

FIELD STUDY

Why are juvenile Himalayan Vultures *Gyps himalayensis* in the Xinjiang Tien Shan still at the nest in October?

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Introduction

The huge Himalayan Vulture or Himalayan Griffon Vulture *Gyps himalayensis* is an unaggressive, gentle, low-profile species. It is the iconic vulture of the Tibetan plateau, highly respected in Buddhist culture, and locally named the scavenger of nature—carrying out the sacred and noble duty of cleaning up nature every day. The dramatic population crashes of three species of *Gyps* vulture have raised concerns about their lesser-known relatives and the survival of this vulture has cultural as well as ecological implications because of its unique role in the centuries-old sky burial tradition that is followed by nearly five million Tibetan people. A lack of baseline knowledge about the species hinders the formulation of appropriate, essential conservation measures. (Lu *et al.* 2009). The Himalayan Vulture is the largest *Gyps* vulture and the biggest raptor in the Tien Shan, Xinjiang, north-west China, weighing up to 12 kg, with a body length between 95–130 cm and a wing span of 270–300 cm (Clark 1994, Ferguson-Lees & Christie 2001). For many decades in the Xinjiang Tien Shan, there has been over-grazing, rat and marmot poisoning, highway construction, extensive mining, poaching and egg-collecting. Breeding and roosting areas were badly affected and the population of large vultures has declined sharply. At present the species is still classified as of Least Concern (BirdLife International 2013). In China there have been few studies of the large carrion-eating raptors (Ye 1991) and published reports are few and deficient in detail. Specifically there have been few observations of the breeding behaviour of Himalayan Vulture. Between August–October 2012 and March–October 2013, we spent more than 90 days in the field in the central Tien Shan (42.50–44.50°N 84.00–88.00°E). By gathering information from local people and carrying out line transects (Hardey *et al.* 2007), we found 14 Himalayan Vulture breeding colonies in seven counties and selected some of them for study. Using four auto cameras (taking 1 image every 5 seconds) and one auto-video camera (GoPro HERO 3), about 1,100 minutes of video images and 110,000 images were collected that allowed observation and study of chick-raising activity and the growth of juveniles,

thus ending much speculation about the breeding of the species in west China.

Basic data

The main study areas were in Heshuo and Hejing counties in south Xinjiang; both have a dry climate. They were formerly part of the nuclear test site near Lop Nur and Bosten lake. There was a strong military presence in the area and it was off-limits for shepherds and local people for many years, consequently there was little disturbance to wildlife.

Himalayan Vultures are generally site faithful and return to the same nesting and roosting locations year on year. We found about 100 nests in 10 colonies in Hejing county. The colonies were all located in the same valley complex, 1–5 km apart. Normally roosting sites were very close to the nests. Depending on the size and structure of the cliff, each nesting colony held between 5 and 16 nests. In Heshuo county, the mountain cliffs stretch from east to west for 7.3 km at altitudes between 2,400–3,100 m. Three colonies holding about 30 nests were found in this area. Although many nests were isolated, some were only about 7 m apart; most nests (about 79%) were built facing south. The Heshuo and Hejing sites are about 47 km apart. Every year nest building and repair was carried out in January to March, eggs were laid between February and April, hatching was between March and May, and chick-raising until July to September or even to October, when the juveniles fledged and left the nest. The 4–5 month chick-raising period is one of the longest on record and may be extended to as long as 6–7 months. About 20% of the chicks in the colonies were still in the nests in October 2013. Given that nesting activity in 2014 would be expected to start from January the adult birds do not get much respite. Conditions in 2013 were unusual in that rainfall was significantly higher than the previous several years.

Nest observations

Almost invariably, the species lays only one egg (Clark 1994, Ferguson-Lees & Christie 2001) and this was the case during the study; they were milky white in colour (Plate 1). In April, a newly hatched white downy chick weighed 164 g—about 77% of

the weight of an egg (Plate 2). The chicks were able to bite at birth. Throughout the chick-raising period the parents were always on guard, even in September when chicks were large.

In other areas it is reported that Himalayan Vulture nests are constructed of sticks (Grimmett *et al.* 1998, Ferguson-Lees & Christie 2001) and that the stick nests of Lammergeiers *Gypaetus barbatus* have been taken over and repaired (Ferguson-Lees & Christie 2001). However, Himalayan Vulture nests in the Xinjiang Tien Shan are distinctive and unlike those of Lammergeier or Golden Eagle *Aquila chrysaetus*. Finer construction materials, primarily reed stalks as well as a small amount of feathers are used. Reeds are readily

available throughout the grasslands. The nest construction can be seen in Plates 1, 2 & 3. Small objects such as coloured glass, small veterinary bottles, plastic items (e.g. cigarette lighter), pieces of bone and ceramics were found occasionally in the nests. Nests were built on ledges or in cavities and small caves on cliffs (Plates 4, 5 & 6). Outer diameter measured 90–320 cm, inner diameter 35–60 cm, centre depression 7–15 cm deep. We were very surprised by this unusual behaviour, whereby such a big bird used a large amount of small, soft, dry reed stalks to build a huge nest. We can only speculate about the means by which these small reeds were carried to the nest site—could they have been swallowed and then regurgitated at the site?

Plate 1. The single egg in a Himalayan Vulture *Gyps himalayensis* nest, 4 May 2013.



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Plate 2. Recently hatched Himalayan Vulture chick on a nest, 31 March 2013.



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Plate 3. Developing juvenile still with downy coat, 15 July 2013.



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Plate 4. Two well-developed juvenile Himalayan Vultures on ledges, 4 May 2013.



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Plate 5. Well-developed juvenile in cave, 15 July 2013.

Plate 6. Well-developed juvenile preening, 15 July 2013.



Some nests contained branch tips of Spruce *Picea schrenkiana* or local bushes *Caragana* sp. presumably used for insulation purpose. These materials do not appear to have been used because of a shortage of suitable sticks from forest trees—the tree-line is at 1,700 to 2,500 m with many bushes and trees in the vicinity (Plate 7). Thus it appears that the materials were used from choice and the Himalayan Vultures in this area have developed unusual nest-building techniques.

We collected data on the rate of chick development in different months from eight different nests. For example, one chick weighed 1,676 g on 16 April, and 8,720 g on 6 August 2013. Breeding was not synchronised and hatching dates differed by 1 to 2 months. Body covering changed

gradually from white down to dark brown feathers with the head colour remaining whitish (compare Plates 3, 4 & 5).

Why are chicks still in the nest in September and October?

We understand that the growth of raptors should not be counted in days or months; it is better counted in terms of 11–14 ‘development stages’. Each stage lasts 10–15 days and there is great variability between different individuals. Seasonal variability is also great—in October 2013, we again checked the nests near Urumqi, and to our surprise found that some 20% of the juvenile Himalayan Vultures remained in the nest (Plates 12 & 13). The reasons may be related to high latitude of the breeding sites (43.167°N 87.117°E), climate change, feeding behaviour, food availability (such as abundance of grazing animals) and individual genetic variation. However, we still think the chick-raising period is abnormally prolonged in the study sites in the Tien Shan. The very slow development of chicks may be for reasons that are far from simple:

1. Mongolian shepherds in Tien Shan were influenced by Tibetan culture and Buddhism and in the past they practised ‘sky burial’ when people died. As the Tibetans moved out, this practice gradually changed and ground burial and cremation became more common and this had a direct effect on the large carrion-feeding birds.
2. Declining populations of Wolves *Canis lupus*, Dholes *Cuon alpinus*, Jackals *Canis aureus*, and Snow Leopards *Uncia uncia* have affected the food source of vultures. We observed that vultures appeared shortly after Yaks *Bos grunniens* were killed by wolves, and they shared the carcass together (Plate 8).
3. Human population in the Tien Shan has expanded very rapidly in the last decade with

Plate 7. View from nest platform showing distant tree-line across the valley, 30 March 2013.



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Plate 8. Himalayan Vultures feeding on carcass of a yak killed by wolves, 21 March 2013.

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Plate 9. Himalayan Vultures feeding on a recently dead horse, 10 May 2013.

sharp increases in outdoor tourist activities, over-grazing, mining, poaching, rodent poisoning, etc. The area and quality of habitat used by wild ungulates is adversely affected, leading to a significant reduction in population of the wildlife that was the basic source of food for the vultures.

4. Farm management has gradually improved in west China; death rates in grazing cattle have greatly decreased due to improved disease control and prevention. Recently, it has been reported that vultures were preying on live lambs because there were no carcasses to be found in the wild.

In other parts of Asia and Africa, the use of the veterinary medicine diclofenac had a deadly impact on *Gyps* vultures. It is still unclear whether vulture populations in China have been affected or not (Oaks *et al.* 2004, Das *et al.* 2011, Prakash *et al.* 2012).

5. Local Islamic people do not eat animals that have died naturally. In the past this helped vultures, but since the price of meat has increased sharply, animals that died naturally have been collected. Some Han people with no religious belief or moral standard processed these dead bodies into dry spicy meat for sale illegally.

6. According to local people, in places where there was sport-hunting, vultures benefited from the organs and carcasses left behind. When guns and hunting were banned in the last century, international trophy hunting was also banned and that too reduced vultures' food supply.

Plate 10. Juvenile Himalayan Vulture eating fresh meat at the nest, 27 May 2013.



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All these factors have directly reduced the food supply and may contribute to the very slow development of juveniles. We have seen very few carcasses in the wild—an adult dead horse (Plate 9) or yak can be eaten completely by vultures in less than a day. Due to this competition for food, vultures cannot wait for the carcasses to decay and our observations indicate that juvenile vultures were fed mostly with fresh meat that was still bloody (Plate 10); decayed meat was seldom seen.

Discussion

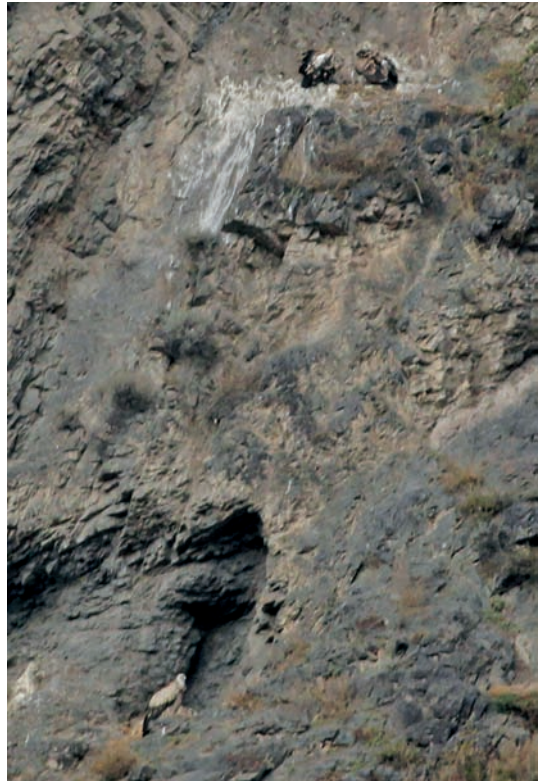
In order to limit interference with breeding, we climbed up to the nests to take measurements or place micro-cameras only once a month (the camera ran automatically for 2–3 days). However we think that rock climbing as well as being risky for the workers (Plate 11)—nests were often 100 to 200 m up the cliffs and required rope work to reach them—did cause too much disturbance. In the early stages of chick-raising, parents were strongly attached to the nest and quickly flew back when the climber left. They also paid little attention to the micro-cameras. But as chicks grew and started walking around near the nest, parents become very alert and alarmed by our activities and by the micro-cameras. After a visit, they would stay at a distance watching their chick for several days and the chick was not fed during that time. This is particularly serious in the later stages of chick-raising from July to September. At this time also, some chicks or parents started to destroy or remove the micro-cameras. It seems that this alert, observant and intelligent species began to associate cameras with human disturbance.

In the study area, other carrion eaters such as Cinereous Vulture *Aegypius monachus*, Griffon

Plate 11. Typical Himalayan Vulture nesting colony using ledges, caves and crannies on steep rock face, 16 August 2012.



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Plate 12. Juvenile and adult Himalayan Vultures at nest sites, 5 October 2013.



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Plate 13. Juvenile and adult Himalayan Vulture at nest site, 5 October 2013.

Vulture *Gyps fulvus*, and Lammergeier were very scarce particularly near the breeding colonies and foraging areas. This may also result from the scarcity of food and the fierce competition for it. More work will be needed to understand the reasons for the unusually long breeding period. However we think it would be helpful to have vulture feeding stations similar in nature to the sky burial sites. Unusable meat, organs and bones can be left for the vultures and help to relieve their food scarcity problem in the Xinjiang Tien Shan.

This would also be a good opportunity to set up educational facilities for local people to observe and learn about these magnificent birds.

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