# Satellite Tracking of the Lappet-faced Vulture *Torgos tracheliotos* in Saudi Arabia

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**ABSTRACT**

Two Lappet-faced Vultures (*Torgos tracheliotos*), were fitted in early 1995 with Satellite transmitters at the Mahazat as-Sayd protected area located in Central west Saudi Arabia in order to track their movements. After release, the vultures left the reserve for approximately seven months, both returning in the autumn. Both birds visited areas to north-east or north of the reserve, though one tended to range over greater distances. The movements of these two birds supported observations of seasonal changes in the abundance of Lappet-faced Vultures in the Mahazat as-Sayd protected areas, and also indicated that some birds engage in short-distance migration within Saudi Arabia. In addition, the movements of these two birds suggest that there is a possibility of contact between other Lappet-faced Vultures populations within Saudi Arabia and those in neighbouring countries. This suggests that a single meta-population could range over the Arabian Peninsula.

**Key words:** Lappet-faced Vulture, Mahazat as-Sayd, migration, meta-population

## INTRODUCTION

Satellite telemetry has in recent years, established itself as a highly effective method of investigating the migration of raptors (e.g. Grubb et al. 1994; Meyburg et al. 1998; 2002; 2003; Ueta et al. 1998, 2000; Martell et al. 2001; Gavashelishvili 2005; Newton 2004; McGrady and Gavashelishvili 2006). Birds of prey are well suited for satellite telemetry studies because many have extensive ranges and

migrations, and most species are also large enough to carry telemetry devices with a long battery life. Most studies to date have been on species with lengthy, often transcontinental, migrations (Strikwerda et al. 1986; Meyburg and Lobkov 1994; Merburg et al. 1995; 1996; 1998; 2003; Brodeur et al. 1996; Kjellen et al.1997; Newton 2008). However, regional movements of birds of prey have also documented (Griesinger et al. 1992; Grubb et al. 1994; Bahat 1995; Mendelsohn et al 2005; Phipps et al. 2013).

The Lappet-faced Vulture *Torgos tracheliotos* (Fig. 1) is amongst the species of conservation concern, both globally and in the Arabian Peninsula (Jennings 2010; Bird-Life International 2012). It is considered as globally threatened under the "Vulnerable category (VU)" (IUCN 2013). The population size in the Arabian Peninsula has been estimated to be about 600 breeding pairs with the majority found in Saudi Arabia (Jennings 2010). Studies at the Mahazat as-Sayd protected area, located in the central part of Saudi Arabia, showed that this protected area probably hosts one of the most important

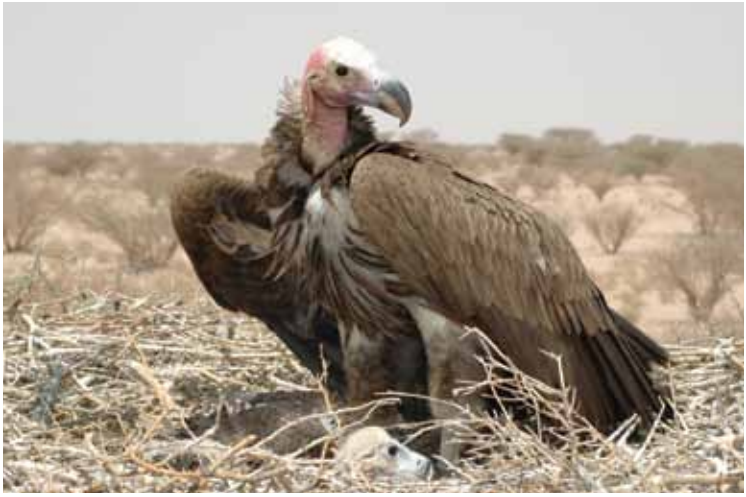

**Fig. 1:** Lappet-faced Vulture with its check photographed in Mahazat as-Sayd Protected Area. (c) Shobrak

populations of this species, with the number of breeding pairs ranging from 28 to 37 (Shobrak 2011). Although some aspects of the breeding biology of Lappet-faced Vulture have been studied in Saudi Arabia, little information is available on their movements (Shobrak 2000; 2001; 2004; 2011; Jennings 2010).

Observations of marked birds in Africa have shown that they are far ranging, with birds having been re-sighted 700 km from their natal site, in their first year (Mundy et al. 1992). Newton and Newton (1996) have demonstrated that seasonal movements of full-grown birds occur in Saudi Arabia, with non-breeding birds vacating the core nesting area when large chicks are in the nest.

The mobility of species is an important aspect in their conservation planning (Newton 2008; 2013). Therefore, understanding the movements of threatened species like the Lappet-faced Vulture is important for the long term conservation of this species. Although the range of the species in Arabia is very extensive (Newton and Shobrak 1993; Jennings 2010), the extent of interchange between well used areas is unknown. Such information is clearly important in developing a management strategy for the species, given their virtual extinction at the northern edge of their range (Del Hoyo et al. 1994; Jennings 2010). Thus, the main objective of this study was to understand the movements of the Lappet-faced Vultures in Mahazat as-Sayd using satellite tracking.

## MATERIALS AND METHODS

In late January and early February 1995 two Lappet-faced Vultures were captured and fitted with 95 g Platform Transmitter Terminals (PTT 100): Microwave Telemetry Inc., USA. The two birds were immature but more than three years old, and were captured in the Mahazat as-Sayd reserve in west central Saudi Arabia. The capture technique takes advantage of the large body size of the birds and their dependence on thermals to help them fly. Birds were caught by hand in the early morning and late evening when there were no thermals. Lone birds were selected to avoid disturbing large numbers of birds at communal roosts.

PTTs were fitted as back-packs and secured by a Teflon ribbon double-loop (Snyder et al. 1989). A 45 g conventional VHF transmitter and plastic wing-tag with letter code were also attached to one wing in following Wallace et al. (1994). The PTTs, which are 'received' by the Argos-Tiros satellite system (Argos, 1996) had been programmed to transmit for 20 hours every week (20 hours on and 148 hours off) to cover a period of approximately 75 weeks. The PTTs also were equipped with pressure sensors. Using a cure calibrated by the PTT manufacturer, the altitude at which the birds flew could be estimated. The range encompassed by the bird's movements was calculated for the period of transmission, using PC software package SEAS (Spatial Ecology Analysis System), and the Home Range Analysis program (CALHOME) based on the minimum convex polygon.

## RESULTS

Transmission of PTT No 23628 (vulture no. 28) started on 25 January 1995, and stopped on 8th of October in the same year when the battery expired, covering a period of approximately 37 weeks, given 108 corrected locations. PTT No. 23629 (Vulture no. 29) started transmitting on 12 February 1995, but transmissions stopped, on 31st May 1995, for a three-month period, before it started again in early September, and continued transmitting until 12 December 1995. The reason for this transmission loss during the summer is unknown. The total period of transmission was approximately 31 weeks, with 82 corrected locations. Lappet-faced Vulture no. 28 left the reserve after its release, returning in the autumn of the same year after it had covered a total distance of 5500 km (Figure 2). It moved continually throughout the tracking period. The greatest linear distance moved away from the capture site was 400 km.

Vulture no. 29 covered 1325 km, moving to the north of the reserve and stayed there for more than three months, before the transmission ceased at the end of May (Fig. 3). During this period, the longest distance moved by this bird away from the release site was 450 km.

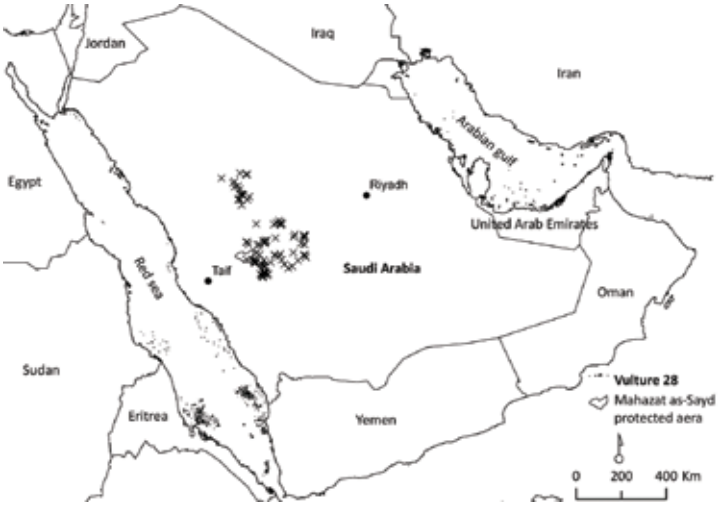


**Fig. 2:** The movement of Lappet-faced Vulture no. 28

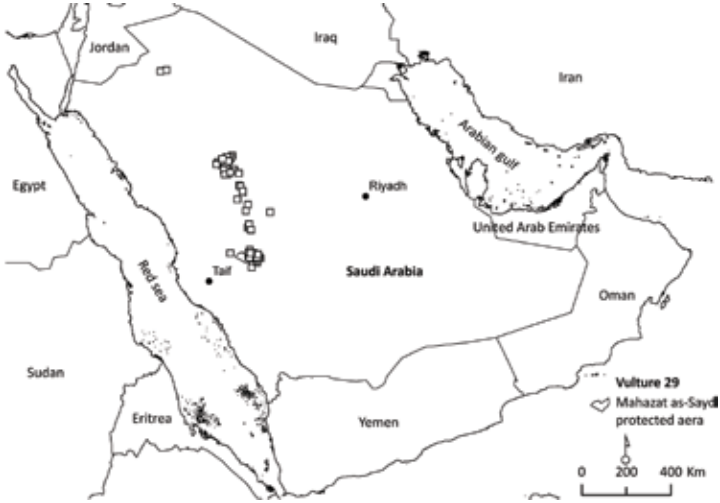


**Fig. 3:** The movement of Lappet-faced Vulture no. 29

When transmission recommenced on 7th September, the bird had moved more than 400km to the north west of its last recorded position in late May, at a Protected Area called at-Tubayq in the north. A week later, the same bird had returned to the Mahazat as-Sayd reserve, having covered more than 900 km. It stayed in the reserve until late November 1995 then moved 400 km to the north.

The bird remained in this area for two weeks before it returned to the reserve in early December 1995 when the last transmission was received. The vulture was located in the reserve during conventional UHF tracking by plane over Mahazat as-Sayd on 31st September 1997. Table 1. Shows the rate of travel recorded (using SEAS) between successive locations. Both birds had similar maximum speeds. From 15 records when the birds were flying, the maximum altitude recorded was 8,825 feet (2,690 m) from ground level, for bird no. 28.

**Table 1.** Distances covered and range areas for the two birds fitted with PTT transmitters

| **Variable** | **Bird no. 28** | **Bird no. 29** |
|---|---|---|
| Distance covered | 5500 km (10 months) | 1325 km in 1st period |
| Distance covered per month | 724 km | 361 km |
| Maximum distance moved per day | 198 km | 193 km |
| Average distance between locations | 63.494 km | 33.92 km in the 1st period<br>42.122 km in the 2nd period |
| Harmonic mean range | 283,380 $km^2$ | 289,280 km2 in 1st period<br>277,840 km2 in 2nd period |
| Rate of travel | 47 km/h | 45 km/h |
| Maximum Altitude | 8825 feet (2690 m) | 5322 feet (1622 m) |

The range calculated by SEAS during seven months from 25 January 1995 to 31 August 1995 was 92,881 $km^2$, also for bird no. 28. The Harmonic mean range calculated by Calhome was 283,280 $km^2$, with an average distance between locations of 63.5 km.

The second bird no. 29 spent more time in one area, and had two shorter periods during which the transmitter was operating. The range encompassed for this bird during the first period was 36,771 $km^2$ and the harmonic mean range of this bird in the first period until end of May was 289,280 $km^2$, with an average distance between locations of 33.9 km. In the second period, from September to early December of 1995, the harmonic mean range was 277,840 $km^2$, with an average distance between locations of 42.1 km.

## DISCUSSION

Each satellite tracked lappet-faced vulture showed a different movement pattern. One moved continually, whereas the other underwent periods of long movement separated by more sedentary periods. These variations in behaviour may have been associated with differences between animals with respect to age or sex. However, both birds left the reserve after release in the winter but returned to the reserve again in the autumn. These findings help explain the annual variation in abundance of lappet-faced vultures in the protected area (Newton and Newton 1996; Shobrak 1996). The longest distances the two lappet-faced vultures moved from the capture site, ranged between 600-1000 km which is similar to the observations in Africa where birds have been re-sighted 700 km from the nesting site (Mundy et al. 1992)

Moreover, breeding Lappet-faced Vultures have been recorded at most of the areas in which the birds were tracked (Jennings 2010). This could be important for the species in the location of food resources as non-breeding birds were observed roosting together in the protected area. This suggests that the birds probably benefited from the presence of other birds in the location of food. In addition, the capture of the birds during the breeding season and the fluctua tion in the number of these vultures in the protected area increases the possibility of contact between individuals between different

breeding colonies. This type of contact has been recorded for several other bird species including birds of prey (Newton 2008).

Contact between birds in this way, is probably important in preserving the genetic diversity of the species. Furthermore, the large distances covered by the two birds suggests that there is the potential for contact between the population in Saudi Arabia and those in neighbouring countries. This contact between different highly dispersed populations, also suggests that the lappet-faced vulture populations in the Arabian Peninsula can be considered to be a meta-population. If the Lappet-faced Vultures from other colonies in the Arabian Peninsula have similar movement patterns, the species should probably be included in the list of species considered by the Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia. However, more work is needed to understand the movements of breeding adults and fledglings in order to determine the threats on the species. Finally, genetic studies should be considered to identify the relation between the different breeding populations in Saudi Arabia and neighbouring countries.

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