

Foraging of Greater Racket-tailed Drongo (*Dicrurus paradise us*) and Lesser Racket-tailed Drongo (*D. remifer*) in Mixed-species Bird Flocks at Khao Yai National Park

Observations were collected on the foraging behaviour of the Greater Racket-tailed Drongo (*Dicrurus paradiseus*) and the Lesser Racket-tailed Drongo (*D. remifer*) at Mo-Singto Longterm Biodiversity Research Plot, Khao Yai National Park during 13–25 October and 22–26 November 2002 in order to investigate their association with mixed-species bird flocks. One of us (SD) searched for drongos, following each individual for as long as possible to make detailed observations on feeding behaviour. Both species usually foraged with the flock to feed on insects flushed by their flockmates. Most Greater Racket-tailed Drongos participated with ground-feeding flocks while the Lesser Racket-tailed Drongos were usually found as a flockmate of smaller insectivores.

Greater Racket-tailed Drongos were observed on 38 occasions for a total time of 244 min. For most of this time (217 min., 31 cases) they associated with mixed feeding flocks of other birds, chiefly those in which White-crested Laughingthrushes (*Garrulax leucolophus*) predominated (22 cases); mixed flocks of small birds (6 cases); and single-species flocks of Long-tailed Broadbills (*Psarisomus dalhousiae*) (2 cases) and Silver-breasted Broadbills (*Serilophus lunatus*) (once; Table 1).

The detailed composition of White-crested Laughingthrush flocks in Khao Yai was described by Nimmuan *et al.* (2004) and usually comprised up to seven species of birds with a body size roughly similar to that of the drongo, including two species of scimitar babblers (*Pomatorhinus* spp.), Red-headed Trogon (*Harpactes erythrocephalus*), Green Magpie (*Cissa chinensis*), Lesser Necklaced Laughingthrush (*G. monileger*) and sometimes Laced Woodpecker (*Picus vittatus*). Most of these species foraged in the middle and lower storey, and in the case of both scimitar babblers and laughingthrushes, on the ground.

Lesser Racket-tailed Drongos were observed in 11 instances, for a total time of 89 min. They were always associated with mixed flocks of small birds feeding in the middle storey, including leaf warblers (*Phylloscopus* spp.), White-bellied Yuhinas (*Yuhina zantholeuca*), and Black-naped Monarchs (*Hypothymis azurea*).

Drongos are thought to benefit from such associations, either due to them more easily locating insects flushed by their flockmates, or due to the opportunities for kleptoparasitism—stealing food—from flockmates (GILL, 1995; HINO, 1998; KING & RAPPOLE, 2001; STYRING & ICKES, 2001). Greater Racket-tailed Drongos that associated with laughingthrush flocks usually perched near or above these ground-feeding species, sallying out to snatch arthropods that they flushed (103 of 127 feeding attempts took place at heights of 5 m or less). Lesser

Table 1. Types of flocks with which Greater Racket-tailed Drongo associated

Flock-type	No. of observations	Flock-size ± 1 S.D.
Laughingthrushes	22	13 ± 6.1
Small birds	6	17.5 ± 4.9
Broadbills	3	6 (one flock); 8 (two flocks)

Table 2. Feeding attempts and successful attempts of Greater Racket-tailed Drongo

	Total time (min)	Feeding attempts	Successful attempts
In-flock	217	127	14
Non-flock	27	8	1

Racket-tailed Drongos, which accompanied the more arboreal flocks of small birds, fed correspondingly higher in the vegetation column: 43 of 63 feeding manoeuvres (68%) took place at heights above 6 m. Nine successful feeding attempts were detected.

There were too few observations to test whether drongos enjoyed a higher feeding rate with flocks than without flocks. In flocks, 127 feeding attempts of Greater Racket-tailed Drongo were observed in 217 min. (0.59 feeding attempts per min.), of which 14 occurrences were known to be successful. This compared with only one successful prey-capture, among eight feeding attempts, in 27 min of observation of non-flock birds (0.30 feeding attempts per min.; Table 2). There was no difference between the proportion of successful and unsuccessful feeding attempts of the in-flock and non-flock birds (Yates' $\chi^2 = 0.00$, $p > 0.05$).

Four instances of attempted kleptoparasitism, in which a Greater Racket-tailed Drongo chased another bird with a prey item, were observed. These involved Long-tailed Broadbill (once) and Green-billed Malkoha (*Phaenicophaeus tristis*) (three times). Only the chase of the broadbill, which dropped an insect prey then captured by the drongo during a flycatching sally, was successful. Lesser Racket-tailed Drongo was once seen to target and successfully capture an insect being chased by a Black-winged Cuckooshrike (*Coracina melanochistos*).

The species kleptoparasitized by drongos were relatively slow-moving, caught larger prey such as dragonflies and moths, and held these prey items in the bill before swallowing. This may have facilitated theft by the drongos (BROCKMANN & BARNARD, 1979). Studies elsewhere suggest that drongos also kleptoparasitize woodpeckers (STYRING & ICKES, 2001) and laughingthrushes (KING & RAPPOLE, 2001). The low incidence of kleptoparasitism observed in the present study might suggest that kleptoparasitism may be a less important feeding strategy than the opportunistic capture of prey flushed by flockmates.

There may be some reciprocal benefits to the flock members from the drongos' presence. Flockmates may be prepared to tolerate occasional kleptoparasitism by drongos because of increased vigilance against predators which the presence of drongos provides (KING AND RAPPOLE, 2001). One apparent example of this was noted during the present study, when Greater Racket-tailed Drongo gave an alarm-call as a bird of prey flew overhead. Seemingly in response, the laughingthrushes stopped feeding, and flew up to higher trees, where they remained silent and were more or less hidden for a few minutes. Another possible explanation is that flock members are forced to tolerate drongos because they cannot afford to spend time or energy necessary to displace them from the flock.

A few Greater Racket-tailed Drongos still occur in non-forest or orchards around the suburbs of Bangkok where the avifauna is too depauperate to support mixed-species bird flocks. Comparison of drongos' feeding behaviours in forest and non-forest habitats might be revealing. In addition, there are few, if any, studies which have successfully demonstrated whether birds in mixed-species flocks have higher feeding rates than those feeding solitarily.

