Home range and activity of African goshawks *Accipiter tachiro* in relation to their predation on bats

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Winter radio-tracking of three African goshawks *Accipiter tachiro* showed that they each occupied well-wooded home ranges of at least 28 hectares. They perched and roosted mainly within densely foliated trees and an adult female changed perches on average 4.7 times per hour. No crepuscular predation of bats was recorded, in contrast to regular summer predation on colonies of little free-tailed bats, *Tadarida pumila*, but winter emergence rates of these bats at dusk had dropped to $\leq 5\%$ of the previous summer. We predict that many accipiters will be regular predators of bats and that skewed sex ratios and high fecundity may be two means by which bats counter this predation.

Key words: *Accipiter tachiro*, home range, activity, bats, predation.

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Introduction

In the summer of 1987-88, a pair of African goshawks *Accipiter tachiro* (Daudin, 1800) were observed to prey regularly on little free-tailed bats, *Tadarida pumila* (Cretzschmar, 1830-1831), at a bridge in the Kruger National Park (Kemp & Rautenbach 1987; Van Jaarsveld 1988). The present study attempts to document the home range, activity and foraging behaviour of African goshawks in the same area during the winter of 1988.

Materials and Methods

Three goshawks were caught and fitted with radio transmitters attached to their tail feathers. A subadult male (NM) with almost complete adult plumage was trapped on 15 June at the lowwater bridge over the Sabie River, 2 km NE of Skukuza (24°59'30"S; 31°36'0"E). The adult female (BF) of a pair at the highwater bridge over the Sabie River, 13 km E of Skukuza (24°57'30"S; 31°43'0"E) was caught on 17 June and the adult male (SM) of a pair resident in the

staff village at Skukuza (24°59'30"S; 31°35'0"E) on 22 June.

Checks were made at least twice daily on the location of each bird from when it was trapped to the end of the study on 26 June using directional Yagi antennas and Yaesu FT-290R receivers. Individual birds were followed between 22-25 June, from 06:00 to 18:00 (sunrise 06:53, sunset 17:25).

Results

All three birds normally perched in evergreen trees with dense foliage and took flight if approached more closely than 40 metres. BF was visible when perched on 2 % of occasions when observers were estimated to be within 50 m, whereas SM was visible 7 % of the time. Visual observations suggested that the birds were solitary for most of the time but we saw a male flying with BF at dawn on two days. On these occasions they were passing the locations at the bridge where they were observed preying on emerging bats during summer. Only a few bats emerged from the roost

Fig. 1. A map of the Skukuza area, Kruger National Park, showing the locations at which *Accipiter tachiro* were trapped and the river systems along which they were radio-tracked.

during this study, and no attempts at predation were made by the goshawks.

NM remained at the lowwater bridge over the Sabie River for seven days (15-21 June, Fig. 1). It then moved 10 km downriver to the highwater bridge on 21 June where it spent part of that day and the night in the home range of BF. It remained at the highwater bridge until 08:00 on 22 June when it left the area and was never located again, despite an aerial search on 24 June along the Sabie and Sand rivers from 3 km west of Skukuza to 3 km west of Lower Sabie.

The SM was tracked on 22 June (Table 1) when it ranged about 500 m south of riparian forest along the Sabie River into a dry, densely-wooded strip along the Nwaswitshaka watercourse (Fig. 1). It perched in densely foliated evergreen trees and roosted that night in such a tree about 200 m south of the river. It made an unsuccessful attempt to catch a laughing dove *Streptopelia senegalensis* (Linnaeus, 1766). Perch changes were not always associated with attacks on prey,

because the goshawk also moved when mobbed by birds such as white helmetshrikes *Prionops plumata* (Shaw, 1809).

The bridge female BF was tracked on 22, 23, 24 and 25 June (Table 1) when it ranged from 800 m east to 600 m west of the bridge (Fig. 1), spending most of the day on either bank in this 28 ha strip of riparian forest. It spent three periods of 31, 61 and 55 minutes, on 22, 23 and 25 June respectively (5,5 % of the four-day, 44,9 h active periods) in dry woodland adjacent to the riparian forest. During the night it roosted in dense riparian vegetation, the first two nights about 100 m east of the bridge and the next two nights at different locations west of the bridge.

SM changed perches on average 1,7 times/hour and BF 4,7 times/hour (range 0-17), much more frequently than the male. Both moved 50-100 m, rarely up to 500 m, at each perch change. BF changed perches most frequently between 06:00-08:00 on 22 June when NM was present, and she may have been interacting with this male. BF was also

Table 1
The number of perch changes recorded for radio-tagged male and female African goshawks
Accipiter tachiro during winter near Skukuza in the Kruger National Park

Individual, date and activity period	Perch changes per hour starting at:												Total
	0:600	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	
SM, 22 June 06:00-17:35 (11h 35min)	3	0	2	2	3	2	0	0	1	2	3	2	20
BF, 22-24 June													
06:05-17:39 (11h 34min)	17	12	3	2	3	5	0	2	2	4	2	5	57
06:09-17:26 (11h 17min)	6	5	2	0	1	4	11	6	5	7	6	6	59
06:18-17:33 (11h 15min)	2	5	7	4	5	0	6	2	3	1	5	4	44
06:18-17:05 (10h 47min)	2	5	7	11	6	3	1	3	6	6	2	1	53
Total	27	27	19	17	15	12	18	13	16	18	15	16	213
Average	8,51 ¹	6,8	4,8	4,3	3,8	3,0	4,5	3,3	4,0	4,5	3,8	9,3 ¹	4,7

¹ Averages only for that time when female was active

more active at 12:00-13:00 on 23 June and at 09:00-10:00 on 24 June when hunting in the dry woodland adjacent to the river.

Discussion

Our data suggest that in winter a male and female African goshawk occupied home ranges of about 28 ha each, centred on a riverine forest where they perched within densely foliated trees. Adults appear to reside in such areas, based both on our observations during summer (Kemp & Rautenbach 1987; Van Jaarsveld 1988) and on those of other observers (Steyn 1982; Piper 1989), but their total home range is probably larger, if we accept nesting records near Skukuza of adjacent nests being 3,3-3,7 km apart (Simmons 1990). The extensive movements of NM suggest a subadult searching for a permanent territory — behaviour rarely documented for raptors.

The goshawks became active before sunrise and continued after sunset, overlapping with the dusk emergence of bats, but no winter predation of bats was recorded. At dusk during previous summers a pair of goshawks preyed regularly on *Tadarida pumila* as they emerged from the highwater bridge (Kemp & Rautenbach 1987; Van Jaarsveld 1988). During our study the number of bats emerging at dusk was $\leq 5\%$ of that during summer (Rautenbach, Van der Merwe & Vivier *unpubl. data*).

Although numbers and diversity seemingly make bats attractive prey for raptors, their small size and nocturnal habits may protect most bats from all but specialized raptors such as bat hawks *Macheirhamphus alcinus* Westerman, 1851. However, aggregation in colonies may number thousands to tens of thousands of individuals, making bats attractive to predators, even to those less specialized than bat hawks. Around large colonies, high prey density may translate into high encounter and capture rates that turn otherwise

unprofitable prey into an important resource. There are many records of raptors harvesting bats departing from large colonies (Rupprecht 1979; Van der Merwe 1980; Hill & Smith 1984), and in summer African goshawks took 1-5 *Tadarida pumila* per evening in our study area (Kemp & Rautenbach 1987; Van Jaarsveld 1988). This translates into 12-60 g of food for birds averaging 362 g (Maclean 1985), or 22-111 % of their estimated daily food requirements (15 % of body mass). Concentrations of bats can therefore provide important feeding opportunities for goshawks and other similar predators (Allen 1939; Kunz 1974).

Colonial roosting clearly carries costs to the bats which may be countered by other benefits. At roosts in buildings at Skukuza *T. pumila* and the Angola free-tailed bat *T. condylura* (A. Smith, 1833) raise up to three offspring per female per breeding season (Van der Merwe, Rautenbach & Van der Colf 1986), perhaps a reflection of the favourable microclimate of the artificial roosts. Vivier (1989) found that 70 % of 149 houses examined in the Skukuza staff village were occupied by colonies of *T. pumila* and *T. condylura* with average colony sizes of 205 and 348 individuals respectively, and a sex ratio in *T. pumila* of one male to 2.85 females. This productivity, which exceeds that of many other bats (Racey 1982), may be one of the direct benefits of colonial roosting. The 95 % reduction of the emergence rate of *Tadarida* in winter when the bats are not bearing young supports this interpretation. Diminished colony size could, however, also reflect the seasonal distribution and availability of insect prey (Rautenbach, Kemp & Scholtz 1988).

We predict that further research will reveal that many accipiters are important predators of colonial bats and that the bats may employ high fecundity and skewed sex ratios to compensate for such predation.

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