

THE LESSER KESTREL (*FALCO NAUMANNI*) AT DANA NATURE RESERVE, JORDAN

The Lesser Kestrel (*Falco naumanni*) is classified as "Vulnerable" and is a species that has declined dramatically in its western Palearctic breeding range in recent years (N.J. Collar et al. 1994, Birds to watch 2: the world checklist of threatened birds, Birdlife Internat., Cambridge, U.K.). Throughout its distribution, the major threat to the Lesser Kestrel is intensive agriculture (i.e., biocides, deep mechanized ploughing, monoculture, elimination of fencelines), which has drastically reduced the supply of large insects, the major food of the species (S. Parr et al. 1995, *Biol. Conserv.* 72:45–53). The Lesser Kestrel has a Palearctic distribution from Iberia to Mongolia and south to the Levant and North Africa (G.M. Tucker and M.F. Heath 1994, Birds in Europe: their conservation status, Birdlife Conservation, Series 3, Birdlife Internat., Cambridge, U.K.). In most of Jordan, the species is considered an uncommon visitor and a local breeder in the Syrio-African Rift Valley (I.J. Andrews 1995, The birds of the Hashemite Kingdom of Jordan, I.J. Andrews Publ., Musselburgh, U.K.). Five pairs were confirmed to breed in Jordan in the Dana Nature Reserve (DNR; M.I. Evans 1994, Important bird areas in the Middle East, Birdlife Conservation, Series 2, Birdlife Internat., Cambridge, U.K.).

To provide baseline data for future monitoring and protection of the nest sites, we conducted a survey at the Dana Nature Reserve (30°37'N, 35°32'E, 15 000 ha in size) from 19–26 April 1997. We censused the breeding population and mapped foraging and breeding sites. We conducted our survey during the peak of the breeding season to locate nest sites to determine colony and breeding population size. The DNR is located in a major gorge flowing from the Sharrah Mountains down to the rift valley floor at sea level (M.I. Evans 1994, Important bird areas in the Middle East, Birdlife Conservation Ser. 2, Birdlife International, Cambridge, U.K.). The cliffs at the head of the wadi are of Nubian sandstone. There is oak (*Quercus* spp.) woodland on the steeper slopes, mixed with Jerusalem pine (*Pinus halepensis*). Atlantic pistachio (*Pistacia atlantica*) and extensive areas of herbs and scrub. Steppe-like sage (*Artemisia* spp.) dominates the gentler slopes and the plateaus.

Pairs normally breed in colonies and forage <1 km of the colony (N.P. Williams and M. Yarar 1995, *Biol. Conserv.* 72:45–53). In the past, pairs nested on the highest cliffs and foraged in the adjacent grasslands and cultivated areas on the plateau to the east (D.I.M. Wallace 1984, *Sandgrouse* 6:24–47). We censused Lesser Kestrels at the site by conducting a systematic search of the area by car and on foot for six days during 19–26 April 1997 when reproductive activity should have commenced. We drove on dirt tracks through the grasslands and agricultural areas to locate foraging birds, which congregate at favored spots, where they hover or perch conspicuously. Areas inaccessible by car were censused on foot. The proximity of the foraging areas to nest areas allowed us to follow foraging individuals to nest sites visually. In addition, nests were located by scanning all suitable habitats (i.e., cliffs and old buildings). Lesser Kestrels vocalize frequently during the breeding season and are very conspicuous: this is especially true of the males which have a distinctive, species-specific call that is often given when they approach the colony (J. Boulos, R. Yosef pers. obs.). After locating nest sites and their associated foraging areas, we counted numbers of birds present during several visits. Nest sites were marked on 1:50 000 topographic maps. We used the maximum count for each site to estimate the total population. To avoid inflating our estimates, we counted only those individuals that flew to a nest site with a full crop or food items. Other Lesser Kestrels we observed were considered late migrants or transients. We further assumed that all birds at a colony belonged to that colony only and did not nest at a neighboring colony.

We estimated that 24–28 pairs of Lesser Kestrels bred in the DNR during the 1997 breeding season. They were distributed over five locations: one pair at the Tourist Campsite, a colony of two pairs at Shagg el Kelba, four pairs at Dana Sandstone, six pairs at the Dana Village Cliffs overlooking the village, and 11 pairs at Umed Dims in Wadi Nuwatif. Although we were unable to locate any nest sites outside the reserve boundaries, most of the Lesser Kestrels foraged outside the nature reserve.

All nests were located in natural cliff crevices. Most pairs nested at an average height of 250 m in a very narrow stratum of the white Disi Sandstone that is particularly rich in crevices. Nests were all within the semiarid Mediterranean habitat and faced southeast (Tourist Campsite), east (Shagg el Kelba), south (Dana Sandstone and Umed Dims), and west (Dana Village Cliffs).

The kestrels foraged in the flatter, upper elevations (1150–1600 m) of the Mediterranean Zone and at its interface with the Irano-Turanian zone of the eastern desert fringes. Most of the birds foraged to the east of the cliffs in cultivated fields (mostly wheat; *Triticum* spp.) that had patches of wild grasses and sage. Birds used the prevailing

westerly winds to loft themselves up the Rift Valley slopes from the breeding cliffs to the foraging areas with apparently little effort. The return journey downhill was accomplished by a sharp-angled glide. In this energetically efficient manner, we observed them foraging as far as 3 km away from their nest sites. However, the majority remained within 1 km of their nest sites.

We observed kestrels foraging within DNR only in the open, grassy patches amongst juniper woodlands, and mostly during strong, hot easterly winds (khamsins), which appeared to make flight difficult to and from cultivated fields. We assumed that flying into the easterly winds was energetically more expensive and less profitable in terms of finding prey because we noticed a marked (but unquantified) reduction in the density of calling cicadas (*Cicadoidea* spp.; a major prey item) on the plateaus during the khamsins. In parallel, there was no change in the level of activity of the kestrels during different wind regimes in the sheltered parklands that were below and to the west of the scarp-edge.

The breeding population of Lesser Kestrel in DNR is the only confirmed breeding colony in Jordan (e.g., M.I. Evans 1994, Important bird areas in the Middle East, Birdlife Conservation, Series 2, Birdlife Internat., Cambridge, U. K.). The earliest estimate of the size of this colony was 15–20 pairs between Dana village and the slopes of Barra in late April 1963 (D.I.M. Wallace 1984, *Sandgrouse* 6:24–47) which was very close to our estimate of 24–28 pairs suggesting that the population size is little different from 34 years ago.

Regular censuses are necessary to monitor population fluctuations. The population of Lesser Kestrels at DNR is one of the southernmost in the world and as such is an excellent subject for study of this phenomenon because population fluctuations are most obvious at the extremes of a species' range (R. Nathan et al. 1996, *Israel J. Zool.* 42: 361–375; I. Newton 1998, Population limitation in birds, Academic Press, London, U.K.).

We consider the Lesser Kestrel population at DNR to be extremely vulnerable to the influences of agricultural practices because most of their foraging areas lie outside the reserve. At present the Lesser Kestrel population has a chance to maintain itself because the current cultivation practices in the foraging areas appear to not be intensive, and are located in low-quality agricultural land (shallow, stony calcareous soil). Thus, conservation managers should encourage farmers to maintain low-intensity agricultural practices or they should try to acquire these areas for inclusion in the reserve. It is also imperative to determine the true breeding population in the deserts to the south and east of DNR in order to establish the true breeding population of Lesser Kestrels in the Hashemite Kingdom of Jordan.—**Reuven Yosef, International Birding and Research Center in Eilat, P.O. Box 774, Eilat 88000, Israel, Jacklene Boulos and Omar Tubbeshat¹, Arava Institute for Environmental Studies, D. N. Cheve, Eilat 88840, Israel.**