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PROGRESSIVE IMPROVEMENT IN FORAGING EFFICIENCY OF JUVENILE  
EUROPEAN BEE-EATERS *MEROPS APIASTER* IN THE EASTERN CAPE  
PROVINCE, SOUTH AFRICA

by W. C. Marais and B. Every

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## INTRODUCTION

The European Bee-eater *Merops apiaster* is a regular visitor to the Sundays River Valley, Eastern Cape Province, South Africa, in the austral summer. It usually makes its first appearance in the Sundays River Valley in January, but has been recorded in November and December (C. Niven pers. comm., 1985) and gathers in pre-migrational roosting flocks and departs in early March (Marais & Every 1982, Marais 1984).

In 1983/1984 the flock of c. 50 European Bee-eaters at Moyeni (33°37'S, 25°38'E), Addo, was composed of 66% newly fledged birds. On arrival the young birds were variously dependent on adults for food.

Although much work has been done on foraging efficiency in bee-eaters (references in Fry 1984), there is no specific information on foraging efficiency of juveniles (C. H. Fry in litt., 1984). This flock provided an opportunity to observe the development of foraging efficiency and independency in juvenile European Bee-eaters.

## METHODS

Observations were made on a flock of c. 33 juvenile and 17 adult bee-eaters in the study area on four days between 4 January 1984 and 27 February 1984, prior to the birds' departure on 5 March 1984. Two types of foraging behaviour were observed: (1) individual foraging sallies from the perch, which will be referred to as perch sallies; and (2) aerial foraging continuously for extended periods without landing, mostly at greater altitude.

All observations were made on perching sallies only, because of the difficulty of quantifying efficiency for aerial foraging. A foraging flight was regarded as successful where one or more prey items were taken while on the wing between take off and consecutive landing. On each occasion the success rate of 50 foraging flights of each of four juvenile and two adult birds was recorded and expressed as a percentage. The foraging efficiency of adults was quantified to provide an index of relative efficiency. Results are shown in Tables 1 and 2 and Fig. 1.

## RESULTS

The roosting flock at Moyeni was composed of about seven foraging flocks, which dispersed from the roosting site in the early morning and returned

during the evening. The most frequent foraging flock size was six birds ( $n = 44$ ) and mean foraging flock size was 7.27 birds. The presence of two adults or, less frequently, multiples of two adults, suggests that foraging flocks may be family groups. In the absence of ringed birds it is not possible to ascertain that. Although all observations were conducted on individual foraging flocks, cursory observations of birds feeding at the roost site showed feeding behaviour similar to that observed at the foraging areas.

Table 1 Foraging success rates of four juvenile European Bee-eaters

Date	Success rate %	Mean success rate %	SD
4.1.1984	18 20 26 28	23	4.76
10.1.1984	38 46 48 52	46	5.88
30.1.1984	56 60 62 70	62	5.88
27.2.1984	76 80 82 88	81.5	5.0

Table 2 Foraging success rates of two adult European Bee-eaters

Date	Success rate %	Mean success rate %	SD
4.1.1984	80 86	83	4.24
10.1.1984	78 84	81	4.24
30.1.1984	78 80	79	1.41
27.2.1984	84 86	85	1.41

Although not quantified, a qualitative assessment of relative foraging ability suggested that young birds spent longer in flight per prey item taken. Adults took up to three prey items per foraging flight. The lower efficiency of juveniles may be a function of poorer flying ability and/or less experience at prey catching than adults.

At the foraging site flocks were less cohesive. Adults left young birds alone for periods, to forage intensively up to 1 km away and for up to 10 min, often at considerable altitude, without landing (as described by Fry 1984). Adults then returned to the young birds and fed them with prey freshly caught from perch sallies, then left again for further intense aerial foraging trips. While the young birds were left alone they foraged by means of perch sallies, always landing to process the prey before swallowing it.

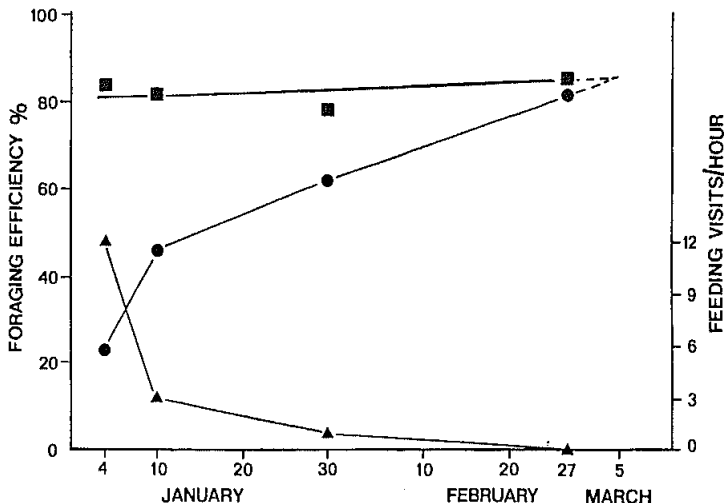


Figure 1 Foraging efficiencies of adult (■) and juvenile (●) European Bee-eaters, and numbers of feeding visits by adults to juveniles (▲), South Africa.

As foraging efficiency of juveniles increased, the frequency of feeding visits by adults decreased (Fig. 1) until the foraging efficiency of young birds had reached about 62% on 30 January. After that date juveniles were seldom left unattended but became an integral part of the entire foraging system. Incidents of adults feeding juveniles became rare and were possibly more socially significant as the young birds' foraging ability approached that of the adults.

#### DISCUSSION

It is clear from Fig. 1 that foraging efficiency of juvenile European Bee-eaters improves progressively, while that of adults remains constant. The improvement of juvenile foraging efficiency was most dramatic over the period 4-10 January, when it doubled from 23% to 46%. It suggests that the early period is critically important for young birds to attain a level of foraging efficiency enabling them to achieve energy reserves for migration, and allowing adults enough time to pursue the same goal without having to spend too much time feeding the young. However, since bee-eaters usually do not fatten themselves at all before migrating (Fry 1984), it is important that a high level of foraging efficiency among juveniles be attained to enable them to sustain themselves while on migration.

The period from 10 January to 27 February showed a more linear improvement in foraging efficiency. Extrapolation of adult and juvenile curves in Fig. 1 suggests that they would converge on 5 March, which was the date of departure. Thus it seems that the birds emigrate as soon as juveniles achieve the same foraging efficiency as adults. In the event of the young birds overwintering in South Africa (and local observations suggest that some do so: Chandler & Every 1984), it would be important that they achieve a level of foraging efficiency to cope with this independence before the adults migrate.

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