

SHORT COMMUNICATION

Yellow-billed malkohas (*Phaenicophaeus calyorrhynchus*) following moor macaques (*Macaca maurus*) in South Sulawesi, Indonesia

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Several authors have reported associations between birds and monkeys in tropical forests (Boinski & Scott 1988, Huettmann 1999, Ruggiero & Eves 1998, Terborgh 1990). By such associations birds are considered to get some benefit, such as protection from predators and/or greater feeding efficiency (Terborgh 1990). In Southeast Asia, however, few reports on such interspecific associations have been available (Galetti & McConkey 1998). The exception concerns several species of macaques living on Sulawesi Island, Indonesia (Fooden 1969). Associations between birds and Sulawesi macaques have been described by researchers as well as bird-watchers (Coates *et al.* 1997, Jepson & Ounsted 1997, Martarinza *et al.* 1994, Whitten *et al.* 1988). Local people in Sulawesi also know of associations between macaques and certain birds, particularly hair-crested drongo (*Dicrurus hottentottus*) and yellow-billed malkoha (*Phaenicophaeus calyorrhynchus*). The farmers call these birds 'burung monyet' (monkey birds) and use the conspicuous calls of drongos and malkohas as signs of macaques' approaches to their fields (S. Matsumura, *pers. obs.*).

This paper reports the association patterns between birds and moor macaques (*Macaca maurus*) at the Karaenta Nature Reserves, South Sulawesi, Indonesia. The vegetation of the reserve is characterized by a limestone type with sparse undergrowth. The crowns of the trees mostly occupy a C-stratum with tree height of 8–14 m, stem diameter mostly below 30 cm, rarely over 45

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cm (Harun & Tantra 1983). Dominant families, in term of species number per family, are Moraceae, Euphorbiaceae and Rubiaceae. The vegetation is partly secondary forest because of illegal cutting and shifting cultivation in the past. The data were collected in October and November 1998. One group of moor macaques (Group B) has been habituated to observers since 1990. The group size was 43 during the study. Each day I checked whether or not the two species of birds were found near the macaque group. Records of days in which I observed the macaque group for less than 45 min were excluded from the present analysis. Drongos and malkohas were found within the spread of the macaque group on 76.7% (23/30) and 86.7% (26/30) of the days, respectively. The association patterns with the macaque group differed between the two bird species. Drongos were found in groups of up to five individuals. They sometimes flew away from the macaque group. In contrast, malkohas were found in pairs. Each pair of malkoha appeared to follow the movements of the group of macaques. I did not find more than one pair simultaneously in the vicinity of the macaque group.

To clarify whether or not malkoha pairs followed the movement of the macaque group continuously, I observed malkohas by the focal sampling method (Martin & Bateson 1993). When I found a malkoha, I followed it as far as possible. I distinguished individual malkohas by their tails. I recorded the activities, height, and animals neighbouring the focal malkoha at 1-min intervals. For neighbouring animals, I recorded all malkohas and macaques within 10 m of the focal malkoha. In addition, I recorded conspicuous behaviours and vocalizations of the focal malkoha continuously. If the cumulative focal observation time on any given day was less than 45 min, I excluded the data from the present analysis. The total observation time I analysed here was 400 min over 6 d.

Figure 1 shows the movement of the observed malkohas. Malkohas moved 200–550 m with the macaque group until I lost sight of them completely. The proportion of time that the focal malkoha was found in the vicinity of macaques (< 10 m) was 59.3%. During the focal observation, malkohas caught 3.9 prey items per hour. The most common prey were grasshoppers. These grasshoppers usually occurred on leaves or branches of trees, and were flushed by the macaques' movements. Macaques did not appear to make any special response to malkohas though they also spend much time foraging grasshoppers and other insects (S. Matsumura, unpubl. data). The frequency of the successful captures appeared to be higher when they were in the vicinity of macaques ($4.4/h^{-1}$) than when they were not ($2.6/h^{-1}$), but the difference was not statistically significant (Wilcoxon signed-rank test, $n = 6$, $T = 6$, $P > 0.10$). The frequency of the malkohas' conspicuous rattling call was higher when they were in the vicinity of macaques ($6.4/h^{-1}$) than when they were not ($1.3/h^{-1}$; Wilcoxon signed-rank test, $n = 6$, $T = 0$, $P < 0.05$). In contrast, the frequency of the malkohas' mewing note tended to be lower when they were in the vicinity of

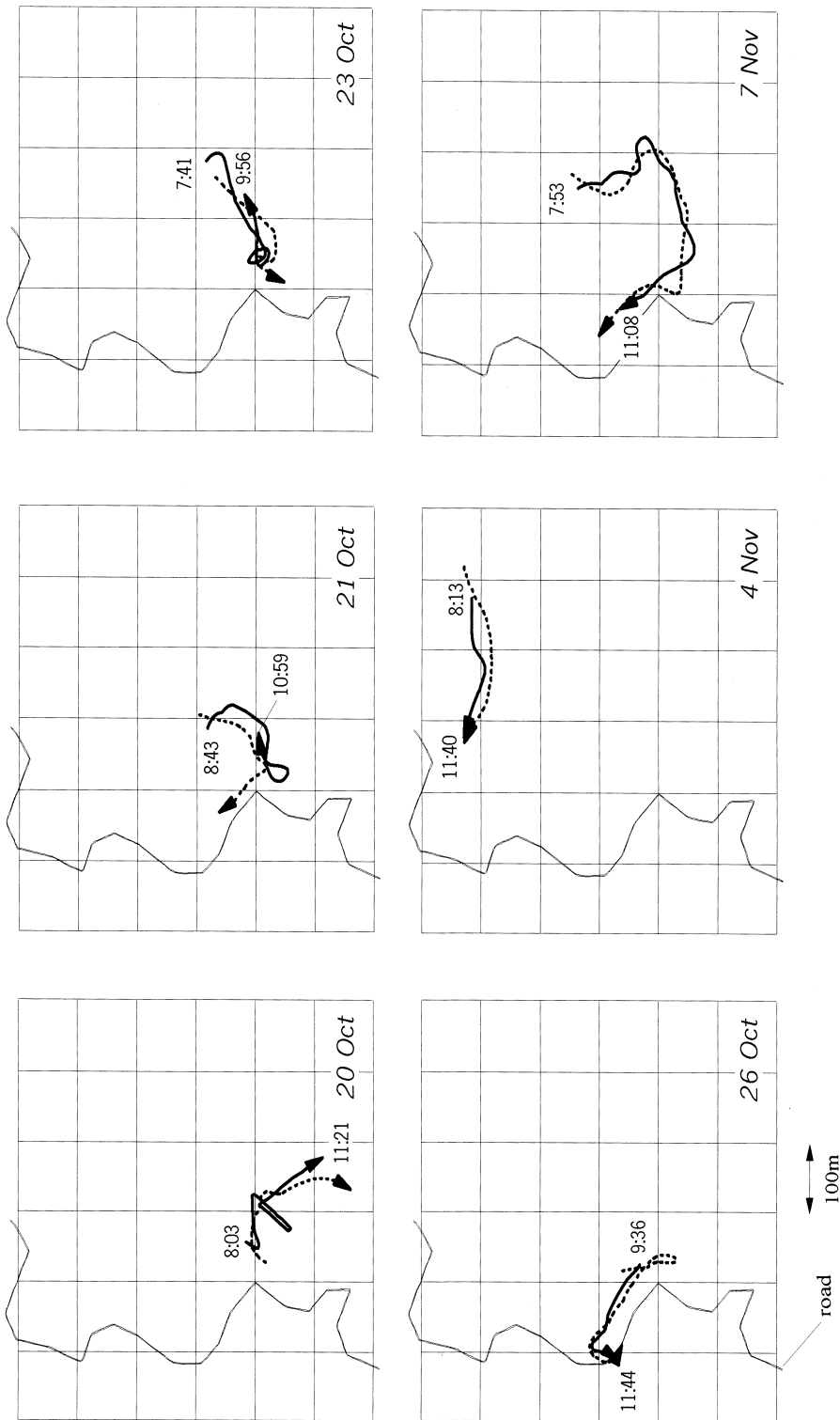


Figure 1. The movement of the focal malkohas (solid lines) and the estimated ranging route of the macaque group (broken lines). The locations of the focal malkohas were recorded in the notebook during the focal observations. At the same time, the estimated central point of the spread of the macaque group members was also noted. After the observations, the movements of the malkohas and of the macaque group were drawn on a different map.

macaques ($9.7/h^{-1}$) than when they were not ($19.9/h^{-1}$; Wilcoxon signed-rank test, $n = 6$, $T = 0$, $0.05 < P < 0.10$). Malkohas used lower (< 5 m), middle (5–10 m), and higher strata (> 10 m) for 22.1, 67.9, and 10.0% of the observation time, respectively (cf. Coates *et al.* 1997).

The results of the focal observation suggested that malkohas follow the movement of macaque groups to a considerable extent. Since October 1998, I carefully checked the presence of malkohas when I was walking in the reserve to detect macaque groups. However, I never found malkohas moving independently of macaque groups during 104 days' observation until February 2000. There was no clear evidence that malkohas formed mixed flocks with other bird species at Karaenta. Malkohas might obtain some benefit from this association with macaque groups. The most likely benefit is that they can easily catch insects flushed by macaque movement (MacKinnon 1990, Whitten *et al.* 1988). The present study failed to provide a significant difference in the feeding rate according to the distance to macaques. We need more detailed studies to consider other factors such as the composition of their prey. Studies on the function of rattling calls and mewing notes would be important since the calling rate differed according to the association with macaques. Although the genus *Macaca* is one of the most intensively studied primate genera in the wild, few authors have described associations of birds and macaques outside Sulawesi (*M. fascicularis*, Ridley 1901 cited in Fooden 1995). One possible reason may be the differences in forest structure between Sulawesi and other tropical areas of Southeast Asia, such as the virtual absence of dipterocarps (Whitten *et al.* 1988). It would be interesting to make further comparative studies to elucidate why this type of close association has evolved especially in Sulawesi.

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