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Gleaning in klipspringer preorbital glands by Redwinged Starlings and Yellowbellied Bulbuls.

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Feeding associations between klipspringer *Oreotragus oreotragus* and at least three passerine species are recorded; two of these, with Redwinged *Onychognathus morio* and Palewinged *O.nabouroup* Starlings, are already well documented (e.g. Angwin 1971; Gordon 1974; Gargett 1975; Tilson 1977; Dean & MacDonald 1981) while the third, with Yellowbellied Bulbuls *Chlorocichla flaviventris*, has been only recently reported (Roberts 1993, 1994). The birds apparently feed on ectoparasites, particularly ticks, and usually concentrate gleaning on the back, neck and around the ears (e.g. Gordon 1974; Tilson 1977; Roberts 1993). In contrast, I found that much of the birds' attention was directed towards the klipspringer's preorbital glands.

Bird/klipspringer interactions were observed during a field study of klipspringer in Zimbabwe at the Maleme Dam area of Matobo National Park and at Sentinel Ranch, 60 km west of Beit Bridge (see Roberts 1994). Data were recorded using a dictaphone while observing the animals through binoculars or a telescope. The duration of each visit and time spent by the birds on different klipspringers or parts of the body could be determined with a stopwatch (to the nearest second). Although *O. morio* occasionally gleaned from nearby rocks, most gleaning occurred while perched on the klipspringer. Pecking rates while perching on different parts of the body were measured. Pecks on the head were divided into those in the preorbital glands and those directed elsewhere on the head. Distance between the observer and the subject varied greatly, but distances were smaller at Matobo than at Sentinel, including two observations within 35 m, and it was therefore possible to take accurate note of the target of gland-directed pecks.

Visits to klipspringer groups by *O. morio* were observed on four separate occasions: twice each at Matobo and Sentinel; four visits by *C. flaviventris* to klipspringer groups were recorded at Matobo. In 7 out of 8 observations a juvenile was present in the klipspringer group and in 3 cases a subadult was present. However, both bird species appeared to show preferences for adults or subadults, a juvenile being visited only once, by *O. morio* at Sentinel. In total, 93 pecks by *O. morio* ($1.3 min^{-1}$) and 42 by *C. flaviventris* ($3.8 min^{-1}$) were recorded. These were spread relatively evenly over the body, although the back received fewest pecks (see Table 1) and peck rates were higher on the neck, head and scent glands than on the back.

Pecking at the preorbital glands occurred during every visit by *O. morio* (at both field sites), but in only one *C. flaviventris* visit (at Matobo, during which it pecked at the left gland 16 times and the right gland 4 times in 94sec). Pecks directed here usually resulted in rapid head shaking by the klipspringer to dislodge the bird, the exception being during the visit by *C. flaviventris*, in which the klipspringer remained very still. In every case when birds pecked a klipspringer on which it was not perching at the time (n=21, all by *O. morio*), most pecks were directed at the scent glands (14) or the rest of the head (5).

There are two possible reasons for gleaning around the preorbital glands: (i) that there is an abundance of ectoparasite prey in the area of the scent glands, and (ii) that birds deliberately ingest preorbital gland secretion.

Ticks may concentrate in and around the glands: in the Matobo N.P. an ixodid tick (*Ixodes matopi*) aggregates on twigs that have previously been

TABLE 1
PECK RATES BY TWO GLEANING BIRD SPECIES ON DIFFERENT BODY AREAS OF KLIPSPRINGER

	Back	Neck	Head		
			Exc. Scent Glands	Scent Glands	Total
Onychognathus morio					
No. of pecks	11	26	8	7	15
Rate (min^{-1})	4.1	13.6	5.7	5.0	10.7
Chlorocichla flaviventris					
No. of pecks	2	8	7	20	27
Rate (min^{-1})	4.8	14.5	4.0	11.4	15.4

scent marked by klipspringers in order to gain access to the host on subsequent visits (Rechav *et al.* 1978; Spickett *et al.* 1980).

However, ecological studies on *I. matopi* show that there should have been few, if any, adult ticks active at the time of these observations (Colborne *et al.* 1981). There had been no rain for several months prior to any of the interactions at Matobo, and ticks would not have been able to locate scent marked branches as this depends on the release of an aqueous active component of the secretion when it dissolves in rainwater (Rechav *et al.* 1978). No *I. matopi* were found at Sentinel, despite daily examination (including after rainfall) of nearly 2 000 scent marks (see Roberts 1994) and ticks recovered from a klipspringer at Sentinel were all *Rhipicephalus* spp. (identified at the Onderstepoort Veterinary Research Institute, South Africa). Moreover, no examination of klipspringers has found ticks at the scent glands: ticks on a male examined at Sentinel were concentrated between the hooves (18), hocks (7), chest (29), inner thighs (2) and testicles (2). Similarly, Colborne *et al.* (1981) found that they were confined to the underside of the body. Three tranquillized klipspringers at Chipangali Wildlife Orphanage, Zimbabwe, had no ticks present in the preorbital glands.

The observations described here are the first to note a concentration of foraging effort around the preorbital glands by any gleaning bird. The scent secretion which accumulates there may be highly nutritious (in other small antelopes it consists of mainly short-chain alcohols and fatty acids: Burger *et al.* 1980, 1981; Bigalke *et al.* 1980). As only adult klipspringers usually have actively-producing scent glands, birds are likely to pay much less attention to juveniles. While it seems certain that some glandular secretion is ingested indirectly, it remains unclear whether *O. morio* and *C. flaviventris* do so purposely. If they do, this would represent a form of bird-mammal feeding relationship which has not been previously documented.

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Observations on roosting Blue Cranes

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All cranes, including Blue Cranes *Anthropoides paradiseus* (Tarboton *et al.* 1987), show a strong preference for roosting communally at night in shallow waterbodies (e.g. Lovvorn & Kirkpatrick 1981). The Black *Balearica pavonina* and Grey *B. regulorum* Crowned Cranes are unique in the group in regularly roosting in trees (e.g. Walkinshaw 1964) and even on overhead electricity transmission structures (Allan 1994). Detailed investigations have been carried out on the characteristics and use of roosts by Sandhill *Grus canadensis* (e.g. Pogson & Lindstedt 1991), Eurasian *G. grus* (e.g. Alonso *et al.* 1987) and Hooded *G. monachus* (Kawamura 1981) Cranes. These studies have shown the importance of roosts in dictating the habits of cranes, including their patterns of large-scale distribution, abundance, local dispersion and use of foraging habitats (e.g.