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HUMMINGBIRD ASSOCIATION WITH ACORN WOODPECKER SAP TREES IN COLOMBIA

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During a study of the ecology of Acorn Woodpeckers (*Melanerpes formicivorus*) in Colombia, we observed Buff-tailed Coronets (*Boissonneaua flavescens*) establishing feeding territories at sap trees for several days. Similar associations between hummingbirds and sap trees have been described in North America (e.g., Foster and Tate 1966, Miller and Nero 1983). This is the first report of such an association for a tropical hummingbird.

Between November, 1982 and June, 1983, we spent ca. 78 h watching Buff-tailed Coronets at Finca Merenberg, a privately-owned reserve located at 2,300 m elev. in the Cordillera Central, 100 km by road east of Popayán. We watched hummingbirds visiting the sap trees of five groups of Acorn Woodpeckers. Woodpeckers drill holes through the bark, into the phloem, and sap is taken as it flows. In Colombia, groups of Acorn Woodpeckers use one or two oaks (*Quercus humboldtii*) in their territories as sap trees.

We also watched the hummingbirds at other food sources, such as flowers. We took time budgets of *Boissonneaua* at sap trees and other food sources, and observed interactions with the woodpeckers and with other hummingbirds. Marking the coronets proved to be difficult, since they lived in the treetops, always flew very high, and avoided mist nets. Only one individual was marked with a leg tag.

Five of six sap trees that were monitored at Finca Merenberg each had an associated Buff-tailed Coronet during almost all of our observation time. We did not detect a coronet at the sixth sap tree until 18 May, probably owing to the difficulty of observing the tall, densely foliaged oak. The coronets disappeared a few days after a group of woodpeckers abandoned the sap trees in April. It is likely that the wood repairs and the flow of sap stops when the woodpeckers cease frequenting the holes. In May, when the woodpeckers returned, the coronets resumed visiting one sap tree.

We do not know if the same hummingbirds visited the sap trees month after month. When we saw them, the coronets used the same perches and the same set of holes day after day. The birds spent much of their time perching, frequently vocalizing, and displaying buff-colored tails and under wing coverts. Vocalization consisted of a short *tsip* emitted constantly at regular intervals of about 2 s. Sometimes hummingbirds flew around the trees in a fast flight, uttering a call. This is the same behavior, presumably territorial, as described for Buff-tailed Coronets at *Huilaea* trees in the eastern Andes (Snow and Snow 1980) and indicates that the coronets established feeding territories for at least several days.

Buff-tailed Coronets spent about 7% of their time feeding at sap holes, 1.7% of it flycatching, and 3.2% of it in interactions with other hummingbirds. All interactions seen at sap trees were with conspecifics. Coronets fed on sap approximately once a minute. While feeding, birds probed up to six holes, more usually two or three. When probing a hole, the coronets sometimes hovered. More frequently, they clung to the trunk in a woodpecker-like manner. Coronets visited only a segment of the branch or trunk and apparently always visited the same holes.

The woodpeckers usually tolerated the activities of the coronets. Sometimes, when a woodpecker was going to suck sap at the holes where a coronet was feeding, the woodpecker threatened and the hummingbird withdrew. We never saw a woodpecker chase a coronet.

Sap trees appeared to be important food sources for these hummingbirds, even preferred over other available sources. Only when the woodpeckers stopped using some sap trees did the coronets establish feeding territories at other sources. They rarely wandered in search of food, but instead, preferred nectar sources (e.g., *Spirotheca* sp., *Psittacanthus* sp.) that favored the establishment of a territory. Their behavior at these plants was essentially the same as in sap trees, but interspecific conflicts were more frequent. Time budgets at these food sources were similar to those at sap trees: 5% feeding on nectar, 1.3% flycatching, and 1.5% in territorial interactions. In those plants large enough to permit the establishment of more than one territory, Buff-tailed Coronets occupied the higher parts of the plant.

We recorded only two individuals of other species of hummingbirds visiting sap trees. In May, when one group of woodpeckers resumed the use of a sap tree, Buff-tailed Coronets visited the tree, but established no territories. On 14 May, a male Booted Raquet-tail (*Ocreatus underwoodii*) visited holes for about 30 s, and on 18 June, a male Long-tailed Sylph (*Aglaiocercus kingi*) visited a series of holes for about 30 s, then perched on the trunk and probed another hole. No Acorn Woodpeckers or Buff-tailed Coronets were present when these visits occurred.

Foster and Tate (1966) listed many animals that are attracted to sapsuckers' sap trees, including insects, birds, and mammals. Some animals come to feed on the sap, but others are attracted by the concentration of insects. Probably all these animals are feeding opportunistically. Sap and other tree secretions can be marginal food sources for some opportunistic hummingbirds (e.g., Kevan et al. 1983). Other hummingbirds, however, may associate closely with sap trees and sapsuckers. Ruby-throated Hummingbirds (*Archilochus colubris*) frequently establish nearly permanent associations with sap trees, feeding on sap and insects (Foster and Tate 1966, Southwick and Southwick 1980, Miller and Nero 1983). Female Ruby-throated Hummingbirds are specialists during the nesting season, feeding almost exclusively on sap (Southwick and Southwick 1980). Rufous Hummingbirds (*Selasphorus rufus*) defend sapsucker feeding sites and are highly dependent on sap in some habitats (Sutherland et al. 1982). Miller and Nero (1983) even suggested that sapsuckers may affect the distribution of Ruby-throated Hummingbirds in North America.

The association of Buff-tailed Coronets and Acorn Woodpeckers' sap trees seems to be a widespread phenomenon. We have seen these hummingbirds feeding at sap trees at the Farallones de Cali (2,000 m elev.) in the Cordillera Occidental. A coronet caught flying insects and visited sap holes without any interaction with the woodpeckers. In six hours of observation, only one other hummingbird, a male Long-tailed Sylph, passed by and was chased away by the coronet. The association in Colombia resembles those described in North America, except for two notable differences.

First, given the number of hummingbird species in Finca Merenberg (nine resident species and at least seven transients), we expected more species to exploit sap trees.

Perhaps other hummingbirds did not feed at these trees because sap holes are usually in the upper part of the tree. Of the nine resident species in Finca Merenberg, only Buff-tailed Coronets and Long-tailed Sylphs are canopy species. Other species, such as the Booted Raquet-tail, may feed in the canopy only occasionally. Also, Buff-tailed Coronets strongly defend their territories against intruders and are always dominant over other species. Only Greenish Puffleg (*Haplophaedia aureliae*) are almost as aggressive, and they sometimes chase coronets. Snow and Snow (1980) found that Buff-tailed Coronets carried on their activities at higher levels and were more aggressive than other hummingbirds.

Second, Acorn Woodpeckers seemed to tolerate the activities of the coronets, whereas sapsuckers usually defend their sap trees against all other animals (Foster and Tate 1966). Acorn Woodpeckers in California do not tolerate hummingbird intruders, and Anna Hummingbirds (*Calypte anna*) enter their sap trees almost exclusively when the woodpeckers are absent (MacRoberts and MacRoberts 1976). These woodpeckers in Colombia are less interspecifically aggressive, perhaps owing to the lack of intruders competing for sap. We never recorded any bird or mammal, other than the hummingbirds mentioned above, visiting sap holes. Our observations are not sufficient to support any speculation on the evolutionary significance of the relationship between Acorn Woodpeckers and Buff-tailed Coronets. We nevertheless conclude that in the areas where both species occur together, the behavior of Buff-tailed Coronets is greatly affected by the activities of Acorn Woodpeckers.

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SONGS, DISPLAYS, AND OTHER BEHAVIOR AT A COURTSHIP GATHERING OF BLUE-BLACK GRASSQUITS

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At 19:05 on 28 June 1983, J. W. Hardy and I encountered a group of at least 20 male Blue-black Grassquits (*Volatinia jacarina*) in Guerrero, Mexico. Surprised to see such a flock in the middle of the grassquits' breeding season, which in Mexico lasts from about April to about November (Miller et al. 1957 and data in the collection of the Western Foundation of Vertebrate Zoology), I returned to the same site on three evenings and two mornings in the following week. Each time, I found many grassquits displaying in a dense congregation unlike anything described to date. In some ways, this congregation resembled a lek.

The grassquits gathered in a shallow basin on a hillside that sloped to the sea, about mid-way between Pie de la Cuesta and Acapulco. The basin was about 30 × 40 m, at an elevation of about 100 m, and was about 400 m inland. Grass (ca. 1 m high), dotted with bushes (up to 3 m high), grew over the hillside and basin.

Each morning and evening, I found between 20 and 30 males in the basin, more than 90% of which were within an area about 25 m in diameter. Because they often changed perches before I could describe the locations and activities of all the birds present, I resorted to making occasional estimates of the overall distribution of the birds, and concentrated on following individuals until I lost sight of them. The grassquits perched and displayed on the grass and bushes, on bare spots in the grass, and on a one-lane asphalt road that crossed the basin. They perched singly or in clumps of up to ten birds; I saw as many as seven grassquits in a single bush about 1 m in diameter. The number and size of these clumps changed often. The grassquits on the road spaced themselves more evenly than those in the vegetation. Fewer than half of the grassquits stood on the road at any time; my presence may have kept others from joining those on the road.

Males sang several versions of their short, buzzy song, which has been aptly phoneticized as *szeeyew* (Slud 1964) and *weezit* (Peterson and Chalif 1973). I recorded three major song types (Fig. 1a–c), and several minor variations on one of them, in about 20 min. Males sang while they perched and while they performed their flight display: with tails spread, they flew straight up to a height of about 0.5 to 1 m; as they descended, they faced head-down and tail-up, righting themselves just before they returned to the perch. Some authors, such as Dickey and van Rossem (1938) and Haverschmidt (1968), have said that the displaying grassquits "leap" or "jump" into the air; all of the ones that I saw obviously flew. As they launched into the air, they often made a series of distinct snapping sounds (Fig. 1d) with their wings before they began singing. Songs usually ended at the tops of display flights. I can find no differences in my recordings between songs that were delivered while the birds perched and while they flew. I saw