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The development of kleptoparasitic behavior in Red-billed Woodhoopoes.—In review of kleptoparasitism, Brockmann and Barnard (1979) state that birds from some orders are disproportionately likely to exhibit this behavior. Kleptoparasitism frequently has been recorded among passerines and predatory nonpasserines but seldom among insectivorous nonpasserines. In particular, only three instances have been documented in which members of the order Coraciiformes exhibited interspecific kleptoparasitic behavior, namely the Common Kingfisher (*Alcedo atthis*), Carmine Bee-eater (*Merops nubicus*), and Abyssinian Roller

(*Coracias abyssinica*) (Grist 1934, Moncur 1946, Tye and Tye 1983). I report here on three observations of interspecific kleptoparasitism involving another member of this order, the Red-billed Woodhoopoe (*Phoeniculus purpureus*). Red-billed Woodhoopoes are long-billed, insectivorous, group-territorial birds, weighing about 75 g. They inhabit a wide variety of woodland types across a broad Afrotropical range (Ligon 1981). They live throughout the year in flocks of 2–12 birds, have a cooperative breeding system (Ligon and Ligon 1978), and a dispersal system involving both males and females.

The present observations were made during a study of woodhoopoe behavior in the eastern Cape Province, South Africa, involving more than 50 flocks observed for 500 days during a ten-year period. All records of kleptoparasitism relate to a single, resident, color-banded flock (BD) in the Queenstown district (31°47'S; 26°47'E), which was monitored from January 1976 until 1984 when the flock disappeared. During this period, more than 200 h of observation were made of the BD flock.

In December 1980, two Red-billed Woodhoopoes from flock BD interacted aggressively with a pair of Cardinal Woodpeckers (*Dendropicos fuscescens*) at the latter's nest cavity in a willow tree (*Salix* sp.). The woodpeckers were trying to feed their nestlings, but the woodhoopoes obstructed them and attempted to steal food intended for the young woodpeckers. On one occasion a woodpecker successfully evaded the woodhoopoes and fed a nestling, whereupon the woodhoopoe male (WW) hopped to the entrance of the nest hole, inserted its bill into the nestling's mouth, retrieved a small insect, and swallowed it. This successful retrieval of food from a nestling resulted in a change in the woodhoopoes' behavior, whereby the adult woodpeckers were now allowed to feed their young unharassed, and the woodhoopoes would then take the food from the nestlings with little difficulty. A young woodhoopoe female (WB) took over WW's role whenever he carried food back to the breeding female (WY) 80 m away. In one hour, WW took four food items and WB three in the course of as many provisions of food by the woodpeckers.

In April 1981 the same two woodhoopoes, WW and WB, were observed molesting and kleptoparasitizing Acacia Pied Barbets (*Lybius leucomelas*) in a similar fashion. The woodhoopoes again waited for the barbets to feed their nestlings, whereupon one of them hopped to the nest entrance and retrieved whatever was fed. In this instance, five food items were robbed in 22 min (four by WW and one by WB) before the woodhoopoe flock moved on.

In February 1983, when WW and WB were no longer present in the BD flock (presumably having died), members of the same flock were seen molesting a pair of Paradise Flycatchers (*Terpsiphone viridis*), feeding three downy chicks, in an identical manner. The nest was partially obscured and I did not see the actual retrieval of food from the chicks, but the woodhoopoes exhibited exactly the same behavior as previously observed.

Red-billed Woodhoopoes occasionally probe unoccupied nests of Masked Weavers (*Ploceus velatus*) (Spence 1974), occupied open-nest structures of Cape Sparrows (*Passer melanurus*) (Newman 1975), House Sparrows (*P. domesticus*) (Newman 1981), and Paradise Flycatchers (pers. obs.), and vacant nest cavities of Black-collared Barbets (*Lybius torquatus*), Knysna Woodpeckers (*Campethera notata*), Cardinal Woodpeckers, Bearded Woodpeckers (*Thripias namaquus*), and Olive Woodpeckers (*Mesopicos griseocephalus*) (pers. obs.). In these instances, they presumably are feeding on insect larvae which hatched in the nest cavities or structures. Although I have recorded such nest probing on 41 occasions in 13 different woodhoopoe flocks, only the BD flock indulged in kleptoparasitic behavior. Similarly, J. D. Ligon (pers. comm.) recorded woodhoopoes tearing dried cattle droppings apart and eating the small beetles inside, but in only one of his Kenyan study flocks. Here also, unusual foraging behavior persisted in the flock even when the original members had all disappeared and been replaced.

Where members of one species feed on the products, scraps, or parasites of another, the development of kleptoparasitic behavior is enhanced (Rand 1954). I suggest that the observed

woodhoopoe kleptoparasitism had its origins in this type of interspecific interaction. During the woodhoopoe-woodpecker interaction, the woodhoopoes were under considerable feeding pressure because they were providing food for the breeding female and three nestlings. This may have provided the stimulus for a change from simple nest probing to active attempts at food interception. The observed adjustment of the initial interception suggests that it was a new behavior for the woodhoopoes and that a process of tactical refinement or learning was involved. The woodhoopoe-barbet interaction observed a few months later, when the flock was under little feeding pressure, and the woodhoopoe-flycatcher interaction, when the initial kleptoparasites (WW and WB) were no longer present, point to the adoption of new, opportunistic, feeding behavior by the BD flock. This, together with J. D. Ligon's observations of manure shredding, suggests that certain behaviors may develop by chance and then be culturally transmitted to younger flock members. The fact that dispersal in woodhoopoes takes place only very infrequently implies that any such new behavior pattern may either take many generations to spread through the population or never extend beyond the flock in which it was initiated, as was probably the case with the kleptoparasitic habits of the BD flock.

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Two Pied Flycatcher males feeding nestlings in the same nest.—The Pied Flycatcher (*Ficedula hypoleuca*) is a small (12 g), hole-nesting Old World flycatcher. In different studies, 3–30% of the males were polygynous (Askenmo 1977, Alatalo and Lundberg 1984, Winkel and Winkel 1984). Potentially polygynous males stay with the first female until she has