Honeyguides and beeswax: preferences and support for olfaction in locating it

This note pertains to the knowledge that honeyguides Indicatoridae[1] come to beeswax (e.g., Fry *et al.* 1988 among many). Between 13 March and 19 November 1993 honeycomb was made available to them to establish their preferences for it in different forms or for its contents as:

I. Dark, dirty, honeycomb without bee larvae, pollen, or honey, but usually lined by remnant pupal casings
II. New pale (white and yellow), clean, honeycomb, without contents
III. Comb rendered by melting to solid clean yellow and pale wax
IV. Honeycomb containing both capped and uncapped bee larvae
V. Honeycomb containing stored pollen (bee bread)
VI. Honeycomb with honey in cells both capped and uncapped

Presentation was on a cut branch (the perch), 1.5 m long and 0.15 m diameter, nailed to the top of a fence post in a wooded garden, Langata, Nairobi, Kenya. The perch was 2 m from a *Terminalia* tree whose morning shadow lay across it, as did the afternoon shadow of a large *Croton megalocarpus.* Thus, while in the open, cover was close by.

Three bays (of length 10 cm x width 5 cm and depth 3 cm, spaced 10 cm apart) were cut into the perch's upper surface to hold the wax samples (Fig. 1). Each depression contained two samples randomly paired to avoid creating association between categories (e.g. dirty wax always appearing with clean wax or larvae appearing with empty comb, etc.) or associating specific cells with any category. The components of pairs and the bays they went into were chosen randomly at least weekly, but often at lesser intervals if bays were emptied or had had to be cleaned.

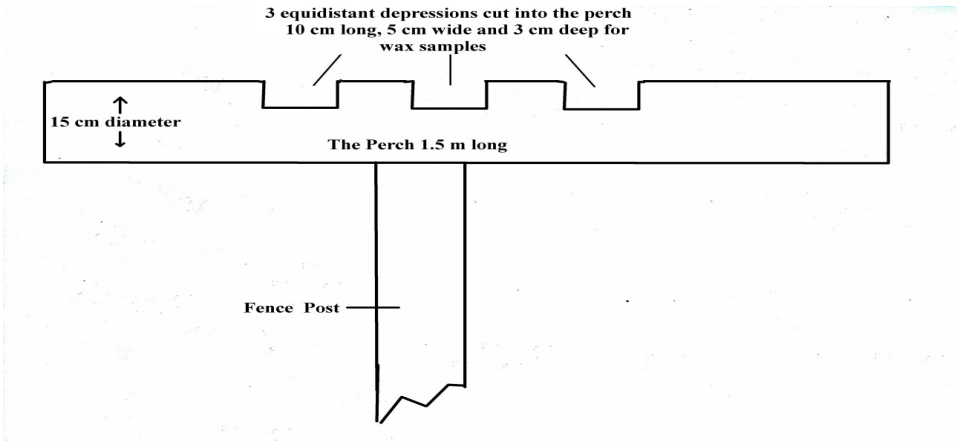

Figure 1. The perch diagrammatically and not to scale.

Three species of honeyguide came to the perch—Scaly-throated *Indicator variegatus,* Lesser *I. minor* and Pallid *I. meliphilus* – all three tended to approach it from inside the *Terminalia*. No bird was colour-banded or individually identifiable with certainty,

[1] When this issue was originally published on 7 January 2018 this family was erroneously called Mellitophagidae. We apologize for this mistake.

but on occasions up to three Scaly-throateds and seven Lessers were in the vicinity of the perch at the same time, with all contributing to the results in Table 1.

Table 1. Observations of Scaly-throated, Lesser and Pallid Honeyguides at an experimental feeding station in Nairobi.

Bait	*I. variegatus*		*I. minor*		*I. meliphus*	
	no. of observations	% of total	no. of observations	% of total	no. of observations	% of total
Old dark comb	4	11.1	1	5.3	0	0
New pale comb	22	61.1	13	68.4	3	37.5
Rendered wax	6	16.7	5	23.3	3	37.5
Bee larvae	2	5.6	0	0	2	25.0
Pollen	2	5.6	0	0	0	0
Honey	0	0	0	0	0	0
Total	36	100.1	19	100.0	8	100.0

From these records, *I. variegatus and I. minor* preferred new comb, followed by comb rendered to solid wax. *I. meliphilus* data are too few for such certainty, but that new comb and rendered wax formed the highest proportion of what they were seen eating hints that, as with the other two, these may be its preferences. Having seen the perch being used, the late Peter Davey wanting a photographic bait, poured molten wax into rough bark on a tree near Athi River where it hardened. Here it was quickly found by *I. minor* and *I. meliphilus* (see photographs from this site on pp. 281 and 283 in del Hoyo *et al.* 2002).

Scaly-throated and Lesser Honeyguides ate some old comb, and might have ingested some old pupal casing. A few bee larvae were taken by both Scaly-throated and Pallid, while an equally small amount of pollen was eaten by Scaly-throateds. All three species seemed to avoid honey and when, as happened, it was in or on new wax and they got it on their bills, they immediately wiped them on the perch and did not go back to the source. None tried to take sealed or unsealed honey from a honeycomb cell, and none tried to take honey by itself when available fortuitously in the bottom of a perch bay.

The few bee larvae taken contradicts both Diamond's pers. comm. report in Fry *et al*. (1988) that captive *I. indicator* sought larvae before eating wax, and Chapin's 1924 observations. Both were reporting on *I. indicator* which may feed differently from the three species reported here. Yet with Diamond the difference might have arisen from his bird being captive and denied the quotient of insects that honeyguides eat in addition to bee products (Hoyo *et al*. 2002). Those noted here were wild with access to the genus's wide range of diets. Chapin *ibid.* only presented a bird with old comb containing larvae limiting its choice to taking what was offered.

Honeyguide disinclination to take honey seems an evolutionary paradox. Honeyguide wax-eating may have evolved from taking scale insects (Coccoidea) which do not produce honey. Yet once they extended their diets to bees (e.g. *Apis, Hypotrigona* and *Trigona*) whose wax was available alongside honey, their avoidance of a food so easily assimilated and nutritious infers an evolutionary pressure not to do so. Such ground may be to avoid honey's stickiness being transferred to plumage and compromising feather function and care.

The three honeyguide species reported here recognized beeswax both as natural honeycomb (in its unique matrix of thin, hexagonal, wax-walled cells), and in its vis-

ually different rendered appearance when melted into a hard opaque mass, ranging in size from a few grams to blocks of several kilograms. That *I. indicator* also has this ability was noted by the Portuguese cleric Jerome Lobo in 1625 (in Chapin *ibid.*) when they ate wax candles.

Further, while comb containing honey, larvae, or pollen quickly attracts bees, thus alerting honey-guides to its presence, bees show little interest in clean, solid, purified beeswax. Yet the birds find it for themselves, and not only recognize it, but seemingly prefer it to old dark comb. This infers that they use cues other than visual recognition to locate it.

On 10 August 1993, an *I. variegatus* was seemingly feeding on a concrete slab. The site was examined closely and the bird had been picking at a very thin film of wax (3 cm^2 area < 0.2 mm thick). Months earlier at this site, boiling water had been poured over a hive frame to melt off old wax. The tiny, very thin, almost translucent film, located cryptically on dirty concrete, discoloured by three months of dust and dirt was all but impossible to see, by a human. Further, it was where beeswax would not normally be found and within 20 m of the very accessible baits on the perch described above.

Further honeyguide ability to locate wax in whatever form was observed during visits by both *I. indicator* and *I. minor* foraging in a dark shed among stored hives and old frames. All had traces of wax on them, but no honey that would have attracted bees. It confirms previous evidence that greater honeyguide also locate wax without the visual appearance of honeycomb or bees to direct them.

An aspect of bee-keeping on the Langata property where these notes were made, was boiling old honeycombs to melt and separate wax from pupal and other debris. The process smelled strongly and attracted bees in such numbers that their presence was a nuisance. To avoid them, boiling was done in a closed room, from which the smell escaped through several bee-proof vents under the eves. The attracted bees flew in clouds about the immediate vicinity, but several lesser honeyguides also attended. While both bees and birds were responding to the same stimulus, the bees milled about in the general area, but the birds fluttered specifically around the vents.

Summed, this inconclusive evidence adds to previous suggestions that honeyguides locate wax through a sense other than sight or by simply following bees; olfaction is the most obvious possibility (e.g. Stager 1967).

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