REFERENCES

ALI, S. & S.D. RIPLEY (1972): Handbook of the Birds of India and Pakistan, Vol. 5, Oxford University Press, Bombay.

ALI, S. (1931): The occurrence of the grey hypocolius (*Hypocolius ampelinus*) in North Konkan. *J. Bombay nat. Hist. Soc. 34*: 1061.

ROBERTS, T.J. (1992): The Birds of Pakistan. Vol. 2 Passeriformes. Oxford University Press, Karachi.

SHEKAR, P.B. (1960): Further Additions to the Birds of Kutch. *J. Bombay nat. Hist. Soc. 57*: 224-225.

18. COMMENSAL FORAGING RELATIONSHIPS OF THE WHITE-BROWED FANTAIL* *RHIPIDURA AUREOLA* IN MYANMAR

Flocking behaviour of birds in the non-breeding season is widely reported from the tropics. A number of reasons have been proposed for this behaviour. Several authors have observed that birds foraging in flocks benefit from the availability of arthropods flushed by flock mates (Belt 1874, Biddulph 1954, Moynihan 1962, Croxall 1976, MacDonald and Henderson 1977). However, other authors have found little evidence that the so-called "beater effect" (Powell 1985) is an important factor in promoting flocking behaviour (Willis 1972, Powell 1977, Greig-Smith 1978, King and Rappole 2001a).

Fantails are small, fly-catching passerines of the Family Pachycephalidae. Though some species of fantail do not appear to participate in mixed-species flocks, e.g. the Willy wagtail (*Rhipidura leucophrys*) (Cameron 1985) and the yellow-bellied fantail (*R. hypoxantha*) (Stevens 1904), other species of the group, such as the white-browed fantail (*R. aureola*) regularly participate in mixed-species foraging flocks during the non-breeding season. Cameron (1985) reported that grey fantails (*R. fuliginosa*) and rufous fantails (*R. rufifrons*) participating in mixed-species foraging flocks appear to forage on insects flushed by other flock members.

We studied the behaviour and movements of the white-browed fantail in mixed-species flocks in semi-deciduous forest in north central Myanmar, in an attempt to determine the basis for their participation in such groups.

This work is part of a long-term study of the birds of the north-central dry zone of Myanmar initiated in 1994, which is continuing. However, most of these observations were collected from January 16-29, 1999 at Chatthin Wildlife Sanctuary (23° 43' N, 95° 31' E), located roughly 160 km north-northwest of Mandalay in Myanmar's Central Dry Zone. This sanctuary was established in 1941; it covers 268.2 sq. km (Salter and Sayer 1983) in which elevations range from 250-500 m. The climate is characterized by a rainy season (June-October), a cool dry season (November-February), and a hot dry season (March-May). The principal forest habitat at the sanctuary is Indaing, a Dry Deciduous Forest comprised of over 100 tree species, but dominated by *Dipterocarpus tuberculifer*. Indaing has a relatively open understorey of grasses and low shrubs maintained by regular, anthropogenic spring burning in March and April. Dominant trees in the forest lose their leaves in March at the height of the dry season, and leaf out again in June after monsoon arrives, at which time a lush, herbaceous understorey develops (Salter and Sayer 1983, McShea *et al.* 1999, Nay Myo Shwe *et al.* 1999).

Bird flocks were located by walking slowly (*c.* 1.5 km/hr) through the forest, watching for movement and listening for vocalization of common flock associates. Once a flock was located, it was followed as long as possible. Observations were conducted with the aid of 8 x 42 binoculars. Descriptions of the foraging behaviour and movements of flock members were written down or dictated into a hand-held tape recorder for later transcription.

*The white-browed fantail-flycatcher *Rhipidura aureola* is considered a member of Subfamily Rhipidurinae, see *Buceros* Vol 6(1), 2001. Published by: Bombay Natural History Society.

During 253 minutes of flock observation, we observed white-browed fantail foraging commensally with other species in nine instances. In six instances, fantails were observed foraging with flocks of sylviid warblers. In three other instances, fantails were observed foraging with chestnut-bellied nuthatches (*Sitta castanea*) (Table 1).

The general pattern fantails foraging with flocks of sylviid warblers was as follows. The warbler flocks consisted of 3-15 individuals of several species, including plain prinia (*Prinia inornata*), Beavan's prinia (*Prinia rufescens*), Radde's warbler (*Phylloscopus schwarzi*), and common tailorbird (*Orthotomus sutorius*) (King and Rappole 2001a). They generally occur in open Indaing with widely spaced trees and a dense understorey, mainly of grasses and shrubs, *c.* 1 metre in height. Flock members forage mainly in the understorey, and in relatively close proximity to one another (flock diameter <25 m). Fantails foraging in association with these flocks typically perch at the front margin of the advancing flock on an exposed branch or side of a tree trunk 1-2 m above the ground. They hawk flying insect prey, which is apparently flushed by the movements of the flock. As the flock moves through the understorey, fantails shift perches in an apparent effort to keep to a perch that enables them to monitor their flock mates. Warbler flocks, with a fantail in attendance, were followed over distances of up to 300 m. Only once did we see two fantails following the same warbler flock without agonistic interaction. On a separate occasion, a fantail attending a warbler flock was chased back in the direction from which the flock had come by a second fantail, which then assumed sole membership in the flock.

Fantails were also observed attending mixed-species flocks of common woodshrike, small minivet (*Pericrocotus cinnamomeus*), with up to 20 other species, including the chestnut-bellied nuthatch (King and Rappole 2001a). In following these flocks, we observed three occasions when fantails were apparently following the foraging activities of chestnut-bellied nuthatches, and attempting to capture flying insect prey flushed by the nuthatches. In one instance, a fantail was seen with a pair of nuthatches, which were gleaning bark in the canopy. The fantail maintained a position below the pair, making periodic hawking flights into the air below the nuthatches, evidently after invertebrates were dislodged by the nuthatches. The fantail followed the nuthatches as they changed perches seven times in 26 minutes over a distance of 100 m. In another instance, a fantail was seen following a nuthatch through three successive perch changes over a distance of 30 m. As the nuthatch foraged, gleaning invertebrates from tree bark, the fantail kept 1-2 m away from the nuthatch, facing it and evidently observing its activities. Only once did we observe two fantails following the same woodshrike flock without agonistic interaction. However, only one of them was foraging commensally with a nuthatch during that observation.

The members of the Subfamily Rhipidurinae, which include the white-browed fantail, are noted for their distinctive style of foraging, in which the conspicuous white patches in the rectrices are exposed abruptly as the bird fans its tail, either from a perch or in flight, thereby flushing insects which are then captured in flight (Goodwin 1967, Cameron 1985, Recher and Holmes 1985). In Myanmar, we regularly observed fantails perching on tree trunks flashing their outer rectrices and chasing insects flushed from the bark, or making zigzag diving flights over the grass, similar to the behaviours thought by Goodwin (1967) to be directed at flushing insect prey. Thus, the switch from preying on arthropods flushed by the fantail itself to preying on arthropods flushed by other species is a natural one, especially in the case of species that flush or dislodge prey from substrates regularly used by foraging fantails (e.g. grass or bark). Cameron (1985) described grey and rufous fantails

TABLE 1
CIRCUMSTANCES ASSOCIATED WITH OBSERVATIONS OF WHITE-BROWED FANTAIL'S COMMENSALISTIC FORAGING ATTEMPTS

Date	Amount of Time Flock Observed	No. of Fantails Present	No. of Foraging Manoeuvers at flushed or dislodged prey	Distance Fantail Followed Commensal	Commensal Species	No. of Commensals	No. of Other Species
17 January	1132-1142	1	not recorded	not recorded	Beavan's Prinia	5	0
20 January	1020-1130	1	5	40 m	Plain Prinia	7	0
					Common Tailorbird	1	0
23 January	1124-1251	1	5	65 m	Prinia spp.	3	0
23 January	1452-1514	1	not recorded	150 m	Beavan's Prinia	5	
					Raddes' Warbler	3	
24 January	0832-1001	1	8	>200 m	Prinia spp.	10	0
					Raddes' Warbler	5	
27 January	0910-0930	2	2	300 m	Prinia spp.	12	0
27 January	1006-1100	2	3	30 m (3 perches)	Chestnut-bellied Nuthatch	2	5
27 January	1501-1527	1	5	100 m (>5 Perches)	Chestnut-bellied Nuthatch	2	0
28 January	0730-0825	1	1	not recorded	Chestnut-bellied Nuthatch	2	7

following close behind tree creepers (Climacteridae) and warblers (Acanthizidae) and catching insects flushed by these species. We present nine examples of similarly opportunistic foraging on prey flushed by warblers and nuthatches by white-browed fantails.

White-browed fantails appear to forage principally on flying insects, while warblers forage mainly by gleaning sedentary invertebrates from leaves. Thus, it does not appear that warbler flock mates are being interfered with by fantail pursuit of prey that they have dislodged. Nor does it appear that warblers benefit in any way from fantail activities. Therefore, the relationship appears to be commensal, in which one species benefits (i.e. the fantail) while the others are neither helped nor harmed (Odum 1971: 211). The relationship between fantails and chestnut-bellied nuthatches also seems to be mainly commensal, in which the fantail benefits and the nuthatch is not affected. However, nuthatches do, on occasion, pursue dislodged prey as they fall, and in one instance we observed a fantail attempting to steal such prey from a nuthatch. Thus, the relationship between these two species appears to include aspects of kleptoparasitism (Brockman and Barnard 1979).

Benefits of flock attendance in Indaing forest in Myanmar appear to include enhanced predator detection provided by flock mates (King and Rappole 2001a) or opportunities to kleptoparasitize flock mates (King and Rappole 2001b). Our observation of foraging white-browed fantails indicates that this species may regularly benefit from exploiting prey flushed by flock mates, as reported in fantails elsewhere (Cameron 1985).

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DAVID I. KING
USDA Forest Service
Northeastern Research Station,
University of Massachusetts Amherst,
Amherst, Massachusetts, 01003 USA.

JOHN H. RAPPOLE
Smithsonian Conservation and Research Center,
1500 Remount Road, Front Royal,
Virginia 22630, USA.

REFERENCES

BELT, T.W. (1874): The naturalist in Nicaragua. Murray Press, London.

BIDDULPH, C.H. (1954): A possible association between the yellow-naped woodpecker and the large racket-tailed drongo. *J. Bombay nat. Hist. Soc. 52*: 209.

BROCKMAN, H.J. & C.J. BARNARD (1979): Kleptoparasitism in birds. *Animal Behavior 27*: 487-514.

CAMERON, E. (1985): Habitat usage and foraging behavior of three fantails (Rhipidura: Pachycephalidae). Pp. 177-191. *In*: Birds of eucalypt forests: ecology, conservation, and management (Eds: Keast, A., H.F. Recher, H. Ford and D. Saunders,). Surrey, Beatty and Sons, NSW, Australia.

CROXALL, J.P. (1976): The composition and behavior of some mixed-species bird flocks in Sarawak. *Ibis 118*: 333-346.

GOODWIN, D. (1967): Notes on the behavior of some Australian birds. *Emu 66*: 237-251.

GREIG-SMITH, P.W. (1978): Imitative foraging in mixed-species flocks of Seychelles birds. *Ibis 120*: 233-235.

KING, D.I. & J.H. RAPPOLE (2001a): Mixed-species bird flocks in Dipterocarp forest of North-Central Burma (Myanmar). *Ibis 143*: 380-390.

KING, D.I. & J.H. RAPPOLE (2001b): Kleptoparasitism of laughing thrushes *Garrulax* by greater racket-tailed drongos *Dicrurus paradiseus* in Myanmar. *Forktail 17*: 1-125.

MACDONALD, D.W. & D.G. HENDERSON (1977): Aspects of the behavior and ecology of mixed-species bird flocks in Kashmir. *Ibis 119*: 481-493.

MCSHEA, W.J., P. LEIMGRUBER, S.L. MYINT AUNG, S.L. MONFORT & C. WEMMER (1999): The range collapse of a tropical cervid (*Cervus eldi*) and the extent of remaining habitat in Central Myanmar. *Animal Conservation 2*: 173-183.

MOYNIHAN, M. (1962): The organization and probable evolution of some mixed-species flocks of Neotropical birds. Smithsonian Miscellaneous Collection 143:1-140.

NAY MYO SHWE, THIDA SWE, LEI LEI HNIN, HTEIN WIN & J.H. RAPPOLE (1999): A guide to the birds of Chatthin Wildlife Sanctuary, Union of Myanmar. Smithsonian Conservation and Research Center, Front Royal, Virginia, USA.

ODUM, E. P. (1971): Fundamentals of ecology. 3rd Edn. W.B. Saunders Co., Philadelphia, Pennsylvania.

POWELL, G.V.N. (1977): Socio-ecology of mixed-species flocks in a Neotropical forest. Unpubl. Ph.D. dissertation, University of California, Davis, California.

POWELL, G.V.N. (1985): Sociobiology and adaptive significance of interspecific foraging flocks in the neotropics. *Ornithological Monographs 36*: 713-372.

RECHER, H.T. & R.T. HOLMES (1985): Foraging ecology and seasonal patterns of abundance in a forest avifauna. Pp. 79-96. *In*: Birds of Eucalypt Forests: Ecology, Conservation, Management, (Eds: Keast, A., H.F. Recher, H. Ford and D. Saunders) Surrey Beatty and Sons, NSW Australia.

SALTER, R.E. & J.A. SAYER (1983): Kyatthin Wildlife Sanctuary: Draft management plan. United Nations Development Programme, Food and Agricultural Organization, Rome. FO:BUR/80/006 Field Document 6/83.

STEVENS. H. (1904): The Yellow-bellied Flycatcher (*Chelidorhynx hypoxanthum*). *J. Bombay nat. Hist. Soc. 1*: 155.

WILLIS, E.O. (1972): The behavior of Spotted Antbirds. *University of California Publications in Zoology 79*: 1-132.

19. ROOSTING BEHAVIOUR OF COMMON TAILORBIRD *ORTHOTOMUS SUTORIUS* (PENNANT)

(*With one plate*)

The common tailorbird *Orthotomus sutorius* (Pennant) is a common warbler found throughout the Indian subcontinent. It uses both natural and artificial fibres to stitch 1-3 leaves to construct a tiny, pocket-sized nest where it lays 2-4 eggs between April and September (Ali and Ripley 1983, HANDBOOK OF THE BIRDS OF INDIA AND PAKISTAN, Compact edn, OUP). The nest is generally built close to the ground amidst thick bushes to elude avian predators. Due to the availability of big-leafed garden plants and abundant food comprising of insects and nectar, this highly adaptable bird has colonized almost every medium-sized city garden. Like most diurnal birds, its daytime activities have been studied to some extent. However, there is a dearth of information on its roosting behaviour. In general, the roosting behaviour of gregarious birds is well documented, but that of tiny solitary birds is little understood.

I would like to share my observations on the roosting behaviour of a pair of common tailorbirds in my backyard at Andheri, Mumbai. Though these birds have been roosting in my garden for the past year, I could not find their nest. Since mid-October 1999, a juvenile bird also accompanies the pair, testifying their breeding success this season. Every evening, about 45-60 minutes before sunset, the family arrives in the garden and makes its presence felt through their repetitive "tik-tik-tik-", and not the usual "towit-towit-towit-". At this point, the birds continue their search for insects amongst leaves and bark. Their feeding sorties are interrupted by short preening bouts, which involve face scratching, wing stretching and preening of