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Conservation aspects and former nest-site selection of the Lappet-faced Vulture *Torgos tracheliotos negevensis* in Israel

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Abstract

The decline of the Israeli population of the Lappet-faced Vulture was first documented in the early 1960s. From 1975 on, reproductive activity was limited to the southern part of the breeding range recorded in previous years. A captive breeding programme was started in 1975 with 16 individuals. In order to evaluate nest-site requirements for future releases, confirmed nest-trees were measured. All trees used for nesting were either *Acacia raddiana* or *A. tortilis*. The shape of the crown was circular in most cases and diameter at breast height was positively correlated to height and total crown diameter. It is essential that the authorities take present development plans on the Israeli and Jordanian sides of the Arava (Syrio-African) Rift Valley into account and conserve these areas, and particularly the two tree species, for future use by wildlife, before it is too late.

Introduction

The capture of an exhausted, first calendar year Lappet-faced Vulture *Torgos tracheliotos negevensis* on 10 June 1995 near the date palms of Kibbutz Qetura in the Arava (Syrio-African) Rift Valley in southern Israel, caused quite a sensation and was considered as a good omen by environmentalists. The previous sighting in the country of this once nesting species was in 1990. Since then only single birds had been regularly sighted at the Sede Boqer feeding station in the Negev Desert highlands, but rarely in the rift valley.

The decline of the Israeli population of the Lappet-faced Vulture was first documented in the early 1960s (Meretsky & Lavee 1991), and since then their numbers have plummeted to extinction in the wild in the early 1990s. Following a survey of the Negev Desert in 1945, the initial breeding population was estimated at 25--30 pairs (Mendelssohn 1971). In the next survey, conducted in 1972, 16 nests were found, but in 1975 only seven pairs nested (Ilani 1981, Meretsky & Lavee 1991). The population decline continued unchecked into the 1980s. Three pairs nested in 1980, and from 1985 to 1989, only one pair nested for each of these years. From 1975 on, reproductive activity was limited to the southern part of the breeding range recorded in previous years (Mendelssohn & Leshem 1983).

Ilani (1981) reported on the shooting of vultures feeding at carcasses by soldiers in the 1950s. Mendelssohn (1971) and Meretsky & Lavee (1991) considered nest robbery and the wide use of biocides in agriculture to have also considerably contributed to the decline of the free-living Lappet-faced Vulture population. Also, at least seven juveniles are known to have been successfully smuggled out of Israel for sale to foreign collectors and zoological parks (O. Hatzofe unpubl. data). In addition, prevention or curtailing of Bedouin grazing practices, and improved hygiene standards of their herds, aggravated the situation because fewer animals died and were thus left as food in the wild for vultures and other carnivores (Frumkin 1986).

Although *T. tracheliotos* is not considered a globally threatened species (del Hoyo *et al.* 1994), the Arabian sub-species *T. t. negevensis* is highly endangered and the Israeli population represented the most isolated known population. Since the description of the *negevensis* subspecies (Bruun *et al.* 1981) additional populations have been identified in Saudi Arabia (Jennings & Fryer 1984, Weigeldt & Schulz 1992, del Hoyo *et al.* 1994, Jennings 1995), Oman and the United Arab Emirates (Gallagher 1982, 1989). Data from mitochondrial DNA sequencing have proved that the Arabian Peninsula Lappet-faced Vultures are the same sub-species as those in Israel (Wink 1995). Today, only the ten individuals held in captivity at the Tel-Aviv University Zoological Gardens (TAUZG) and the six at the Hai-Bar facility in the Arava Valley can be considered as the source for future reintroduction programmes (Dr Roni King, Israel Nature Reserves Authority, pers. comm.).

A breeding nucleus was established in 1975 and the staff at the TAUZG have demonstrated that Lappet-faced Vultures can breed successfully in captivity (Mendelssohn & Marder 1983, 1989). Since 1992, a captive breeding programme by OH has resulted in three young successfully raised from three fertilized eggs laid. In continuation of the policy, and with the knowledge of the inevitable crash of the population in the wild and lack of an appropriate genetic pool, the Israel Nature Reserves Authority (INRA) commissioned Drs Vicky J. Meretsky and Daphna Lavee to prepare a conservation and management plan for the Negev Lappet-faced Vulture (Meretsky & Lavee 1991). The emphasis was on the accumulation of all pertinent information for use in future reintroduction programmes. The original intention was to use captive-reared birds to reinforce the existing population in the wild (Meretsky & Lavee 1991), but because of the recent local extinction of the Israeli population, we now have to consider this as a reintroduction programme

Reproductive and behavioural data on captive birds were given in Meretsky & Lavee (1991) and this report emphasized the lack of descriptive data from the field. In particular, there was a serious lack of data on nest site selection. Fortunately, Dr Yekhiam Schlezinger, in his capacity as the regional biologist for the INRA, had marked on a 1:100 000 scale topography map all nesting trees of which he and other rangers had knowledge. We visited all these sites to collect data on (a) the position of the nest on the tree, and (b) to try and understand the factors governing nest placement in this species which has a large wingspan (255—290 cm) and body mass (males in captivity 6.500—9.200 g, N = 3; females in captivity 10.500—13.900 g, N = 7; Mendelssohn & Marder 1983, 1989), and that builds an enormous nest – perhaps the biggest constructed by any bird of prey.

Study Area and Methods

All trees that had been used by Lappet-faced Vultures for nesting are located in the Arava Valley in southern Israel. The area is arid and the average precipitation is 30 mm, with an average of ten rainy days per year (Ginat 1993). Annual average temperature is 26°C (range 10°C—39°C). Annual relative humidity is 39% with no dew recorded.

The plant community comprises representatives from three geobotanical regions -- Saharo-Arabian, Irano-Turanian, and Sudanese. The predominant trees in the valleys in which the Lappet-faced Vulture nests are slow-growing *Acacia* spp.

All nest trees previously marked on the 1:100 000 scale topography map were located. In order to avoid the after-effects of desiccation and rotting of dead trees, only those found alive were measured for height of tree, diameter at breast height (DBH), and crown dimensions (length x breadth measured from north-south, east-west). We used $P = 0.05$ as the minimum acceptable level of statistical significance.

Results

Two of the 30 trees identified in the field were dead. All nest trees were either *A. raddiana* (N = 19) or *A. tortilis* (N = 9; Table 1). Trees were located in wide canyons (N = 26) or on plains (N = 4).

The shape of the crown was circular in most cases and the north-south diameter was not different from the east-west diameter (Paired t-test; $t = 0.4426$, DF 27, P2-tail = 0.779) The DBH of the trees were positively correlated to height ($t = 20.404$, DF =

27, P2-tail = 0.0001) and total crown diameter (t = 13.311, DF = 27, P2-tail = 0.0001).

Table 1 *Parameters of Acacia trees used by breeding Lappet-faced Vultures in southern Israel. C1 denotes crown diameter (m) north-south; C2 - crown diameter (m) east-west; CD - total crown area (m²); Hgt - height (m) of nest tree; and DBH - diameter (m) of trunk at breast height*

	Species	C1	C2	CD	Hgt	DBH
1	*A. raddiana*	11.9	9.8	116.6	4.2	1.00
2	*A. raddiana*	14.4	12.2	175.7	6.4	2.43
3	*A. raddiana*	7.3	5.2	38.0	3.3	0.90
4	*A. tortilis*	8.1	8.9	72.1	3.7	0.59
5	*A. raddiana*	7.3	8.0	58.4	5.6	1.51
6	*A. raddiana*	8.1	13.4	108.5	6.1	1.52
7	*A. raddiana*	12.7	16.5	209.6	5.3	1.30
8	*A. raddiana*	13.6	18.1	246.2	7.1	3.20
9	*A. raddiana*	10.2	8.3	84.7	3.5	0.88
10	*A. raddiana*	11.5	11.8	135.7	2.8	1.00
11	*A. raddiana*	12.6	11.7	147.4	5.8	2.68
12	*A. raddiana*	9.8	11.5	112.7	4.4	1.63
13	*A. tortilis*	15.2	15.5	235.6	3.5	1.13
14	*A. tortilis*	13.8	13.2	182.2	4.2	2.10
15	*A. tortilis*	12.5	9.6	120.0	5.8	1.66
16	Dead					
17	Dead					
18	*A. raddiana*	12.8	14.6	186.9	6.6	1.85
19	*A. raddiana*	9.9	13.1	129.7	3.5	1.55
20	*A. raddiana*	9.7	11.0	106.7	4.8	2.20
21	*A. tortilis*	14.1	10.1	142.4	5.1	0.90
22	*A. raddiana*	13.5	8.5	114.8	4.4	1.51
23	*A. raddiana*	14.5	14.8	214.6	6.4	1.19
24	*A. tortilis*	14.5	13.2	191.4	4.6	1.35
25	*A. tortilis*	16.2	9.6	155.5	5.2	0.99
26	*A. raddiana*	9.8	8.8	86.2	6.1	2.50
27	*A. tortilis*	8.9	7.9	70.3	5.6	1.60
28	*A. raddiana*	10.5	10.3	108.2	4.9	1.52
29	*A. tortilis*	13.4	11.2	150.1	5.5	1.28
30	*A. raddiana*	11.1	9.9	109.9	5.6	2.13
Mean		11.7	11.3	136.1	5.0	71.1
SD		2.5	2.9	53.6	1.1	32.4
Min.		7.3	5.2	38.0	2.8	13.5
Max.		16.2	18.1	246.2	7.1	>100

The overall smallest crown area was 7.3 x 5.2 m (38 m^2) and the average height of the nest tree was 5.0 m (Table 1). Nest trees were stout and had circular crowns with a large surface area on which the large nests (approx. 2 m diameter; Mendelssohn & Leshem 1983) were built. Mendelssohn & Leshem (1983) found that nests were between 3.5—8 m above ground and that on occasion nests were built on a lower branch that was shaded by higher canopy.

Discussion

In our study eight of the 28 trees (29%) were *A. tortilis* (Table 1), which is more than recorded in Saudi Arabia where only one (6%) of 16 nests was built on *A. tortilis* and the rest on *Maerua crassifolia* (Newton & Shobrak 1993). The height of the nests was similar 4.5 m (± 0.6, N = 13, range 3.2—5.5) in Saudi Arabia compared to 5.0 m in Israel (Table 1). Lappet-faced Vulture nests have also been found on *Tamarisk* spp. trees in the western Negev (A. Galili, INRA unpubl. report, 1992).

Nest trees are mostly free-standing and in the middle of wide canyons (wadis) or on plains. This contrasts with Weigeldt & Schulz (1992) who found that all nest trees were located on sandy plains with very few in wadis.

The increase in tourist-related desert activities (e.g. four wheel-drive vehicle tours) in the past decade in areas where Lappet-faced Vultures bred is one of the first problems that the reintroduction programme will have to face. Although many Israeli naturalists contend that they could approach close to Lappet-faced Vulture nests without flushing the parents (B. Shalmon & B. Gamlieli, pers. comm.), Newton & Shobrak (1993) warn against persecution by Bedouin shepherds who toss stones into the nest. Further, establishment of new settlements within the next few years will hinder creating an extensive nature reserve that is required for the reintroduction of Lappet-faced Vultures to be successful. It is essential that relevant authorities take present development plans along the rift valley, on the Israeli and Jordanian sides, into account and conserve them for future use by wildlife before it is too late. This is especially critical in light of the fact that Mendelssohn & Leshem (1983) found that pairs built as many as five nests in the same territory, and Newton & Shobrak (1993) recorded that the distance between nesting neighbours averaged 3850 m (N = 6, range 2200—6800). However, no data on nest site fidelity are available.

Another factor that should be taken into account is dispersal distances of juveniles. In southern Africa, tagging has shown that juveniles can disperse up to 1100 km from the natal area (Anonymous 1995). This is encouraging from the Israeli point of view because the nearest known breeding colony of Lappet-faced Vultures in Saudi Arabia is only about 200 km to the southeast (P. Symens, unpubl. data). This indicates that if a reintroduction programme were initiated, natural recruitment may also take place.

Several theories have been forwarded to explain the extinction of the Lappet-faced Vulture in the wild (Bruun 1981, Frumkin 1986, Shirihai 1996); however, no research was done on the subject and we remain uncertain of the causes. This raises the question of the advisability of future releases because, although many researchers (P. Symens & A. Galili. pers. comm.) are certain that the lack of food may be the primary reason, the cause(s) of extinction in the wild remains unidentified. Further, the known problems have not been removed (Meretsky & Lavee 1991).

In addition to the above mentioned, another problem is that if the released individuals have been in captivity for more than two years and have no other wild, free-living individuals on which to cue in for establishing breeding territories and to learn to forage in the wild, the reintroduction might not succeed (Wallace & Temple 1983, Sarrazin *et al.* 1996). In Griffon Vultures (*Gyps fulvus*, Sarrazin *et al.* (1996) detected a permanent adverse effect of captivity on the reproductive capability of birds released when more than two years old. In addition, the availability of food resources remains a problem (Frumkin 1986). It is unlikely that reintroduced populations will survive without artificially augmenting their diets at regularly stocked feeding stations. This further complicates matters as past experiences suggest that feeding stations alter the behavioural and communal structures of other desert animals. Mammalian predators (e.g., *Hyaena hyaena*, *Canis lupus*) have also been observed to frequently raid carcasses and Brown-necked Ravens *Corvus ruficollis* mob raptors, vultures or other avian scavengers that come to feed (Dr B. Shalmon, pers. comm.).

We also need to take into account the fact that the Negev Lappet-faced Vulture is at the extreme northern periphery of the distribution of the species, indicating that they are more vulnerable than others (Nathan *et al.* 1996). Griffith *et al.* (1989) showed that reintroduction programs into peripheral areas are less successful than programmes in non-peripheral areas. Nathan *et al.* (1996) suggest that such species should be assigned high conservation priority because they are inherently vulnerable and low human pressure may suffice to increase an already high probability of extinction.

To conclude, we raise the question as to whether Israel and Jordan are capable of setting aside areas as nature reserves following the development boom after the peace process has begun between the two countries. Only areas that have suitable nest sites and food resources will sustain reintroduced populations. These areas need to be identified at the earliest and set aside prior to their being allocated for human purposes only. If that is not feasible, the continuation of the whole programme needs to be questioned and re-evaluated.

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