Tables 3–4), some not until December. They presumably belong in the main to the European nominate subspecies, and

Table 4. Months of arrival, peak numbers, and departure of Cranes *Grus grus* wintering in Emeq Hefer (Israel), 1968–9 to 1991–2 (summarizing data in Table 3).

	Month of arrival (frequency)	Month with peak number of birds (frequency)	Month of departure (frequency)
October	15		
November	7	1	
December	2	2	
January		15.5	2
February		5.5	3
March			14
April			2
May			2
No. of years for which data exist	24	24	23

the wing-tagged adult mentioned above had probably been marked near Moscow (International Crane Foundation director, G. Archibald pers. comm.), though it is possible that some are from the Turkish population of *lilfordi*.

The wintering population peaks from early December to the beginning of February, and the return of wintering birds probably begins in January, with numbers then decreasing rapidly through mid-February; most or all Cranes have disappeared

Table 5. Proportion of first-years in the wintering population of Cranes *Grus grus* in Emeq Hefer (Israel), 1984–5 to 1991–2. For each winter, the proportion has been calculated using the sum of all counts from December to February (following Fernandez-Cruz 1981).

	Percentage of first-years	No. of days of observations	Sum of all counts of all birds
1984–5	13.6	31	6,560
1985–6	14.9	18	1,988
1986–7	15.8	6	981
1987–8	16.4	12	1,724
1988–9	12.0	4	234
1989–90	26.1	7	889
1990–1	16.3	4	264
1991–2	15.0	8	1,739
Total	15.2	90	14,379

Plate 2. Cranes *Grus grus*, western Negev (Israel), January. (*Alan Roberts*)

by the end of March (Bodenheimer 1935; Langer 1982; Dovrat 1984; Levy 1985; Paz 1986; see Tables 3–4). In a single day at the end of March 1990 about 5,000 Cranes, presumably passage migrants through the country, were seen in the Kibbutz Dan area of Emeq Hula near Mount Hermon (O. Amir pers. comm.), and on very rare occasions birds are seen even as late as May.

Only once was a Demoiselle Crane *Anthropoides virgo* observed by NL (and later also by several others) in winter, the first Israeli wintering record (Shirihai in press): a subadult bird with several hundred Cranes in Emeq Yizreel, from 6 to 15 December 1986. The species is otherwise very rare in the country, occurring only in spring.

Flock size and composition

Average flock size in Emeq Hefer and Emeq Yizreel during the 1984–5 study was 141 (range 10–1,700). Since then, several flocks in Israel have reached peaks of about 1,500–5,000 birds, all in Emeq Hula. Recent years have seen larger aggregations than ever before on the central coastal plain and particularly in Emeq Hefer, where the Cranes winter in a flock of up to 1,050 individuals (Table 3). The flock in Emeq Yizreel has been up to 1,700 birds (Table 2) and about 1,500–2,000 occur in the western Negev (NL unpubl. data, Nature Reserves Authority data). The mean proportion of first-year birds in the wintering population of Emeq Hefer between 1984–5 and 1991–2 was 15·2% (Table 5), similar to that found for wintering Cranes and other *Grus* species in other countries (Table 6).

Diurnal activity patterns

Feeding areas were mostly peanut, wheat, and cotton fields in Emeq Hefer, and chickpeas, cotton, corn, and wheat in Emeq Yizreel, but sorghum, tomato, and

Table 6. Proportion of first-years in various wintering populations of Cranes *Grus grus* in Europe and elsewhere.

	Percentage of juveniles	Total no. of birds	Source
Germany	12·00	5,805	Libbert (1969)
Spain	11.42	17,240	Fernandez-Cruz (1981)
Sweden	5.0–6.7 in various years	?	Swanberg (1981)
Mainly Eurasia and North America (various (*Grus* spp combined)	13.5	?	Johnsgard (1983)

even avocado and olive plantations were also visited. Only very rarely did the birds visit reservoirs to drink. Foraging activity tended usually to be highest during the morning, though this pattern was not evident in the January data (Figure 4). Especially in mid-afternoon the birds tended to spend their time resting at day-loafing sites (see below), and most birds preened or sometimes slept. Preening also occurred during the morning and in the evening at night-roosts.

Over the four months of the 1984–5 study there was no significant change in the proportion of birds resting at any one time during daylight (monthly range 6·2–8·1%) or engaged in vigilant behaviour (18·4–20·2%) (Table 7, Figure 4). The monthly average proportion of birds foraging varied from 27·1% to 43·5%, and on average fewer than 6% of birds were engaged in sociality at once. The proportions of birds

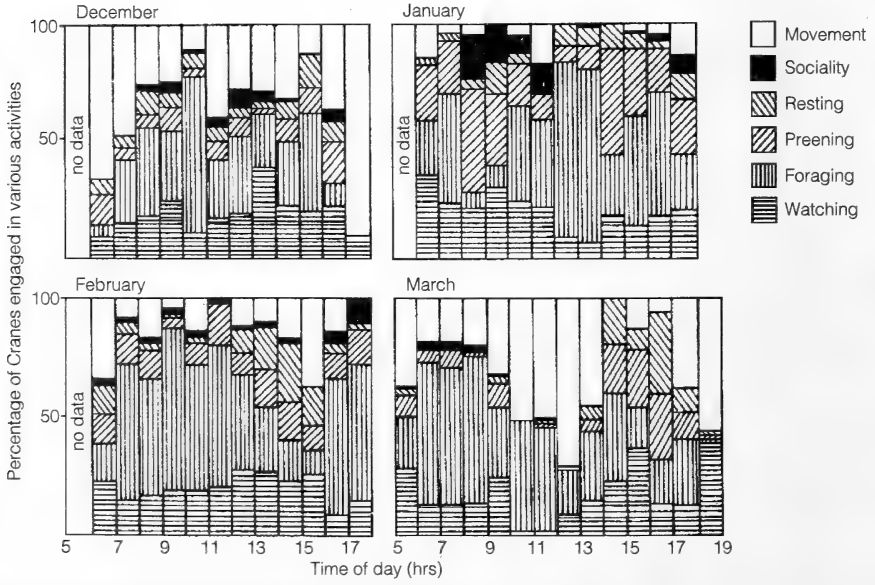

Figure 4. Daily activities of Cranes *Grus grus* wintering in Emeq Hefer and Emeq Yizreel (Israel), December–March 1984–5.

Table 7. Daily activities of Cranes *Grus grus* wintering in Emeq Hefer and Emeq Yizreel (Israel), December–March 1984–5. Figures are mean percentages of birds engaged in each activity (with standard deviations) and summarize data presented in Figure 4. See text for details of data collection.

Activity	December	January	February	March
Movement	37.8±11.3	15.2±6.5	6.0±3.2	31.5±10.0
Sociality	2.3±1.3	2.3±1.3	5.5±3.4	0.5±0.5
Resting	6.8±1.5	8.1±3.9	6.7±2.1	6.2±4.5
Preening	7.6±2.5	11.3±1.6	23.6±6.3	8.3±3.7
Foraging	27.1±9.1	43.5±10.7	38.0±11.4	34.8±9.0
Watching	18.4±4.9	19.6±2.8	20.2±4.2	18.7±6.5
Total time (hours) covered by observations	30.8	45.6	37.1	36.2

moving and preening showed contrasting trends, with more moving in December and March, and fewer during January and February, while the opposite was true for preening (Table 7). For both activity categories the differences between December and March on the one hand and January–February on the other were significant (*t*-test, $P<0{\cdot}05$). The number of rainy days was only four in December and three in March, but ten in January and 13 in February, the rainier period perhaps forcing the Cranes to spend more time preening and thus less time moving. Also, the proportion of time spent moving may reflect restlessness after arrival (in December) and before leaving (in March), or may result from the flight activity of newly arrived or passage birds during late autumn and early spring migration.

On 11 dates in 1984–5, mainly during the second half of the winter, using vehicles and with the help of several assistants, we followed the early morning flights by Cranes in Emeq Hefer from their roosts to their feeding sites. The flights ranged from 17 to 32 km and were always to the south. The average ground speed, from

Plate 3. Cranes *Grus grus* in peanut field, Emeq Hefer (Israel), January. (*Nadav Levy*)

departure to landing, was 18·8 km per hour, and average air speed (i.e. allowing for wind speed and direction, measured at ground level) was 41·7±SD6·4 km per hour (similar to measurements by Alerstam 1975 on Cranes migrating in southern Sweden). Foraging birds were recorded as far as 30–35 km from known night roosts (from 1985 to 1992), and foraging ranges of up to about 35 km from the night roosts were also noted by van der Ven (1979, 1981) and Deppe (1978, 1981a, 1981b) for Cranes on autumn migration stopover in Europe.

At the start of the season the birds flew only to nearby fields to feed, later to more distant ones as those close at hand were exhausted (Levy 1985; Alonso *et al.* 1989). Food availability could thus be a limiting factor for Cranes whose wintering was restricted to one area, and this may provide a reason for the movements which it seems probably occur, during the whole winter, between the different major Israeli wintering areas (see above). We suggest, therefore, that for a new wintering region to develop in Israel, it must contain more than one potential foraging area. The increase in the number of wintering regions in Israel does appear to be linked to an increase in foraging areas, but it is still difficult to say whether the improved conservation measures intended to benefit Cranes in Israel in recent years have also contributed to the increase in wintering numbers.

Roosting

There was one main night roost in Emeq Hefer and one in Emeq Yizreel, but some birds occasionally roosted at additional sites. In Emeq Hefer there were two other sites, 7 km from the main roost and 2 km from each other. Emeq Yizreel contained a total of four roosts, about 2–5 km from one another, the three additional ones being used mainly after rainfall.

Two of the night roosts in Emeq Hefer were observed in the 1984–5 winter in order to determine times of departure and arrival relative to sunrise and sunset. Because the pattern found at both roosts was similar, data from them were combined (Figure 5). On 11 dates from 15 December to 6 March birds were counted while leaving the roosts, and of the 2,827 individuals recorded on these occasions,

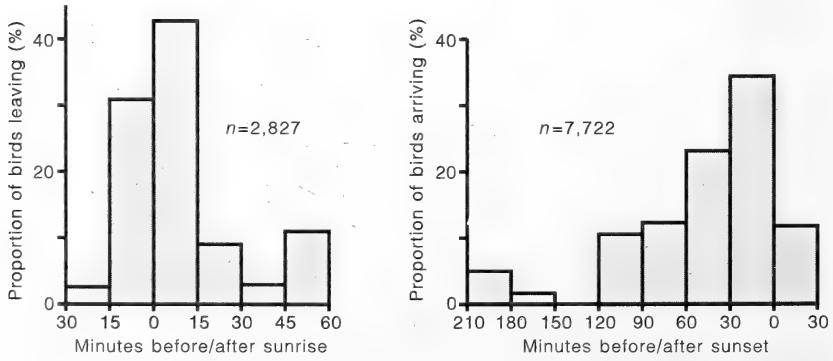

Figure 5. Timing of departure from and arrival at night roosts of Cranes *Grus grus* in Emeq Hefer and Emeq Yizreel (Israel) during the winter of 1984–5 (see text).

2,103 (74%) left between 15 minutes before and 15 minutes after sunrise. This conflicts with the statement in Cramp and Simmons (1980) that most Cranes leave night roosts half an hour before dawn. Occasionally, substantial numbers departed much later than was typical: thus 44% of 620 birds on 9 February and 23% of 183 birds on 19 February left 45 minutes or longer after sunrise. Our observations indicate that in mid-winter, due to the shorter days and reduced food supply, the birds depart earlier relative to dawn, but even at this time of year departure can be delayed until about 90 minutes after sunrise, and in thick fog it can be even later (Suaretz 1975; Levy 1985; Alonso *et al.* 1989). Thus on 29 December 1984 in Emeq Yizreel, due to fog, the departure of about 1,500 Cranes from the roost was not completed until about two hours after sunrise, though it had started 40 minutes before sunrise.

During 7 December to 23 February 1984–5, on 13 evenings in Emeq Hefer and two evenings in Emeq Yizreel, 7,722 Cranes were counted arriving at roosts, 5,405 (70%) arriving between sunset and 90 minutes earlier (Figure 5). Cramp and Simmons (1980) and Johnsgard (1983) stated that the evening arrival is after sunset.

Birds usually progressed to the final night roost site through one or two pre-roosts, these always lying within 2 km of the actual roost site. Cramp and Simmons (1980) and Johnsgard (1983) noted that these arrivals are accompanied by excited calls and dancing-displays, but we found this to apply only to the pre-roost areas, the silent flight to the actual roost being quite probably an adaptation to reduce predation (Lack 1968).

Throughout the whole of every winter in Emeq Hefer and Emeq Yizreel most Cranes visited day-loafing sites during the middle of the day (11.00–15.30 hrs). These are on the same areas as the night-roosts, or nearby, and it appears that the birds thus fly twice a day to feeding grounds up to about 7–21 km away. Day-loafing sites and night roosts were almost always in open fields, and on very rare occasions in shallow water of flooded fields or reservoirs, though day-loafing sites were always very close to open water of some sort. The occurrence of day-loafing sites was also noted by Cramp and Simmons (1980) and Johnsgard (1983), and several explanations for this habit are apparent: (1) the gatherings (and night roosts) may act as 'information centres' for food finding, etc. (Ward and Zahavi 1973); (2) they may decrease individuals' risk of predation (Lack 1968); (3) they may facilitate social bonding (Levy 1985, 1986b, 1989). Cranes could be heard calling at any time during the day, but vocal activity peaked just prior to departure for, and on arrival at, day-loafing sites and night pre-roost areas.

Predators

There are reports of various species of crane being killed by large raptors such as *Aquila* eagles (Makatsch 1970; Cramp and Simmons 1980; Johnsgard 1983; Levy 1985), and similar attacks by raptors on wintering Cranes were observed regularly in this study (Levy 1986c, 1989), mainly by Spotted Eagles *A. clanga*. Each year 10–15 Spotted Eagles winter in Emeq Hefer and 3–5 in Emeq Yizreel, and they are commonly seen in the vicinity of Crane flocks throughout the winter; they may

Plate 4. Spotted Eagle *Aquila clanga*, immature, Ein Gedi (Israel). (*Eyal Bartov*)

thus represent a major threat. During the 1984–5 winter we observed 52 cases in which Spotted Eagles appeared near Cranes, but only in three instances did the eagles dive and (unsuccessfully) attack them. In the winter of 1985–6, however, we found three Spotted Eagles feeding on a dead juvenile Crane. On examination the corpse proved still to be warm, and this was therefore probably a genuine case of predation by Spotted Eagle. Other raptors seen during this study to act aggressively towards Cranes were Long-legged Buzzard *Buteo rufinus* and Peregrine *Falco peregrinus* (very rarely observed). Black Kite *Milvus migrans*, harriers *Circus*, Buzzard *Buteo buteo*, Osprey *Pandion haliaetus*, and Kestrel *Falco tinnunculus* were often seen near Cranes but without any observed interaction (Levy 1985, 1986c). Information on possible terrestrial predators of wintering Cranes has been discussed by Johnsgard (1983) and Alonso *et al.* (1989).

The Cranes' calling rose in intensity when raptors such as eagles and Long-legged Buzzards were present. Attacks by raptors directed at Cranes on the ground or even in the air cause synchronized mobbing of the predator (Moll 1963; Levy 1985, 1986c; Alonso *et al.* 1989; this study), but such dense gatherings sometimes also happened, in the apparent absence of any predator, just before the flight to roost and at feeding sites, day-loafing sites, and pre-roosts, so it is possible that this behaviour also has a social function (Levy 1986c).

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Nadav Levy and Yoram Yom-Tov, Department of Zoology, Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel.

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Breeding biology of the Desert Finch *Rhodospiza obsoleta* in Israel

REUVEN YOSEF

Summary Breeding of Desert Finch *Rhodospiza obsoleta* was studied in the Negev desert of Israel. First clutches were laid from late April to mid-May, second clutches in the third week of June. Nests were in trees, 2–4 m up. Courtship feeding preceded nest building, and copulation was noted from ten days before until eight days after laying started. Size of main clutches was 4–5, of replacements 3–4, overall average 4·4. Incubation averaged 13·8 days; young were fed in the nest by the male alone, apparently only on crop milk, for 14–16 days, and fledged young accompanied their parents for a further 14–16 days. Overall hatching success was 60%, highest in the earliest clutches of the season. Infertility accounted for 39% of egg loss. Measurements are given of adult birds, eggs, and nests.

THE DESERT FINCH *Rhodospiza obsoleta* is a little-studied species with a range extending from south-east Turkey, the Levant, and north-west Arabia to central Mongolia. It inhabits semi-arid plains with scattered bushes and trees and eats mainly seeds, but has also been observed eating leaves and buds and, during the breeding season, insects. Desert Finches are gregarious all year round, with flocks of 20–25 individuals often seen in flight or feeding together. They nest in loose associations and are usually double-brooded. (Vorobiev 1980; Paz 1986, 1987.)

In Israel, the Desert Finch is a winter visitor and an erratic breeder (Paz 1986, 1987). Aharoni (1942) reported breeding at a site in the Vale of Sharon in the 1920s, but the species subsequently disappeared from there. In 1958 a small population was discovered in the northern Negev desert and since then breeding has appar-

Plate 1. Desert Finch *Rhodospiza obsoleta*, Sede Boqer (Israel). (*Eric Hosking*)

ently spread in that region, though local breeding groups are of no more than 20–30 pairs (Paz 1987) and there are few data on their location and density. Other breeding areas are reported occasionally, but the Negev remains the species' Israeli stronghold.

No detailed research has been done on the Desert Finch's breeding biology, though a variety of observations has been published, mostly in Russian (e.g. Kovshar' 1966, Umrikhina 1970, Vorobiev 1980). Hence, during the 1988 breeding season I collected life history information on this species at one of the occupied sites in the Negev: Midreshet Sede Boqer, where it is a summer visitor.

STUDY AREA

Sede Boqer (30°52′N 34°47′E, 475 m above sea level) is situated on a flat loess plain in the Negev desert highlands. The region is considered an arid zone (UNESCO 1977), having 250–300 days per year with neither rain nor dew and a precipitation to evaporation ratio of less than 0·2. Rainfall occurs in winter and averages 90 mm a year, but there are large variations in the total annual amount which falls and in its temporal and spatial distribution. The annual average relative humidity at 14.00 hrs is 39% (Zangvil and Druian 1980, 1983). The predominant perennial plants are the shrubs *Artesmia herba-alba, Hammada scoparia, Noaea mucronata, Raemuria negevensis, Zygophyllum dumosum,* and *Atriplex halimus,* and a variety of herbs also occurs (Danin *et al.* 1975). The study was conducted within the settlement of Midreshet Sede Boqer, which is surrounded by a fence 5 m high; the area involved maintains the ungrazed natural vegetation, though a variety of ornamental trees has been planted.

METHODS

Using mist nets, as many as possible of the adult population (23 birds) were trapped and colour-ringed; sex, measurements, and weight were recorded before the birds were released (Table 1). Colour-ringing facilitated individual identification of pairs

Table 1. Biometrics of adult Desert Finches *Rhodospiza obsoleta* trapped at Sede Boqer (Israel), March–May 1988. Values are mean ± standard deviation.

	Male	Female
Wing (mm)	86·3±2·3	75·5±1·8
Tail (mm)	61·0±1·0	59·4±4·3
Weight (g)	23·8±1·3	26·4±6·6
Sample size	16	7

and permitted the verification of attempted second broods. Weekly searches were conducted for nests in each of the stands of trees in which activity was discovered, and observers working in pairs followed the activity of given breeding pairs for long periods through the day, averaging nine hours. Fertility of suspected infertile eggs was determined by candling with an optical fibre light.

RESULTS AND DISCUSSION

Timing of events in the reproductive cycle

The earliest flocks observed were of mixed sex and arrived between 2 and 6 March. Courtship behaviour, including courtship feeding, was observed almost immediately, and three big flocks, each of 25–30 individuals, split into numerous smaller groups of 4–10. The settlement has numerous stands of trees covering areas of 10–45 m^2, and the finches nested within these, each stand forming a discrete breeding group. The weekly census of the number of active nests showed that there were two peaks during the breeding season, one soon after the birds' arrival, from the end of March to mid-April, and a second from the end of June to mid-July. Many pairs were found to be double-brooded. First-brood nests were completed towards the end of March, and eggs were laid between 27 March and 14 April. After an incubation period of 13–15 days, the young were in the nest for the next 14–16 days before fledging, and then accompanied their parents for a further 14–16 days until they dispersed. Dependent young and parents usually returned to the nesting tree for the night and roosted together.

Plate 2. Desert Finch *Rhodospiza obsoleta*, Sede Boqer (Israel). (*Eric Hosking*)

During the second half of May, pairs that had successfully fledged young engaged in further courtship feeding, while pairs that had re-nested because of predation or bad weather were completing their first nesting. In the second week of June, another frenzy of nest building was observed in preparation for the second brood. Second clutches were laid in the third week of June, young hatched in mid-July, and fledging occurred by the end of the month. Parents cared for young until the end of July, after which all birds left the area. No further Desert Finches were observed during August and most of September, though at the end of September big flocks were seen once again for short periods of two or three days. None of the colour-ringed birds was observed in these flocks which were evidently migrants or nomadic birds from elsewhere.

Nest building

Nests were built 2–4 m above ground in planted trees—*Eucalyptus*, *Pinus*, and *Acacia*. Although Umrikhina (1970) reported that only males built nests, females in the present study were observed bringing nest material and helping with the building, most obviously when the inner cup was in place and the female shaped it by sitting in it and twisting around. The nests were ellipsoid in shape (as also found by

Kovshar' 1966, Umrikhina 1970, and Sagitov and Bakaev 1980), and usually lined with a mixture of feathers and various annual plants. New nests were built for second broods, and males stripped material from old nests for use in these, but the lining was usually new. Second-brood nests were smaller in size (Table 2): cup

Table 2. Measurements of nests of Desert Finch *Rhodospiza obsoleta* at Sede Boqer (Israel). Values are mean ± standard deviation, in mm.

	1st brood (March–April)	2nd brood (June–July)
Outer diameter	91·9±9·5	83·9±4·9
Overall height	54·1±9·3	45·9±3·9
Width of cup	22·3±3·1	23·2±4·1
Depth of cup	39·6±2·6	39·6±3·4
Sample size	15	15

size did not differ significantly between broods, but both the outer diameter and overall height of second-brood nests were found to be significantly smaller than those of first broods (*t*-test, P<0·01).

Pair formation and copulation

It was difficult to determine the existence of pairs within large flocks, and they could be identified only after smaller groups had formed. The mean time between the latter stage and the completion of the nest and start of laying was 16·8±SD7·9 days (n=22). Males were observed feeding seeds to their females before building started.

Using only data gathered during first broods and from pairs which were suc-

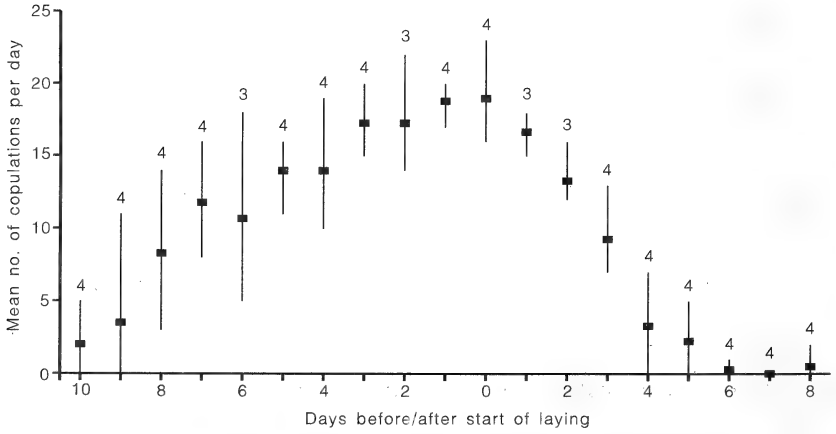

Figure 1. Copulation frequency relative to female's laying date in Desert Finch *Rhodospiza obsoleta* at Sede Boqer (Israel). Data relate to copulatory behaviour for first clutch during March–April only. Error bars indicate actual range of data, with sample sizes.

cessfully followed through a whole day, from first light to last, a pattern emerged of the number of copulations per day relative to a female's laying date (Figure 1). Over the ten days before laying started, the copulation rate rose fairly steadily from about twice a day to about 19 times per day; it then declined until, by day six after the female had laid her first egg, it was seldom seen.

Egg laying and incubation

The eggs were oval. A few had black dots on one end, but all were otherwise completely white. Average dimensions were 18·7×13·9 mm (n=34) and the average initial weight (within six hours of being laid) was 2·17±SD0·13 g (n=21). Average clutch size for first and second broods combined (excluding replacement layings) was 4·7±SD0·5 (n=51): 34 clutches (67%) comprised 5 eggs, and 17 (33%) four eggs. All re-layings due to egg loss produced clutches smaller than those which they replaced: of 16 such clutches, seven had three eggs, and nine had four (Table 3). More nests with clutches of five eggs were found during the first peak of nesting (78%, March–April) than during the second peak (54%, May–June); fewer nests had clutches of four eggs during the early nesting period (Table 3).

Eggs were laid at 24-hour intervals, and in all of 37 nests in which it was re-

Table 3. Clutch size and hatching success in Desert Finch *Rhodospiza obsoleta*, Sede Boqer (Israel).

	1st brood (Mar–Apr)	1st brood replacements	2nd brood (May–Jun)	All nests
Mean clutch size (±SD)	4.8±0.4	3.6±0.5	4.5±0.5	4.4±0.7
Clutch size frequency:				
3 eggs	0	7	0	7
4 eggs	1	9	11	26
5 eggs	21	0	13	34
No. of eggs hatched	81 (63%)	35 (61%)	62 (57%)	178 (60%)
No. of infertile eggs	21 (16%)	4 (7%)	21 (19%)	46 (16%)
No. lost to other causes	27 (21%)	18 (32%)	26 (24%)	71 (24%)
Total no. of nests	27	16	24	67
Total no. of eggs	129	57	109	295

corded, incubation began with the laying of the second egg; it lasted an average of 13·8±SD1·1 days (n=22). These observations concur with those of Rustamov (1958) in Turkmenistan and Sagitov and Bakaev (1980) in Uzbekistan. Only females were observed to incubate, as was also found by Klimanis (1987) and Paz (1987).

Hatching and the nestling period

All eggs from the same brood hatched within a period of 48 hours. Infertility accounted for 39% of the total egg losses, and a greater proportion were found to be infertile in the first- and second-brood main clutches than in the replacement nesting attempts (Table 3). The replacements suffered relatively greater loss through other causes, however, and their overall hatching success was not significantly different from that of either of the main clutches (t-test, $P<0·05$). Hatching success

Plate 3. Desert Finch *Rhodospiza obsoleta*, Turkmeniya, May. (*Marc Raes*)

was highest of all in the earliest of the first-brood clutches. Causes of egg failure other than infertility were predation, inclement weather, and desertion following human disturbance, together accounting for 61% of the total loss.

Of 17 nestlings in which it was recorded, all opened their eyes three days after hatching, as described by Sagitov and Bakaev (1980). Feather growth was rapid, and by 7–8 days of age nestlings were fully feathered. Because of the asynchronous hatching which occurred in most nests, big differences in development were seen among siblings: at the same time as freshly hatched young weighed on average 1·7±SD0·2 g (n=22), their siblings 6–48 hours older averaged 11·3±SD1·72 g (n=53); such differences were found also by Rustamov (1958) and Vorobiev (1980). A comparison of the weight of freshly hatched young and freshly hatched eggs (see above), allowing for eggshell weight (0·12 g, n=120: Schönwetter 1980–4), gives an average egg mass loss through incubation of 16·1%.

Behaviour of adults at the nest

Males fed their mates at the nest and were vigilant in its immediate vicinity, keeping away conspecific birds both during incubation and after hatching. Right up to fledging, males fed the nestlings on a milky fluid mixed with seeds or green vegetation, probably young shoots; no other type of food was seen to be fed to them. Newton (1972) indicates that, in European species at least, such secretions (presumably crop milk) are not otherwise known in Carduelinae. The adult females were always present and attentive at the nest (e.g. removing faecal sacs) but were never seen to feed the nestlings.

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Reuven Yosef, Mitrani Center for Desert Ecology, Department of Biology, Ben-Gurion University, Jacob Blaustein Institute for Desert Research, 84993 Sede Boqer, Israel. (Presently at: Department of Zoology, Ohio State University, Columbus, Ohio 43210, USA.)

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Notes on the birds of the eastern Rub' al Khali, Saudi Arabia

B. PAMBOUR and A. R. A. AL KARRAIRY

Summary During an NCWCD expedition to the eastern Rub' al Khali (Saudi Arabia), from 12 February to 13 March, 49 bird species were recorded including nine proven or probable breeders (six within the sands proper). The most common species were Hoopoe Lark *Alaemon alaudipes* and Brown-necked Raven *Corvus ruficollis* (resident) and Desert Wheatear *Oenanthe deserti* and Desert Warbler *Sylvia nana* (wintering). A probable breeding site for Moorhen *Gallinula chloropus* was found, and a Crab Plover *Dromas ardeola* was seen, suggesting an overland passage. Open sandy areas with a good cover of bushes form the habitat used by most species. Extreme aridity and the absence of trees and annual plants are probably the major factors limiting diversity and density of species.

DUE TO obvious logistical problems, the avifauna of the great sand sea of southern Arabia, the Rub' al Khali (also known as the Empty Quarter or the Sands) has never been properly assessed, and only scattered notes have been published on the subject (Ticehurst and Cheesman 1925; Kinnear 1931, 1934; Philby 1933; Thesiger 1950, 1959). During February and March 1990, with logistical support provided by the Frontier Forces of the Kingdom of Saudi Arabia, an expedition to the Uruq al Mu'taridah area in the eastern part of the Rub' al Khali was carried out by the National Commission for Wildlife Conservation and Development, with the aim of investigating the biological resources of the area. This offered a unique opportunity to study the region's birdlife.

Plate 1. High crescentic dunes in Uruq al Shaybah (Saudi Arabia), February, after heavy rain. Relatively small underlying sabkhas are exposed, and the one shown here is partly inundated. (*Bruno Pambour*)

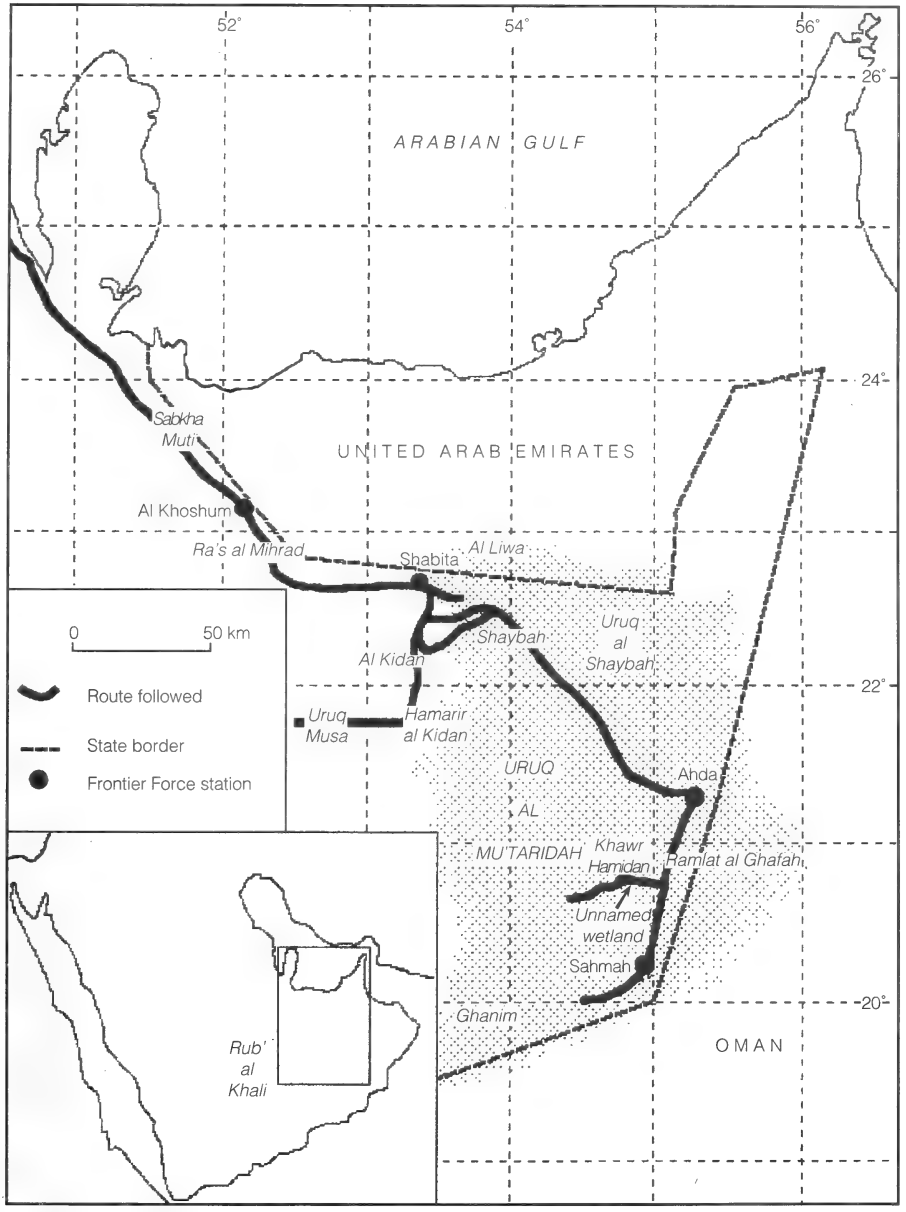

Figure 1. Route followed by the NCWCD expedition to the eastern Rub' al Khali (Saudi Arabia), 12 February to 13 March 1990.

Plate 2. Star dunes, the predominant form in the south-east of Uruq al Mu'taridah (Saudi Arabia), here to the north of Sahmah station. Exposed substrate (sabkha and gravel plain) is more extensive than the sands. (*Bruno Pambour*)

STUDY AREA

The Rub' al Khali is a sedimentary basin elongated in a SW–NE direction across the Arabian Shelf, falling over a distance of about 1,000 km from an elevation of about 800 m in the south-west almost to sea level in the north-east. It is the largest continuous expanse of sand desert on earth and occupies about 640,000 km^2, more than the area of France. The Uruq al Mu'taridah, the south-eastern part of the sand sea, includes some of the most variable and spectacular dune topography on earth. The region surveyed represents a vast, lowland, inwardly draining basin, with immense numbers of wind-driven dunes on a level substrate of sabkhas (salt flats) at 80–100 m above sea level. Ten natural habitat types can be distinguished, based on geomorphological features:

- Sabkha: unvegetated flat ground with evidence of salt.
- Gravel plain: fairly flat plain; no vegetation.
- Eroded gravel plain: some relief apparent due to drainage (small wadis with vegetation), underlying rock appearing in some places.
- Vegetated gravel plain.
- Flat sandy plain.
- Ripples: gravel plain or sabkha with small wave-like dunes.
- Sand sheet: thick continuous layer of sand over sabkha or gravel.
- Low dunes: less than 5 m high.
- Larger dunes.
- Wetlands.

The four stations of the Frontier Forces which were visited as part of the expedition (Al Khoshum, Shabita, Ahda, Sahmah: Figure 1) have also to be considered as a separate habitat type. They are all permanent settlements, each occupied by an average of 20 people and containing a few small trees. Water and fuel are supplied to them by huge army trucks which cross the desert throughout the year.

The major dune types can be summarized as follows (for more details see the excellent synthesis by Llewellyn 1988).

- Large simple crescentic (barchan) dunes. Up to 300 m high, lying along a WNW–ESE axis. Their flanks are covered by smaller crescentic dunes. Small underlying sabkhas are exposed (see Plate 1). Present mainly in the north, west, and central part of the area (Al Kidan, Uruq al Shaybah).
- Complex crescentic dunes. Arranged in linear chains on a sabkha substrate, with exposed sabkha tending to cover a greater area than do the dunes themselves. Star dunes on their crests represent the transition zone between crescentic and true star dunes. Occur in the eastern parts of the Uruq al Mu'taridah.
- Small simple crescentic dunes. Underlying substrate completely covered except for a few relict lake beds. These characterize the north and north-west margin of the area (Al Liwa).
- Star dunes. Exposed substrate (sabkha and gravel plain) is generally more extensive than the dunes (Plate 2). Predominant in the south-east of the region.
- Linear dunes. Found on the western margin of the Uruq al Mu'taridah (Hamarir al Kidan, Uruq Musa).

Plate 3. *Cornulaca* bushes on low dunes in the south-east of Uruq al Mu'taridah (Saudi Arabia), February. (*Bruno Pambour*)

Weather data (two years' records) are available from the station of the Meteorological and Environmental Protection Agency in the Shaybah area at 22°21′N 54°03′E. For February these show average daily minimum and maximum temperatures of 16 and 28°C, and an absolute minimum and maximum of 9 and 37°C. The

eastern Rub' al Khali is subject to morning and evening fogs and heavy dews in the cool season. Average rainfall is very low (less than 50 mm a year) and erratic.

Despite the extreme aridity of the Rub' al Khali, vegetation within the dunes is almost omnipresent, and unique in kind and composition; the sands of the region are more densely vegetated than the other less hyperarid rock deserts and gravels plains of the Kingdom. The shrub-dominated vegetation is very diffuse but is well distributed on the open sandy areas, interrupted by sterile interdune floors (Plate 3). The limitation of moisture to fogs, dews, and erratic rain showers has, however, restricted the botanical diversity: the expedition recorded only 20 perennial species within the main body of the sands, half of which were rather abundant; 17 additional species were recorded from the margins of the Rub' al Khali. Many of the species found to comprise the major perennial components of the vegetation (given here with their Arabic names) were endemic: the shrubs *Calligonum arabicum* (abal), *Cornulaca arabica* (haad), *Tribulus arabicus* (zahr), and *Zygophyllum mandavillei* (harm), and the herb *Limeum arabicum* (burkan); other more widespread perennials present included sedge *Cyperus conglomeratus* (aandab) and the shrubs *Halothamnus* (tahmah), *Salsola cyclophylla* (araad), and *Seidlitzia rosmarinus* (shanaan). The low rainfall means that annuals are, as a rule, absent from the region, and grasses are represented in very restricted habitats only by the two annual species *Stipagrostis plumosa* (nasee) and *Centropodia forskalii* (hojain). Trees are virtually absent from the inner sands, though a few *Tamarix pycnocarpa* up to about 2–3 m tall are present where water is available near the ground surface. (Mandaville 1986, 1990; Chaudhary and Al-Juwayed 1990.)

In the south-eastern part of the Uruq al Mu'taridah, at 20°41′N 54°42′E, we discovered a natural spring-fed wetland not marked on existing maps. This site (referred to here as the unnamed wetland) comprised large pools and reedbeds of *Phragmites* and covered over 40 ha (Plate 4).

Plate 4. Large pool with reedbed of *Phragmites* in the unnamed natural wetland in the Uruq al Mu'taridah (Saudi Arabia), February. (*Bruno Pambour*)

METHODS

Field work was carried out by two observers for five hours per day from 12 February to 13 March 1990, most observations being made from a moving vehicle or during long walks (Figure 1). Some records of birds of prey were made from an NCWCD aircraft. Two long vehicle transects were carried out, driving at a speed of 40 km per hour.

Itinerary

12 February. Al Khoshum to Shabita.
13 February. To Ahda.
14 February. To Sahmah, and on to establishment of first main camp, north of Sahmah (20°45′N 54°44′E).
21 February. To Ahda.
22–23 February. To Shabita (after heaviest rainfall for 20 years, over 100 mm in 12 hours).
24 February. Establishment of second main camp, near Shabita.
6 March. To Al Kidan area.
7–8 March. To Ra's al Mihrad area.
9 March. To Shabita.
10–11 March. To Al Khoshum.

SYSTEMATIC LIST

Marsh Harrier *Circus aeruginosus*. Part of a skull found near the unnamed wetland was identified as this species by P. Bayle after comparison with a reference collection. Evidently a passage migrant.

Pallid Harrier *Circus macrourus*. Six single individuals seen hunting on sand dunes and gravel plains from 12 February to 7 March: two near Shabita, two in Al Kidan, one in Shaybah, and one north-west of Sahmah.

Long-legged Buzzard *Buteo rufinus*. Ten widely distributed records, including one of two birds together, from open sandy areas, sabkha, and gravel plains: 22°47′N 53°00′E, 22°08′N 54°20′E, 21°26′N 54°12′E, 22°14′N 53°20′E, 21°42′N 51°58′E, 21°40′N 51°20′E, 20°02′N 54°35′E, 22°08′N 54°52′E, 22°08′N 54°07′E, 22°28′N 53°38′E. This raptor probably breeds at very low densities, though it may be limited by a lack of nest sites and birds from outside the Rub' al Khali may disperse into the region during the winter.

Steppe Eagle *Aquila nipalensis*. One seen from an aircraft at 21°26′N 53°43′E (J. Grainger). An unidentified eagle in the Ghanim area on 20 February was also believed to be this species.

Kestrel *Falco tinnunculus*. Recorded in open sandy areas and gravel plains. One pair was established around Shabita station, and another pair at 21°30′N 55°10′E. Single birds were also seen at 22°08′N 54°20′E, 22°40′N 53°31′E, 22°52′N 52°32′E, 22°29′N 53°46′E, and 20°45′N 54°44′E. Presumably a resident breeder at very low densities.

Lanner *Falco biarmicus*. An escaped falconer's bird with jesses was hunting wagtails at Shabita station on 3 March.

Water Rail *Rallus aquaticus*. At least five different birds were heard calling in reedbeds at the unnamed wetland. It seems most likely that this is a wintering population; breeding would not be impossible but would be remarkable. The nearest known breeding site, and apparently the world's most southerly, is 700 km northwest at Hofuf (Cramp and Simmons 1980; Bundy *et al.* 1989).

Moorhen *Gallinula chloropus*. At least four different birds were seen or heard in reedbeds at the unnamed wetland. It seems likely that this is an isolated breeding site, as populations exist in many (though mainly coastal) regions of Arabia.

Crab Plover *Dromas ardeola*. One bird was found very unexpectedly on the edge of a large inundated sabkha at 22°08′N 53°33′E, about 220 km from the Arabian Gulf coast, on 2 March (J. Grainger). This suggests the possibility of a previously unsuspected overland movement across southern Arabia. Inland records of the species seem to be otherwise unknown.

Stone Curlew *Burhinus oedicnemus*. A few birds appear to winter in open sandy areas. One was seen on 28 February at 22°28′N 53°36′E, and several tracks were found in different areas.

Herring Gull *Larus argentatus*. One flying north over Sabkha Mutti at 23°22′N 52°02′E, 70 km from the coast, on 11 March.

Sandgrouse *Pterocles*. A Frontier Force soldier at Shabita reported that unidentified sandgrouse occur each winter. Spotted Sandgrouse *P. senegallus* is the most likely to occur.

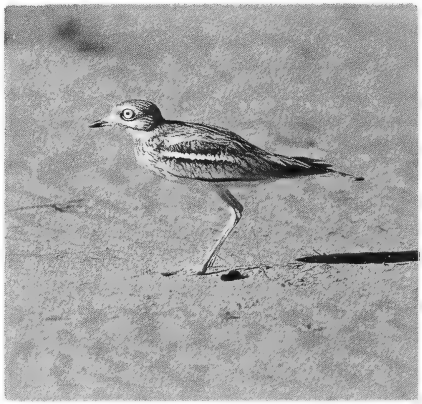

Plate 5. Stone Curlew *Burhinus oedicnemus*, eastern Rub' al Khali (Saudi Arabia), February. (*Bruno Pambour*)

Palm Dove *Streptopelia senegalensis*. At least two pairs nesting in wooden boxes at Shabita station; present all year according to the soldiers.

Ring-necked Parakeet *Psittacula krameri*. A group of five flying north at Ra's al Mihrad (22°52′N 52°32′E) on 10 March.

Eagle Owl *Bubo bubo*. One resting in a *Cornulaca* bush in low dunes at 20°45′N 54°44′E on 18 February. This record, together with the first for the Rub' al Khali (about 900 km to the west, on Jabal Abu Shidad, 18°22′N 46°30′E: Mandaville 1982), indicates that the species does inhabit the region.

Little Owl *Athene noctua*. Two records in open sandy areas confirm the presence of this sedentary owl, presumably as a resident breeder. One was seen in Khawr Hamidan at 20°45′N 54°44′E (H. Tatwani) and another in the Ghanim area. Pellets found in an empty water tank at Ra's al Mihrad (22°52′N 52°32′E) were also thought to belong to this species.

Blue-cheeked Bee-eater *Merops superciliosus*. A group of five, presumably on passage, at Ra's al Mihrad (23°00′N 52°00′E) on 10 March.

Hoopoe *Upupa epops*. One bird, presumably on passage, was at Sahmah station on 5 March.

Black-crowned Finch Lark *Eremopterix nigriceps*. Present at seven sites, all in open sandy areas with good vegetation cover; evidently rather uncommon. Flocks of up to 15 were in Khawr Hamidan (20°45′N 54°44′E), nine including a singing male were seen at 20°38′N 54°27′E on 18 February, and five were recorded south of Ahda (20°41′N 55°03′E). Breeding in the region is certainly possible for both this species and the next, but, given their propensity for nomadism (e.g. Jennings 1980, Bundy *et al.* 1989), it cannot be assumed.

Dunn's Lark *Eremalauda dunni*. One on a gravel plain at Al Khoshum (23°18′N 52°15′E) on 11 March.

Hoopoe Lark *Alaemon alaudipes*. The commonest of the resident small passerines, occurring in all open sandy areas and gravel plains with a good growth of bushes covering at least several dozen hectares. Over 20 records, in all areas visited, mainly singing and displaying males.

Crested Lark *Galerida cristata*. One on sandy ground near the expedition camp in the Al Kidan area (22°40′N 53°31′E) on 9 March.

Swallow *Hirundo rustica*. Single migrants were at Shabita station on 4 March and Al Khoshum station on 11 March. Also, one was found dead in an empty water tank at Ra's al Mihrad (23°18′N 52°15′E).

Red-rumped Swallow *Hirundo daurica*. Singles recorded on 25 February and 5 March at Shabita station, and on 28 February in Al Kidan.

House Martin *Delichon urbica*. One was seen on 24 February at Shabita station. Another was found dead in the empty tank at Ra's al Mihrad.

Tawny Pipit *Anthus campestris*. One at Al Khoshum station on 11 March.

Meadow Pipit *Anthus pratensis*. At least three individuals were seen at the unnamed wetland on 17 February.

Water Pipit *Anthus spinoletta*. Two were with Meadow Pipits at the unnamed wetland on 17 February.

Yellow Wagtail *Motacilla flava*. Two migrants at the expedition camp in the Al Kidan area (22°40′N 53°31′E) on 9 March.

Pied Wagtail *Motacilla alba*. Six records of up to four birds in open sandy areas, gravel plains, wetlands, and human settlements. Recorded from 17 February to 11 March, at the unnamed wetland and in the Shabita and Al Kidan areas.

Black Redstart *Phoenicurus ochruros*. A male of the subspecies *phoenicuroides* at the expedition camp in the Al Kidan area (22°40′N 53°31′E) on 9 March.

Isabelline Wheatear *Oenanthe isabellina*. Four records of single birds, probably winter visitors, from open sandy areas and gravel plains: Shabita station on 13 February and 5 March, at 22°40′N 53°31′E on 2 March, and Al Khoshum station on 11 March. Also, two were found dead in the empty tank at Ra's al Mihrad.

Wheatear *Oenanthe oenanthe*. Two migrants at the expedition camp in the Al Kidan

area (22°40′N 53°31′E) on 9 March.

Pied Wheatear *Oenanthe pleschanka*. Four records of migrants in open sandy areas and gravel plains of the Shabita and Al Kidan areas from 28 February to 4 March.

Desert Wheatear *Oenanthe deserti*. The commonest species seen, with 33 records, plus one found dead in the empty tank at Ra's al Mihrad. Widespread in open sandy areas, sabkha, and gravel plains, its numbers being greatest where the density of bushes was highest. About half the records were of pairs, and single males were singing at 20°38′N 54°27′E on 18 February and at Shabita station on 4 March. The eastern Rub' al Khali is, however, about 800 km south of the known breeding range (in Iran), so all records are presumably of winter visitors or migrants.

Plate 6. Male Pied Wheatear *Oenanthe pleschanka* on a *Cornulaca arabica* bush, eastern Rub' al Khali (Saudi Arabia), February. (*Bruno Pambour*)

Red-tailed Wheatear *Oenanthe xanthoprymna*. One at Shabita station on 3 March.

Mourning Wheatear *Oenanthe lugens*. Four records, presumably of winter visitors, in open sandy areas of the northern fringe of the Uruq al Mu'taridah, and one in the Ghanim area, all in February.

Hooded Wheatear *Oenanthe monacha*. One female, presumably a winter visitor, at a large sabkha (20°41′N 54°42′E) on 21 February.

Blue Rock Thrush *Monticola solitarius*. Three at Al Khoshum station on 12 February were probably on passage given the non-rocky habitat.

Desert Warbler *Sylvia nana*. Widespread in open sandy areas and gravel plains with relatively dense vegetation (especially *Calligonum* bushes) in good condition; 23 records. The only *Sylvia* wintering in the Rub' al Khali.

Desert Lesser Whitethroat *Sylvia curruca minula*. One at the expedition camp in Sabkha Mutti on 11 March. The absence of trees explains the lack of further records.

Whitethroat *Sylvia communis*. One found dead in the empty tank at Ra's al Mihrad.

Chiffchaff *Phylloscopus collybita*. Three single migrants recorded from 28 February to 4 March in the Shabita area.

Spotted Flycatcher *Muscicapa striata*. One found dead in the empty tank at Ra's al Mihrad.

Isabelline Shrike *Lanius isabellinus*. One at the unnamed wetland on 17 February.

Great Grey Shrike *Lanius excubitor*. Found in six open sandy localities: Shabita station (where one was singing on 24 February), Al Kidan (22°14′N 53°20′E and

22°40′N 53°31′E), west of Shaybah (22°30′N 53°40′E), Khawr Hamidan (20°45′N 54°44′E), and Ghanim (20°02′N 54°35′E). It is not possible to say whether the records relate to resident breeders or to winter visitors.

Woodchat Shrike *Lanius senator*. One migrant at 22°29′N 53°46′E on 27 February.

Brown-necked Raven *Corvus ruficollis*. Fairly common resident of open sandy areas and gravel plains, recorded from 12 localities distributed all over the surveyed area. A remarkably large group of ten birds was seen at 20°38′N 54°27′E on 18 February. On 13 February two nests were found, both in marker posts—empty drums raised 3 m above ground on poles (Plate 7); they were 30 and 60 km east of Shabita and held 5 and 6 eggs.

Plate 7. A nest of Brown-necked Raven *Corvus ruficollis* in a marker post, 30 km east of Shabita (Saudi Arabia), February. (*Bruno Pambour*)

House Sparrow *Passer domesticus*. A small breeding population of at least 20 individuals was established on buildings at Shabita station; birds were seen carrying nest material.

Trumpeter Finch *Bucanetes githagineus*. A group of ten birds, presumably winter visitors, on gravel plains at Ramlat al Ghafah (20°58′N 55°21′E) on 14 February.

Corn Bunting *Miliaria calandra*. Five were found wintering on open sandy areas and gravel plains near Shabita on 13 February.

DISCUSSION

The extreme aridity of the Rub' al Khali, its low ecological diversity, and the absence of annual plants and sizeable trees explain the low numbers of both species and individuals recorded. Altogether 49 bird species were identified during the expedition, but, given the shortness of the study period, its timing (late winter/early spring), and the paucity of other data from the region, it is impossible to be certain of the status of many of the species. However, nine can be classed as known or probable resident breeders (Long-legged Buzzard, Kestrel, Moorhen, Palm Dove, Eagle Owl, Little Owl, Hoopoe Lark, Brown-necked Raven, House Sparrow) and a further five as possibly breeding (Water Rail, Black-crowned Finch Lark, Dunn's Lark, Crested Lark, Great Grey Shrike). Excluding the waterbirds and species commensal with man, the study found only six probable and four possible residents of open sandy habitat. The breeding bird community of the Wahiba Sands in Oman includes all these ten species apart from Eagle Owl and Crested Lark (Gallagher 1988). Some typical desert birds which were expected to occur in the Rub' al Khali were not found; these included Houbara *Chlamydotis undulata*, Spotted Sandgrouse *Pterocles senegallus* (but see p. 86), and Bar-tailed Desert Lark

Ammomanes cincturus, absences perhaps due mainly to the lack of annual plants. Bar-tailed Desert Lark was recorded by Kinnear (1931) at the edge of the sands at Al 'Ain, south of Ghanim.

The species assumed to be resident occurred almost always in well vegetated habitats with a relatively high density of bushes and where it had evidently been raining during the last few years. Good numbers of hares, small rodents, reptiles, and invertebrates such as scorpions and insects were also found at these sites. In areas which seemed to have suffered extended periods of drought and where most of the bushes were dead, no birdlife at all was found. Data from driven transects (Table 1) give a crude indication of the low density of birds, though the results are biased against the smaller and more terrestrial species: the two most common species, Desert Wheatear and Desert Warbler, are winter visitors, present only during the time of year when food availability is at its highest.

Table 1. Bird densities from driven transects in the eastern Rub' al Khali (Saudi Arabia), February 1990. Shaybah area: high crescentic dunes with small sabkhas, 203 km, 13 February. Ramlat al Ghafah area: gravel plains and sabkhas predominant, with star dunes, 160 km, 22 February. Figures are numbers of individuals per 100 km.

	Shaybah	Ramlat al Ghafah
Pallid Harrier *Circus macrourus*	0·5	0
Long-legged Buzzard *Buteo rufinus*	0·5	0·6
Kestrel *Falco tinnunculus*	1·0	0·6
Black-crowned Finch Lark *Eremopterix nigriceps*	0·5	0
Hoopoe Lark *Alaemon alaudipes*	1·5	1·3
Isabelline Wheatear *Oenanthe isabellina*	0·5	0
Desert Wheatear *Oenanthe deserti*	3·4	5·6
Desert Warbler *Sylvia nana*	2·0	1·9
Great Grey Shrike *Lanius excubitor*	0	0·6
Brown-necked Raven *Corvus ruficollis*	2·0	1·9

Passage migrants figured prominently in the species seen, even though the study period covered only the early part of the spring migration. Numbers and diversity of migrants would undoubtedly have been greater if the survey had been extended further into the passage season.

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Bruno Pambour, National Wildlife Research Center, PO Box 1086, Taif, Saudi Arabia. (Presently at: Le Grand Manusclat, Le Sambuc, 13200 Arles, France.)

Abdul Rhaman Abdullah Al Karrairy, National Commission for Wildlife Conservation and Development, PO Box 61681, 11575 Riyadh, Saudi Arabia.

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Krüper's Nuthatch *Sitta krueperi* and Turkish pine *Pinus brutia*: an evolving association?

M. P. FRANKIS

Summary In south-west Turkey, cones from a small proportion of Turkish pines *Pinus brutia* appear to open only incompletely, so that the seeds do not fall out unaided but have to be pulled out. These trees probably rely for propagation on seeds being extracted by Krüper's Nuthatch *Sitta krueperi* and stored in sites suitable for their germination. Comparisons with the more highly developed associations between other pine species and nutcrackers *Nucifraga* are made, and the almost complete coincidence of the ranges of *P. brutia* and Krüper's Nuthatch is noted. Notes on the feeding behaviour and distribution of Krüper's Nuthatch are given.

IN AUTUMN 1989 I made a botanical study trip to south-west Turkey to collect material of conifers, particularly the Turkish or Calabrian pine *Pinus brutia* which occurs commonly at altitudes of 200–1,200 m in this area. Bird observations were made at the same time, among which Krüper's Nuthatch *Sitta krueperi* figured prominently as a common species in *P. brutia* forests. My studies of this pine indicated a hitherto undescribed variant in seed dispersal, which may be associated with the feeding behaviour of Krüper's Nuthatch.

SEED DISPERSAL OF *PINUS BRUTIA*

The cones of *P. brutia*, 6–10 cm long, mature in April (Shafiq 1978) and crack open under the heat of the sun or grass fires through the next one or two summers; then, in autumn and winter, rain softens the scales and allows them to open fully on subsequent re-drying, whereupon the winged seeds normally fall out and are dispersed by wind. At the first stage of opening, the seeds are unable to fall out (preventing the seeds from falling onto dry soil or a still-smouldering grass fire), though it is possible to extract them forcibly with tweezers or similar implements.

For all the cones collected in this study, the natural process was imitated by warming the cones to crack the sealed scales partly open, and then soaking and re-drying the cones to allow them to open fully. A small proportion of trees—four out of about 80 or 100 studied—were found to have cones in which this process of artificial wetting and re-drying did not open the scales sufficiently to allow the seeds to fall out freely, whether the cone was freshly opened, or whether it had already been partly open on the tree when picked. In normal-coned trees of *P. brutia*, as in all other wind-dispersed pines, a single wetting and drying allows the scales to open fully, but in one cone of this variant, repeated experimental wetting and drying on six occasions, using both warm and cold water, still failed to release the seed. The seed from this cone, and similar ones, could however be extracted by force as in the case of unsoaked partly open normal cones. Where wind dispersal is relied on, these trees would be unable to reproduce, as their seed cannot blow out of the cone, and they would therefore quickly be eliminated by natural selection.

OBSERVATIONS ON KRÜPER'S NUTHATCH

Observations were made between 25 September and 2 October: at the entrance area to Termessos National Park, 25 km north-west of Antalya, at 300–400 m altitude; on the east and south slopes of Ak Dağ, 25–35 km north of Kaş and 100 km WSW of Antalya, at 900–2,000 m; and on the valley slopes of tributaries of the Eşen Çay (river), 0–10 km south-west of the previous site, at 200–900 m altitude. Krüper's Nuthatches were seen in all of the more extensive areas of *P. brutia* forest, mostly in small groups of two to five birds, probably family parties and failed breeding pairs, and also more rarely in coniferous forest composed of other species. Feeding behaviour observed included searching the foliage and bark for invertebrates, but also, more significantly, taking seeds from the cones of *P. brutia* on several occasions. The strong, tweezers-like bill was inserted between the scales of partly open cones (probably including both normal cones and 'fully' open abnormal cones, as they cannot be distinguished before wetting), and the seeds pulled out, taken to bark crevices, and hammered open in the same manner as employed by the Nuthatch *S. europaea*. Krüper's Nuthatch, like other nuthatches, feeds largely on invertebrates in the breeding season and switches to a diet of oily vegetable food in the autumn and winter (Cramp in press); in the largely pure *P. brutia* forests the oily seeds of this pine constitute the only such food available in large amounts and must contribute heavily to the bird's winter diet.

Plates 1–2. Habitat of Krüper's Nuthatch *Sitta krueperi* in autumn: Turkish pine *Pinus brutia* forest at about 1,000 m, north of Kaş (south-west Turkey), September. Note crop of cones in tree-tops. (*M. P. Frankis*)

NUTHATCHES AS DISPERSAL AGENTS

The Nuthatch is well known to store food for future use (e.g. Simms 1971), and although I did not specifically observe this for Krüper's Nuthatch it is known that this species also does so (Löhrl 1988). Krüper's Nuthatch can only extract seeds from the cones when they are at least partly open; in wet weather (frequent in the winter in Turkey) the cone scales temporarily close fully and the nuthatch must then rely either on other, possibly limited, food sources, or on stored food.

As, apparently, the only means by which the seed of the abnormal variant of *P. brutia* can be dispersed, I suggest that Krüper's Nuthatch is storing them under conditions which are at least sometimes suitable for their germination—on the ground in soil crevices, and in quantities exceeding the birds' actual requirements. These seeds could then germinate and thus perpetuate the abnormal, non-wind-dispersed variant of the pine. Many seeds from normal cones, taken before they fall naturally during autumn and winter, will be dispersed similarly.

The seeds of the pine are also taken by the thick-billed east Mediterranean race of the Crossbill *Loxia curvirostra guillemardi* and the Syrian Woodpecker *Dendrocopos syriacus*, but as these species do not cache the seeds, they will not have any influence on this form of seed dispersal.

SIMILAR ASSOCIATIONS

The Nutcracker *Nucifraga caryocatactes* and Clark's Nutcracker *N. columbiana* have been demonstrated to be of vital significance in the dispersal of a number of pines, notably Swiss or Arolla pine *P. cembra* in Europe, Siberian pine *P. cembra sibirica* and Korean pine *P. koraiensis* in northern Asia, and whitebark pine *P. albicaulis* in North America (Goodwin 1976; Tomback 1981; Lanner 1982). Similar associations probably also exist between the Pinyon Jay *Gymnorhinus cyanocephalus* and the Pinyon pines *P. edulis* and *P. monophylla* in the western USA, and between the Azure-winged Magpie *Cyanopica cyanus* and the stone pine *P. pinea* in the Iberian peninsula (Goodwin 1976). In all of these cases the relevant pines have large seeds which have completely lost the potential for wind dispersal, having only vestigial wings and being unable to disperse effectively from the cones without avian assistance. The wing on the pine seed, which aids wind dispersal, is an impediment to avian dispersal, its presence making the seed more difficult to grasp, a factor which has encouraged the loss of the wing in the more highly developed nutcracker associations (Lanner 1982). Also of importance in these associations is the large size of the seeds, providing a larger amount of food for the same amount of work by the bird (Lanner 1982). This reduction of wings and increased seed size is not found in *P. brutia*, suggesting its association with Krüper's Nuthatch is of recent development and not yet well evolved. In *P. brutia* the seed, at 50 mg, is not as heavy as those in the nutcracker associations, but is distinctly larger than those of its closest relative, Aleppo pine *P. halepensis*, at 20 mg. This seed size difference is one of the most important features distinguishing these two pines (Nahal 1962, 1983) which are otherwise similar and even considered conspecific by some authorities (e.g. Dallimore and Jackson 1966).

DISTRIBUTION OF *PINUS BRUTIA* AND KRÜPER'S NUTHATCH

These two species have very nearly coincident ranges (Figure 1). The range of Krüper's Nuthatch is inadequately recorded: earlier maps (e.g. Voous 1960, Harrison 1982) show an extensive range in eastern Turkey and the Caucasus outside the range of the pine, but this is not shown by more recent texts (Flint *et al.* 1984; Hollom *et al.* 1988; Cramp in press). The distribution of the abnormal variant of *P. brutia* is not yet known; besides occurring in the area visited in this study, I have also found it in cultivated *P. brutia* grown from seed of Crimean origin. This occurrence is of interest as Krüper's Nuthatch is not known from the Crimea, suggesting the possibility that it has either been overlooked there—as it was until recently on the Greek island of Lesbos off Turkey (Löhrl 1965)—or that it may have become extinct there in recent times (the pine occurs only in small populations in the Crimea). *P. brutia* is found at altitudes between sea-level and 500 m in northern Turkey; in southern Turkey it occurs most commonly between 200 and 1,200 m, sometimes down to sea-level and rarely up to 1,400 m (Işik 1986; pers. obs.).

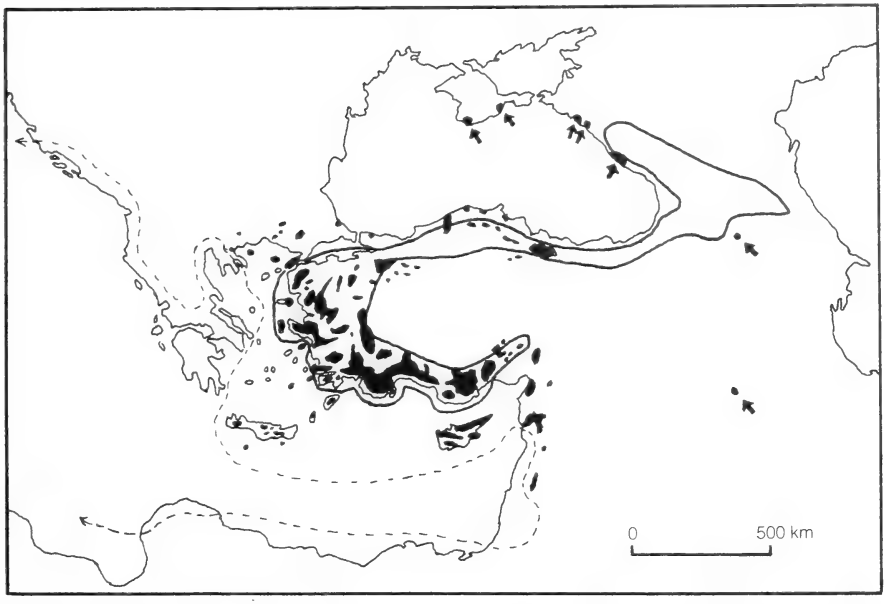

Figure 1. Distribution of Krüper's Nuthatch *Sitta krueperi* (within solid line, after Cramp in press), Turkish pine *Pinus brutia* (solid black), and Aleppo pine *P. halepensis* (within dotted line, after Critchfield and Little 1966). The outlying populations of *P. brutia* in northern Iraq, Azerbaijan, and the Crimea are small.

Krüper's Nuthatch breeds from sea-level to 1,700–2,000 m, but mostly over 1,200 m (Löhrl 1965, 1988; Harrison 1982; Hollom *et al.* 1988); my own observations in autumn showed it to be most abundant in *P. brutia* forest at 200–1,200 m, with about 20 seen and several others heard, but also in small numbers (two or three scattered individuals only) in forests of black pine *P. nigra* and cedar of Lebanon *Cedrus libani*

at 1,000–2,000 m. The cones of both the two latter species open in late winter and drop their seeds more rapidly than *P. brutia*, reducing the availability to Krüper's Nuthatch. This suggests the possibility of a degree of migration to lower altitudes outside the breeding season, when the birds are feeding on seeds and utilizing the higher availability in *P. brutia* forest, and also of movement to higher altitude *Cedrus* and fir *Abies* forest when breeding, and feeding on invertebrates (*Abies* and *Cedrus* are closely related and have similar seeds, though *Abies* seed is shed in autumn).

In its Soviet Union range, Krüper's Nuthatch is cited by Flint *et al.* (1984) as occurring in forests of Caucasian fir *A. nordmanniana* (misidentified by Flint *et al.* as European silver fir *A. alba*, synonym *A. pectinata*), where it is 'not numerous', which accords with my finding of only small numbers in *Cedrus libani* forest. Krüper's Nuthatch is also found in winter between Loo and Adler on the eastern Black Sea coast (Neufeldt and Wunderlich 1984, cited by Cramp in press), where it is not reported as breeding by Flint *et al.* (1984), giving a further suggestion of altitudinal migration. There is an outlying population of *P. brutia* at this locality (Critchfield and Little 1966).

It should be noted that nowhere does Krüper's Nuthatch occur within the range of *P. halepensis*, which is found to the south of the range of *P. brutia* (coastal Syria, Israel, and Libya) and to the west (to Morocco and Spain), nor in the extensive areas of *Abies* forest north-west of the range of *P. brutia* (Bulgaria, Yugoslavia), suggesting that the presence of *P. brutia* is the most crucial factor in the species' ecology, with other *Pinus* species, *Abies*, and *Cedrus* taking a second place.

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My studies were carried out whilst on a holiday run by Explore Worldwide Holidays, whose tour leader, Mike Belton, was very helpful at all times. I am greatly indebted to Duncan Brooks for suggesting this paper and assisting with some difficult literature, to the Editors of *The Birds of the Western Palearctic* for a preview of the Krüper's Nuthatch text in preparation, and to Dr Chris Page, Edinburgh Royal Botanic Garden, for encouragement of and financial help with my conifer studies on this trip.

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Michael Frankis, 21 Jesmond Park West, Newcastle upon Tyne NE7 7BU, UK.

NOTES

Range extension of Black-winged Kite *Elanus caeruleus* in northern Egypt

PETER L. MEININGER

BETWEEN mid-December 1989 and late June 1990 a wide-ranging ornithological project was carried out in Egypt (Meininger *et al.* 1990; Meininger and Atta in prep.). Attention was focused mainly on wetlands and waterbirds, but systematic notes were made of all bird species observed during our extensive coverage. A striking phenomenon was the relatively common occurrence of Black-winged Kites *Elanus caeruleus* in many parts of the Nile delta and the Suez canal area. Compared to the breeding distribution mapped by Goodman and Meininger (1989), which showed the situation in 1970–87, a considerable range extension seems to have taken place in the northern part of the country.

In winter and spring 1990 Black-winged Kites were frequently observed in many places throughout the Nile valley, the Faiyum oasis, the cultivated parts of the Suez canal area (south to Suez), and in the entire Nile delta, including newly reclaimed and irrigated areas west of Ismailiya and south of Alexandria. During the mid-winter waterbird counts 180 Black-winged Kites were seen in the Nile delta, and all localities in northern Egypt where the species was observed in winter and spring 1990 are shown in Figure 1. The species breeds almost throughout the year in Egypt, where no significant migratory movements are known (Goodman and Meininger 1989), and most birds observed are presumed to be local breeders. From March to June 1990 birds displaying or carrying nest material were seen at several places around Lake Manzala and in the Suez canal area; high densities were frequently noted in extensive agricultural areas, but birds were not restricted to such habitats and small numbers were regularly observed in marshy areas of Lake Manzala, including areas almost devoid of trees along the Ismailiya–Port Said road. These observations in unsuitable breeding habitat do suggest that some dispersion occurs, mainly in winter.

On 16 January 1990 one was seen by Hans Riehmann at Dakhla oasis (c. 25°30′N 29°E), and on 17 March 1990 one was at Wadi el Natrun. These records, together with that of a single bird seen on 27 June 1989 at Sadat City, near Wadi el Natrun (Evans 1990), are the first recent records from the Western Desert (Goodman and Meininger 1989).

In the nineteenth century the species was extremely common in the Nile delta (Adams 1864), but uncommon in the Nile valley south of Qena, c. 26°N (Shelley 1872; Gurney 1876). By the turn of the century, however, it may have extended its range southward along the Nile valley, for Quinet (1904) found it common all through Egypt and Meinertzhagen (1930) considered it fairly well distributed in the 1920s. This apparent variability in population size and distribution has continued even in recent decades. In the early 1980s the species was common in the Nile

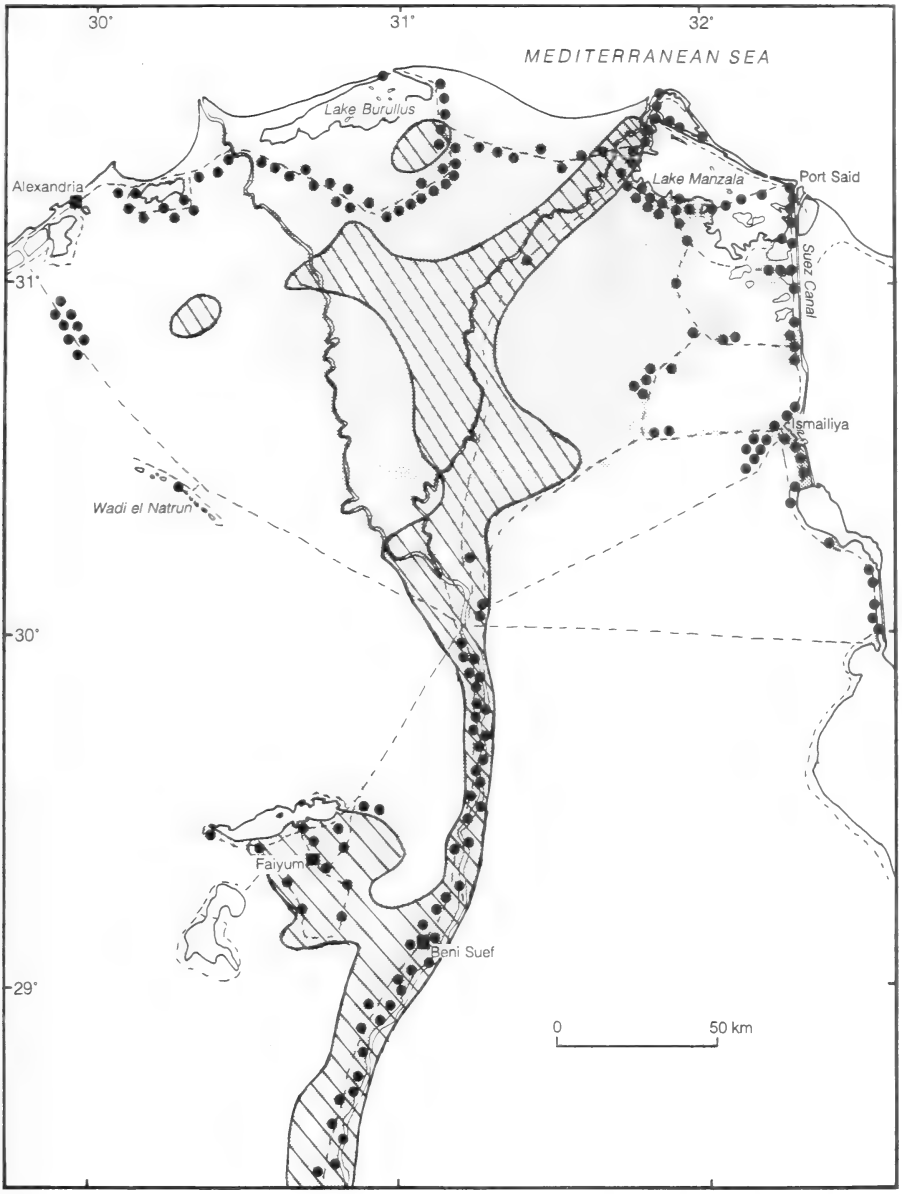

Figure 1. Records of Black-winged Kites *Elanus caeruleus* in northern Egypt during winter and spring 1990; each dot represents an observation locality, often involving more than one bird. Shaded areas are irrigated; hatched area is known breeding range in 1970–87 (after Goodman and Meininger 1989); dashed lines are routes travelled during the study.

valley from Sohag (c. 26°30′N) south to Aswan, but uncommon between Sohag and Cairo, except for the surroundings of Beni Suef and in the Faiyum oasis where it was fairly common. It had decreased markedly in the Nile delta, where it occurred only locally in the southern part (Mullié and Meininger 1985). In the mid-1980s, numbers increased again, with the species occurring throughout the Nile valley, the Faiyum oasis, and in parts of the Nile delta, though in 1987 it was still absent from the coastal areas. The only two observations then known from the Suez canal area were in 1944 (Goodman and Meininger 1989). The increase of Black-winged Kites in the Nile delta has apparently continued after 1985, and now almost the entire delta has been recolonized, including Lake Burullus, Lake Manzala, and the Suez canal area.

Some regional reduction in numbers, as noted in the past, appears to have been related to the local heavy use of pesticides, particularly insecticides in cotton fields, and rodenticides (Mullié and Meininger 1985), although there is only circumstantial evidence for this since no residue analysis has been carried out (Goodman and Meininger 1989). Rodent populations reached an exceptional peak in the late 1970s and were successfully controlled with various rodenticides. Acute poisons (e.g. zinc phosphide) were used initially, and later on less dangerous chronic poisons (Burgstaller *et al.* 1990). The recent range extension and increase in numbers of Black-winged Kite may well have been the result of a decrease in the use of certain pesticides, although this is to a great extent speculative.

ACKNOWLEDGEMENTS

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Peter L. Meininger, Foundation for Ornithological Research in Egypt, Belfort 7, 4336 JK Middelburg, Netherlands.

Visible migration of Sparrowhawk *Accipiter nisus* and Penduline Tit *Remiz pendulinus* in southern Turkey

VINCENT VAN DEN BERK

FROM 11 to 17 October 1988 a wader and waterfowl count was conducted in the Çukurova coastal wetlands of southern Turkey, roughly between Yumurtalık and Mersin. For details of the area, see Aukes *et al.* (1988) and van der Have (1989). This note describes the visible migration of two species observed in significant numbers during this period, while some other aspects of autumn birdlife in the area have been described by van den Berk (1991).

Sparrowhawk *Accipiter nisus*. Movements of this raptor were prominent in mid-October, starting about 06.00 hrs at all of our various observation sites around the coast and peaking between 08.00 and 10.00 hrs when a steady stream of low-flying single birds passed eastwards, parallel to the shore. Visible movements tailed off around midday and only a few birds were noted in the afternoon. On 15 and 16 October, between 06.00 and 13.00 hrs, counts from a vantage point covering some kilometres of the dunes between the sea and Akyatan Gölü recorded, respectively, 74 and 68 Sparrowhawks. No systematic notes were made on the sex or age of the birds, but the majority was thought to be female. Strength of the passage over this mid-October period appeared to be much the same every day, both west and east of Karatas (i.e. within and outside the Gulf of Iskenderun), and autumn visits in 1982, 1985, and 1990 revealed the same picture. It thus seems that, over the entire migration period of this species, which extends from early September to early November, good numbers must pass here, and the Çukurova coast may be one of the few known areas in the east Mediterranean where the autumn movement of Sparrowhawks is concentrated (see Bijlsma 1987). The flight direction of birds observed in the mornings indicates that they are then flying around the Gulf of Iskenderun, but the near-absence of visible movements in the second half the day at Çukurova may well not be a real one. At the Bab-el-Mandeb straits in Djibouti, the autumn migration of Sparrowhawks continues from dawn to dusk (Welch and Welch 1988), and in the afternoon birds may be approaching the Çukurova coast much higher than earlier in the day, to cross the Gulf on a broad front—behaviour that was noted there for other raptor species (van den Berk 1991).

Penduline Tit *Remiz pendulinus*. The eastward passage of low-flying groups, parallel to the shoreline, was noted commonly along the entire Çukurova coast, especially in the early morning hours. It was often difficult to get the calling flocks into

view, but several groups were seen and heard between 11 and 14 October at Çamlik and Yelkoma Gölü. On 15 October, low-flying groups of 15, 30, and 35 were seen before 09.00 hrs over the dunes bordering Akyatan Gölü; several more groups were heard but not seen, and some hours later many calling groups passed unseen around Tuzla Gölü. Similar observations were made at Akyatan Gölü again the following day, and on 17 October six groups totalling 77 birds flew low along the beach between the Berdan and Seyhan river mouths.

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V. van den Berk, Noordereind 3[a], 4012 BT Kerk Avezaath, Netherlands.

A nest of Caucasian Black Grouse *Tetrao mlokosiewiczi* in Turkey

JOHN TEMPLE LANG and MARK COCKER

ON 6 July 1991, while accompanied by a local man familiar with the species, we found a nest of Caucasian Black Grouse *Tetrao mlokosiewiczi* in north-east Turkey. Such nests are rarely found (this was the first that our companion had seen), and there appear to be conservation conclusions to be drawn.

The nest, located when the female flew directly off it at about 30 m from us, was on a north-west facing 35–40° slope in a small side valley at about 2,800–3,000 m near Sivri Kaya in Dogu Karadeniz Daglari. It was within about 3 ha of low scrub dominated by the white dwarf rhododendron *Rhododendron caucasicum*, not yet in bloom. The area of scrub was the least accessible of the patches we examined and was denser, taller (about 1 m high), and more tangled than the others. It also held

singing Quail *Coturnix coturnix*, Water Pipit *Anthus spinoletta*, Marsh Warbler *Acrocephalus palustris*, Mountain Chiffchaff *Phylloscopus sindianus*, and Scarlet Rosefinch *Carpodacus erythrinus*. The nest was concealed in the scrub, in a saucer formed by the branches of a stump of rhododendron, about 5 cm above the ground. It was about 20 cm in diameter, shallow, and composed mostly of dry grass but containing several dry rhododendron leaves. It held five eggs, almost but not quite oval, of sandy-beige ground colour, with small indistinct light brown spots around the middle.

Plate 1. Nest of Caucasian Black Grouse *Tetrao mlokosiewiczi*, Sivri Kaya (Turkey), July 1991. (*John Temple Lang*)

Neither the scrub area in which the nest was situated nor the floristically rich meadows around it showed any signs of having been grazed that year. The side valley was deserted, and the summer village about 3 km away seemed empty. We found no other black grouse, and all the other rhododendron we saw was either in small patches or in larger areas divided by grazed grassy paths, and was surrounded by grazed meadows. Only the area where the nest was found corresponded to Johnsgard's (1984) description of the nesting habitat as dense scrub. Rhododendron is the only source of fuel at this altitude, and we saw it being cut and stored as firewood for the summer village. So, in addition to the threat to the habitat from grazing, mentioned by Cramp and Simmons (1980), it seems likely that there is a threat to the habitat of this grouse in Turkey as long as firewood is needed in summer in the nesting areas. Perhaps an alternative fuel can be provided to relieve the pressure on the rhododendron scrub—a policy which has been effective in reducing the cutting of trees for firewood which threatened the habitat of the Algerian Nuthatch *Sitta ledanti* (Ledant *et al.* 1985).

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John Temple Lang, ave. P. Hymans 113, bte 19, 1200 Brusells, Belgium.
Mark Cocker, 23 Harford Manor Close, Ipswich Rd, Norwich NR2 2LW, UK.

A Cory's Shearwater *Calonectris diomedea* in the Egyptian Western Desert

STEVEN M. GOODMAN and C. VANCE HAYNES JR.

MEINERTZHAGEN (1930) considered Cory's Shearwater *Calonectris diomedea* a vagrant to Egypt and cited only two records from the Mediterranean coast, but in recent years there has been an increasing number of reports of it from both the Mediterranean and Red Sea coasts of the country. Records of the species from these waters are of migrants or winter visitors which are generally noted between mid-August and December, although it has been found throughout the year (Goodman and Meininger 1989). Also, flocks of up to 20 birds have been noted with some regularity in the Gulf of Aqaba (Paz 1987). All of these records are from coastal areas, however, and it is for this reason that the discovery of a Cory's Shearwater in the Egyptian Western Desert is of interest.

In 1989 we were members of a geological expedition to the Darb el Arba'in area of the Western Desert, one of the more hyperarid areas of the eastern Sahara (Haynes 1982), and on 13 February, while traversing an area of barren sand sheet, we found a mummified Cory's Shearwater at 22°51′N 28°06′E, 390 km south-west of Kharga and approximately 800 km west of the Red Sea coast. The bird was partially buried and the exposed portion of the body was abraded by the action of blowing sand. The bones were completely ossified. Enough of the wing feathers remained intact to determine that the bird had prominent white markings on the inner web of the primaries, a feature characteristic of the nominate Mediterranean subspecies (Cramp and Simmons 1977). The wing feathers and the skeleton are now housed in the University of Michigan Museum of Zoology (specimen number 227828).

What the bird was doing away from the coast, let alone in such a remote desert area, is enigmatic.

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Steven M. Goodman, Department of Zoology, Field Museum of Natural History, Roosevelt Rd at Lake Shore Drive, Chicago, Illinois 60605, USA.

C. Vance Haynes Jr, Departments of Anthropology and Geosciences, University of Arizona, Tucson, Arizona 85721, USA.

W. R. P. Bourne has commented as follows.

Cory's Shearwater appears to be one of the seabirds currently flourishing because it has taken to feeding behind fishing boats. Until about thirty years ago it was only known to occur regularly in the Mediterranean and North Atlantic, although it has since been realised that it normally winters in the South Atlantic, extending well round into the Indian Ocean, where it has now been reported off Somalia (J. S. Ash, *Scopus* 7: 54–79), Oman (G. Bundy, *Sandgrouse* 7: 29–42), and at the head of the Arabian Gulf (D. M. Simpson, *Sea Swallow* 36: 16)—as well as around the head of the Red Sea and even part-way along the Suez Canal in the Great Bitter Lake (P. Meeth, *Sea Swallow* 36: 38); these records are mainly between June and December.

It seems unlikely that such birds are vagrants from the Mediterranean because few winds blow in that direction. They might be migrants, especially young birds, from the Mediterranean trying to reach their winter quarters overland, but this seems unlikely to be a general explanation, as some occur in late summer before the chicks fledge and the birds start to move south in October and November. So they seem most likely to be inexperienced immatures, which appear to disperse most widely and return last, trying to return home from their winter quarters up the wrong side of Africa.

There are several considerations here. If such birds started north at the normal time for adults (about February) they would find the south-east trade winds extending far south in the southern Indian Ocean (Figure 1) and these would guide

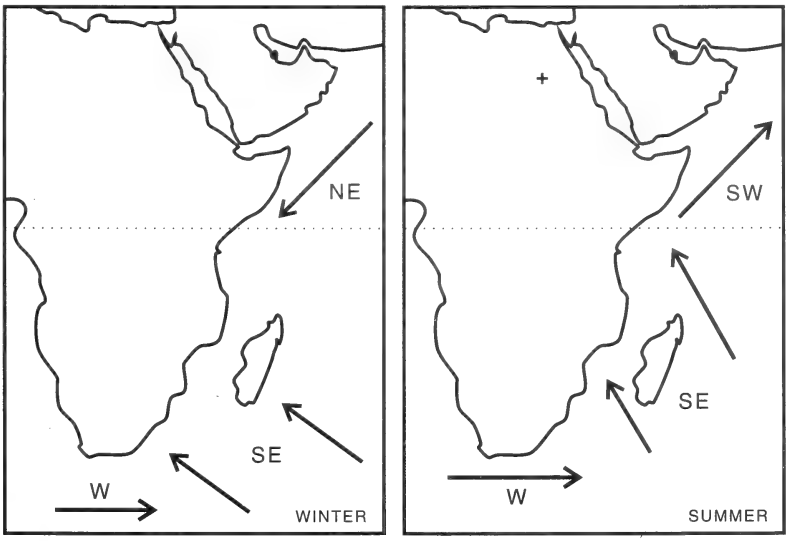

Figure 1. Prevailing winds in the western Indian Ocean during the northern winter and summer. **+** Record of Cory's Shearwater *Calonectris diomedea*.

them back into the Atlantic; if, despite this, they should move north within the Indian Ocean they would be delayed by the north-east monsoon in the Arabian Sea. On the other hand, waiting until the westerlies move north later in the year would tend to drift birds into the Indian Ocean where their passage would now be assisted first by the south-east trades and then the development of the south-west monsoon. If a bird from the west Mediterranean then headed home from about Somalia it might well end up in the Egyptian desert.

A Radde's Accentor *Prunella ocularis* from Oman reidentified as Black-throated Accentor *P. atrogularis*

PER ALSTRÖM

IN 1975 a bird identified as Radde's Accentor *Prunella ocularis* was seen on Masirah island (Oman) from 2 November until collected on 22 November (Rogers 1988) (the year was wrongly given as 1976 by Gallagher and Woodcock 1980). The specimen is kept in the British Museum (Natural History), Tring (BMNH number 1976.1.13), and would constitute the only record of that species for Oman.

I have examined the specimen, and in my opinion the bird is clearly not a Radde's Accentor but a Black-throated Accentor *P. atrogularis*—still a first record for Oman (and Arabia). This reassessment has been endorsed by P. R. Colston of the BMNH, M. D. Gallagher, and the Oman Bird Records Committee.

The bird in question shows an all-pale throat (with only very little blackish on the feather bases) and is thus not a typical Black-throated Accentor, which, as implied both by its English and scientific names, usually shows a black bib. Rarely, however, the black bib is very indistinct, and in the field it may exceptionally even seem to be lacking (only on first-winter females?). The Masirah bird is virtually identical to a specimen of Black-throated Accentor in the BMNH collected in Gilgit (Pakistan) on 9 January 1979 (BMNH number 97.12.10.1085).

The following characters, described and illustrated in Alström (1990), identify the Masirah bird as a Black-throated Accentor.

- The buffish colour of the breast is deeper than in the average Radde's and extends onto the side of the throat which is otherwise unmarked (in Radde's, the throat is entirely whitish or very pale buffish except, often, for fine dark spots on the side, forming a fine dark malar stripe).
- The supercilium is buffish, especially above and behind the eye (whitish or, in fresh plumage, very pale buffish in Radde's).
- The ear-coverts are rather pale with dark edges (in Radde's the ear-coverts are normally rather uniformly dark with a small pale spot at the rear). Black-throated usually has ear-coverts much as Radde's, but my examination of skins shows that birds with little black on the throat generally have rather pale-centred ear-coverts, as in the Masirah specimen.

The Arabian Accentor *P. fagani* (considered by some, e.g. Dementiev and Gladkov 1954, to be a race of Radde's Accentor) is resident in western Yemen but could possibly straggle to Oman. However, in Arabian Accentor there is a dark-spotted malar stripe, and the entire breast is (at least sometimes) distinctly streaked, unlike in Black-throated Accentor, including the Masirah bird (Brooks *et al.* 1987, Plate 7; Cramp 1988; Hollom *et al.* 1988; personal studies of BMNH specimens).

The Masirah bird is a female according to the label and most likely a first-winter due to the very reduced amount of black on the throat.

Black-throated Accentor breeds in the Urals and in the mountains of western China, western Mongolia, and neighbouring parts of the USSR, and winters mainly from Afghanistan to north-west India (e.g. Cheng 1987, Cramp 1988). Stragglers have reached Israel (January–March 1982: Hovel 1987; Paz 1987), Finland (October 1987: Hario *et al.* 1988), and Sweden (June 1988: Edenius and Giesler 1990).

Plate 1. Top: Black-throated Accentor *Prunella atrogularis*, (first-winter?) female, Masirah (Oman), November 1975. Bottom: Radde's Accentor *P. ocularis*, male, Elburz (Iran), April. Specimens, British Museum (Natural History). (*Duncan Brooks*)

Plate 2. Radde's Accentor *Prunella ocularis*, Turkey, August. (*Marc Raes*)

Plates 3–4. Black-throated Accentor *Prunella atrogularis* with pale throat, Finland, October. (*Pekka Komi*)

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Per Alström, Kungsgatan 3, 462 33 Vänersborg, Sweden.

First record of Long-toed Stint *Calidris subminuta* in Bahrain

ERIK HIRSCHFELD

ON THE afternoon of 16 May 1991 Patrick Murphy and I visited Dumistan (26°08´N 50°29´E) in the north-west of Bahrain for a count of migrants. The temperature was close to 40°C, and after two weeks of north-westerlies there was a light east wind. This change in direction had caused many passage birds to resume migration, and my morning excursion that day had produced the lowest numbers of migrants for several weeks. The Dumistan site is a fenced-off wasteland, approximately 750×500 m. To the north is cultivated land and to the south-east is Nakhl Lawzi, a saline lake. In the southern part of the site is a poultry farm which regularly dumps large amounts of chicken waste on the open ground where it dries in the sun, attracting large numbers of fly larvae and, with them, birds such as Cattle Egrets *Bubulcus ibis*, Collared Pratincoles *Glareola pratincola*, gulls *Larus*, Collared Doves *Streptopelia decaocto*, Turtle Doves *S. turtur*, wagtails *Motacilla*, wheatears *Oenanthe*, and shrikes *Lanius*. It is also the best place in Bahrain to encounter large flocks of coastal species such as Sanderling *Calidris alba* and Turnstone

Arenaria interpres as well as Curlew Sandpiper *C. ferruginea*, Ruff *Philomachus pugnax*, and other waders, which sometimes roost on the shores of Nakhl Lawzi.

As we arrived at the site at about 15.45 hrs a flock of seven stints drew our attention. I thought they looked a bit long-legged and long-necked through binoculars (7×42) and when I viewed them in the telescope (20–40×77) I could see yellowish legs. I immediately suspected they were Long-toed Stints *Calidris subminuta* and took the following description from a distance of about 60 m. Dumistan and Nakhl Lawzi were searched the next day but the birds were not found again.

Size. As Little Stint *C. minuta* (several were nearby).
Head. The birds' plumage was determined to be intermediate between winter and summer. All had a dark reddish-brown cap which reached the base of the upper mandible and was bordered by a whitish supercilium. Two birds had quite a dark lore, while in the rest it was less dark but still emphasized the supercilium. The ear-coverts and nape were plain reddish-brown, the nape contrasting with the darker cap.
Upperparts. A fairly prominent whitish V was noticeable on the back of every bird; on one it seemed to consist of two rows of rather indistinct round spots, while the others showed it as two lines on the inner edge of the scapulars. Scapulars had blackish centres with rufous-brown margins, and the tertials of all individuals also had wide rufous-brown edges. At least two birds had grey, winter-type median coverts while the rest had mostly replaced them with blackish feathers fringed reddish-brown and greyish-white. A whitish wing-bar was apparent in flight.
Underparts. Whitish, the breast streaked on the sides but less so in the centre. Throat and centre of upper breast unmarked.
Bare parts. Bill blackish, with no pale base visible; thin and slightly drooping towards the tip but not strikingly different from Little Stint. Compared to Little Stint the legs were remarkably long, and in flight the toes projected visibly beyond the tail. Two birds had completely yellowish legs, four of them had mud or dirt on the lower part of the legs so that yellow was only visible on the tibia, and one showed yellow from halfway along the tarsus upwards. The middle toe of one bird was seen and noted to be strikingly long.
Voice. No calls were heard.
Behaviour. The birds were quite shy and we could not approach them closely. Every time we flushed them they landed together in a small group and did not mix with the other *c.* 250 Turnstones, 25 Sanderlings, 50 Curlew Sandpipers, and ten Little Stints that were nearby. Mostly they stood inactive, presumably watching us, but we also saw them feed a few times. No difference in feeding action from Little Stint was noticed.

Of the three pale-legged species of stint, Temminck's *C. temminckii* could easily be ruled out by its plumpness, short legs, and plain plumage. Least Sandpiper *C. minutilla*, which would be an unlikely though not impossible visitor to the Gulf from the Americas, differs in its short-necked appearance, shorter legs that do not project obviously beyond the tail in flight, normally less bright rufous fringes to the tertials, and supercilia that usually join over the bill. The strong sunlight made it very difficult to determine shades of colours exactly, and might also have been the reason why we did not note the pale bill-base which is usually present on Long-toed Stint—though it is often restricted and indistinct (R. F. Porter pers. comm.). I am familiar with Long-toed Stint from the breeding grounds in Siberia.

This record is the first for Bahrain, though the species is known from neighbouring countries. In Saudi Arabia, Jennings (1981) listed a record from Riyadh, and a

bird was at Abqaiq in the east from 28 August to 4 September 1977 (Bundy *et al.* 1989). A small influx took place in the United Arab Emirates in autumn 1990: one at Ramtha tip on 14 September, one at Dubai fish farm from 28 September to 2 November, three at Al Wathba on 1 October, and at least two at Ghar lake on 1–5 October (Richardson 1990, 1991). It is a scarce passage migrant and winter visitor in Oman from August to May (Oman Bird Records Committee 1990). Long-toed Stint breeds across southern Siberia, and the main wintering range lies from Australia to southern and eastern India, but the passage records in Arabia suggest the existence of a small wintering population in East Africa (Wallace 1974; Hayman *et al.* 1986).

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Erik Hirschfeld, c/o IAL, PO Box 144, Manama, Bahrain.

First record of Paddyfield Warbler *Acrocephalus agricola* in Bahrain

ERIK HIRSCHFELD and TADEUSZ STAWARCZYK

IN THE late morning of 13 September 1991 we were birding at Ghalali, close to the airport at Muharraq in Bahrain. The area consists of fields with crops such as sorghum and grass, ditches with (in summer) dried-out reeds, and lines of small palm trees along the tracks between the fields. It is the most north-easterly farmland in Bahrain and regularly attracts large numbers of migrants in both spring and autumn. As we walked along one of the tracks a brownish warbler was flushed from a palm tree close to us and settled for a while in another palm further down the track. With 10 × 42 and 10 × 50 binoculars and a 20–40 × 77 telescope we observed it there for about five minutes at distances down to 30 m, though it was partly concealed by palm leaves for some of this time. After that it flew into dense cover among *Sesuvium* and *Zygophyllum* bushes, and when flushed from there it quickly took cover again so that thereafter we only managed to see it in flight.

Size. Judged to be about the same as Whitethroat *Sylvia communis* (by which it was chased among palm leaves on one occasion).

Head. Dark eye-stripe below a long, distinct, fairly wide, whitish supercilium extending well

beyond the eye. The upper border of the supercilium was darker brown, in turn bordering a greyish-brown crown.

Upperparts. Unstreaked warm brown with a rufous tinge, contrasting slightly with the crown and nape which were more greyish-brown. The wing-tip either reached the tip of the uppertail-coverts or fell slightly short of this, but due to the bird's nervous behaviour we were unable to gauge the exact primary spacing; another reason for this was the bird's habit of keeping its tail slightly fanned and cocked upwards at about 30° to the horizontal, thus obscuring our view of the primaries which rested on top of the uppertail-coverts. Undertail-coverts were typical *Acrocephalus*, long and fluffy. Tail all-dark, rounded.

Underparts. Whitish, with slightly buffish flanks.

Bare parts. Iris looked dark, possibly deep reddish-brown, but the sunlight was very strong and it was difficult to assess exact shades. The bill looked of typical *Acrocephalus* length, with a pale lower mandible (no dark tip was noted) and a dark upper. Bill shape was distinctive: deeper, especially at the base, than in Reed Warbler *A. scirpaceus* and looking stouter, though not as stout as that of Great Reed Warbler *A. arundinaceus*.

Voice. When it sat openly for a short while in the bushes it was heard calling a couple of times: a soft 'tjick', with the last letter somewhere between 'g' and 'k'. Such a call from an *Acrocephalus* was new to both of us.

TS's first impression was of Rufous Bushchat *Cercotrichas galactotes* because of the strong facial pattern and the cocked tail, while EH thought it was an *Acrocephalus* due to the brownish upperparts, size, and warbler-like movements (looking around in all directions, and frequent nervous bobbing of the whole body). The head pattern made us suspect Paddyfield Warbler *A. agricola* quite early, and after consulting literature at home we confirmed the identification. Reed Warbler and Blyth's Reed Warbler *A.dumetorum* were excluded by the distinctive supercilium with dark upper margin, short wing, stout bill, and call, and Booted Warbler *Hippolais caligata* was ruled out by upperpart colour, tail shape, long undertail-coverts, and face pattern. We are both familiar with Blyth's Reed Warbler in good numbers from Poland, Sweden, India, and the USSR, as well as with Marsh Warbler *A. palustris* and Reed Warbler from the field and ringing. EH has seen Paddyfield in the USSR and Pakistan and is familiar with both nominate *caligata* and *rama* Booted Warblers from UAE, Pakistan, and the USSR.

Paddyfield Warbler breeds from the northern Black Sea and north Caspian regions east across south-central Asia, wintering mainly in the Indian subcontinent (Cramp 1992). The nearest breeding populations to Bahrain are in north-east Iran (Hollom *et al.* 1988), but as the species is recorded during the breeding season in eastern Turkey (M. Ullman *in litt.*) there is a possibility of other, unknown breeding areas in (e.g.) Iran and Iraq. The only previous Arabian records are from Oman, where a bird was found dead on Masirah island on 6 November 1979 and one was recorded in the south of the country on 13 October 1984 (Oman Bird Records Committee 1990); there is also a record from Eilat in October 1990 (*Brit. Birds* 1991, 84: 233–4).

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Erik Hirschfeld, c/o IAL, PO Box 144, Manama, Bahrain.

Tadeusz Stawarczyk, Museum of Natural History, Wroclaw University, Sienkiewicza 21, 50-335 Wroclaw, Poland.

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