

four males and one female of this species on 19th December 1974 at the Lowlands savannah. The males were displaying and singing. These are the first authentic records of this species for Tobago, although Meyer de Schauensee (1966) mistakenly included Tobago in the range of the species. It is interesting to speculate on the manner in which this apparently sedentary species reached Tobago, especially in view of the Northern Range of Trinidad effectively barring dispersal to the north from the central plains where the species is common. Again, perhaps "Alma" was responsible.

**Bobolink *Dolichonyx oryzivorus*.** On 17 February 1974 an immature bird of this species was studied at distances down to six feet at the Friendship Estate dump by my wife and myself, along with George Reid. Its tail was very abraded, it seemed to be in heavy moult, and made very short, weak flights, often only for a few yards, as it fed on insects among the low shrubs and weeds. This is the first record for Tobago, though the species has been recorded once from Trinidad (in June!), and is regular on autumn passage through the West Indies to South America.

**Northern Parula Warbler *Parula americana*.** On 19 December 1974 an individual of this species was mist-netted at Grafton Estate. After being carefully examined and photographed it was released. Though in many respects similar to the Tropical Parula *P. pitiaiyumi*, it could be distinguished by the distinct whitish eye-ring, and by the underparts, of which the chin, throat and upper breast were bright yellow, whilst the rest were whitish, with the lower abdomen faintly tinged yellow. This is the first record for Tobago, but as Bond (1970) pointed out, it was to be expected. The Tropical Parula is listed for Tobago on the strength of three specimens said to have been taken near Charlotteville many years ago (Hellmayr 1906); but there have been no records since then, and one wonders whether Hellmayr's record is authentic. The northern species is a regular if rare winter visitor to the Lesser Antilles.

**Purple Honeycreeper *Cyanerpes caeruleus*.** On 21 August 1972 I saw two, possibly three, individuals of this species on the trail near Pigeon Peak. The long, decurved bill effectively precluded confusion with the congener, *C. cyaneus*, already known from Tobago. Although this record has already been published (ffrench 1973b), no details were given at that time. It seems highly probable that these individuals were

related to some captive birds brought from Trinidad and released at Charlotteville about the time of Hurricane Flora. Otherwise, the species has not hitherto been reported from Tobago.

#### REFERENCES

- Bond, J. 1970: Native and winter resident birds of Tobago. Philadelphia; Acad. Nat. Sci. 30 pp.
- Dinsmore, J. J. 1967: Ecology and behaviour of the Greater Bird-of-Paradise on Little Tobago island. M.S. thesis (unpubl.), Univ. Wisconsin.
- 1969: Duel calling by birds of paradise. Auk. 86: 139-140.
- 1970: Courtship behaviour of the Greater Bird-of-Paradise. Auk 87: 305-321.
- 1972: Avifauna of Little Tobago island. Quart. J. Florida Acad. Sci. 35 (1): 55-71.
- ffrench, R. P. 1971: A list of recently published articles on the avifauna of Trinidad and Tobago. J. Trin. Field Nat. Club. 52-54.
- 1973: Dubious bird records for Trinidad and Tobago. J. Trin. Field Nat. Club. 74-79.
- 1973b: A Guide to the birds of Trinidad and Tobago. Wynnewood, Pa. Livingston Pub. Co. 470 pp.
- Hellmayr, C. E. 1906: On the birds of the island of Trinidad. Novit. Zool. 13: 1-60.
- Kirk, J. 1883: List of birds in L. G. Hay's Tobago Handbook. N.p.
- Meyer de Schauensee, R. 1966: The species of birds of South America and their distribution. Wynnewood, Pa. Livingston Pub. Co., 577 pp.

#### FEEDING METHODS OF SOME TRINIDAD HUMMINGBIRDS

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The hummingbird family includes hundreds of species which vary in size, bill length and bill shape. Many flowers are pollinated by hummingbirds and Grant and Grant (1968) have shown that the shapes, sizes and structures of the flowers visited are adapted to maximise the

chances of pollination. Each flower is most efficiently pollinated if it is visited by hummingbirds which regularly visit that species of flower. Measurements of the rate of calorie intake as compared to energy used during feeding by hummingbirds (Wolf et al, 1972) have shown that the optimum flower is different for different hummingbird species owing to differences in corolla length and shape and nectar concentration. Hence, while it is advantageous to the hummingbird to specialise in feeding from one flower species, such specialisation is also beneficial to the flower species since it makes successful pollination more likely.

The feeding adaptations of hummingbirds can easily be studied in Trinidad and Tobago since there is considerable variation among the 17 species which have been recorded. For scientific names and alternative names see Appendix. The feeding specialisations of the hummingbird species occurring in the forest and the cocoa and citrus-growing areas of the Northern Range of Trinidad are described in an extensive paper by Snow and Snow (1972). They found that the length, width and curvature of the corolla tube of about sixty species of flowers correspond to the shapes and sizes of the bills of hummingbirds feeding from the flowers. The same general conclusion has been reached in an earlier study by Skutch (1952). For example the two larger hermits, which have curved bills, fed most frequently at the balisier *Heliconia bihai* (see also Snow and Snow 1973). The flower of this plant is situated in a bract at such an angle that straight-billed species cannot easily feed from it. The other four flower species visited frequently by hermits have curved corollas. A further example was the ruby topaz, whose bill is short. This was the species most frequently seen to feed from flowers whose corolla tube was less than 10 mm long, and it never fed from flowers more than 19 mm long.

Snow and Snow (1972) also noted that larger hummingbirds fed for longer than did the small species. Since it seems possible that hummingbirds which specialise in particular flower species might show a characteristic feed duration when offered unlimited food, an experiment was carried out to investigate the duration of feeds at artificial feeders by seven species of hummingbirds.

#### Methods

A total of 117 birds were timed at feeders at Mr. Peter Rapsey's house in Aripo Valley, Trinidad. The feeders are frequently replenished with red-coloured sugar solution at a concentration of approximately 100 gm per litre (0.55 molar). When a hummingbird arrives at a feeder it drinks with intermittent short pauses of less than one second. When measuring the duration of feeding the stopwatch was stopped during the

pauses so that a "feed" was the total time that the bill tip was under the surface of the solution. In some experiments the volume of solution in the feeders was measured at the beginning and end of the experiment.

#### Results

##### Duration of Feeds

The duration of feeds was similar for five species but shorter for two others. The mean feed duration was between 8.3 and 8.9 seconds for the rufous-breasted hermit, the white-necked jacobin, the black-throated mango, the blue-chinned sapphire, and the copper-rumped hummingbird. All these were statistically longer ( $p < 0.05$ ) than the feed duration of the white-chested emerald with a mean of 6.7 seconds or the little hermit with a mean of only 3.2 seconds. Field observations of the little hermit showed that it took shorter feeds from flowers than did other species. Snow and Snow (1972) show that all four of the smaller species mentioned feed on smaller flowers, so it is somewhat surprising that the feed durations of a comparatively small species like the copper-rumped hummingbird was just as long as that of the three larger species. These results are discussed further by Broom (1975).

##### Behaviour at Feeders

The behaviour of hummingbirds approaching a feeder or a flower-bearing plant also varies from species to species. The mango and the copper-rumped, which are also found in more open country, fly directly and rapidly to the food. All three hermit species fly close to the ground and make many brief pauses in their feeds from flowers or feeders. The hermits were easily displaced from feeders by other species. Several white-chested emeralds, a small species, sat on branches within two metres of a feeder for much of the time and attempted to drive off any individual visiting one feeder. They were seldom successful unless the intruder was of their own species or a hermit. Other species did not show such defence of a feeder unless they were interrupted while feeding from it. French (1973) describes the copper-rumped as an extremely aggressive species, but the black-throated mangoes were more vigorous in driving off others, at the Aripo Valley feeders.

##### Insect Food

Although hummingbirds are usually thought of as nectar feeders, almost all species also eat insects. In addition to the insects which must occasionally be eaten together with nectar, two different sorts of hunting methods are employed by species in Trinidad. The rufous-breasted

hermit gains much of its food by hovering by leaves and twigs and picking small insects from the surface. The other two hermits and other small species also feed in this way on occasion (Snow and Snow 1972). Some of the larger species catch insects in flight. French (1973) states that the black-throated mango "commonly hunts for insects in the open" and Snow and Snow confirm this. Observations on the brown violet-ear suggest that this species may depend predominantly on insects for food. An individual watched at the Aripo Valley feeding station on several different days rested near feeders, but rarely fed from them. Instead it made frequent short flights from its perch, caught an insect and returned. French also reports that this species shows fly-catching behaviour. A further fly-catcher technique has been observed by M. G. Hardy (personal communication). He watched a long-billed starthroat on many occasions at a stream in Maracas Valley hovering over the water surface in the same position for many seconds and apparently sucking in minute insects from the swarms over the water.

#### Responses to Salt

As a consequence of the observation by Bacon (1973) of a hummingbird in Colombia hovering over the sea and apparently drinking from it, further experiments were carried out at the Aripo Valley station to assess the responses of hummingbirds to salt. Firstly the birds were presented with a choice of water or colourless salt solution. The number of visits to each rapidly declined, but for 0.5 molar salt solution there was an indication that the visits were slightly longer than those to water (p 0.1 2-tailed binomial t-test). It thus seems possible that the hummingbird observed by Bacon might have drunk sea water for its salt content but there are other possible explanations (see Broom 1975). A further experiment was carried out in which hummingbirds were offered a choice of red-coloured sugar solution (0.27 molar) or that sugar solution with salt added. If the salt concentration was 0.07 molar or less the hummingbird did not discriminate between the two, but if it was 0.125 molar or more they drank much less from the feeders containing salt. Two human subjects presented with such solutions could not detect the presence of salt unless it was 0.25 molar.

There is much scope for further work on hummingbirds which could be carried out by any naturalist. Trinidad, with its variety of species and range of different sorts of habitats, is particularly suited to such studies.

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#### References

- Bacon, P. R. 1973: Hummingbird drinking sea water, *Auk*, 90, 917.
- Broom, D. M. 1975: Duration of feeds and responses to salt by hummingbirds at artificial feeders. *Condor*, (in Press).
- French, R. P. 1973: "A guide to the birds of Trinidad and Tobago", Livingston Publ. Co. Pennsylvania.
- Grant, K. A. & Grant, V. 1968: "Hummingbirds and their flowers", Columbia University Press.
- Stutch, A. F. 1952: Scarlet passion Flower. *Nature Mag.*, 45, 523-525 and 550.
- Snow, B. K. & Snow, D. W. 1972: Feeding niches of hummingbirds in a Trinidad valley, *J. Anim. Ecol.*, 41, 471-458.
- Snow, D. W. & Snow, B. K. 1973: The breeding of the hairy hermit *Glaucis hirsuta* in Trinidad. *Ardea*, 61, 106-122.
- Wolf, L. L., Hainsworth, F. R. & Stiles, F. G. 1972: Energetics of foraging, rate and efficiency of nectar extraction by hummingbirds. *Science*, 176, 1351-1352.

#### Appendix

| English and scientific names of birds in order mentioned |                                   |
|--|-----------------------------------|
| rufous-breasted hermit, hairy hermit                     | <i>Glaucis hirsuta</i>            |
| green hermit, Guy's white-tailed hermit                  | <i>Phaethornis guy</i>            |
| ruby topaz -   | <i>Chrysolampis mosquitus</i>     |
| white-necked jacobin, jacobin -                          | <i>Florisuga mellivora</i>        |
| black-throated mango -                                   | <i>Anthracothorax nigricollis</i> |
| blue-chinned sapphire, sapphire -                        | <i>Chlorestes notatus</i>         |
| copper-rumped hummingbird, common emerald -              | <i>Amazilia tobaci</i>            |
| white-chested emerald, white-breasted emerald -          | <i>Amazilia chionopectus</i>      |

|   |                                  |
|---|----------------------------------|
| little hermit, Longuemare's<br>hermit – | <i>Phaethornis longuemareus</i>  |
| brown violet-ear –                      | <i>Colibri delphinae</i>         |
| long-billed starthroat,<br>starthroat – | <i>Helio master longirostris</i> |

## ASPECTS OF THE ECOLOGY OF THE LIZARD

### *TUPINAMBIS NIGROPUNCTATUS*

by C. O. R. Everard (Trinidad Regional Virus  
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#### INTRODUCTION

The large diurnal terrestrial lizard *Tupinambis nigropunctatus* Spix. (*nigropunctatus* = black-spotted) belonging to the family teiidae is well enough known in Trinidad to be given two local names "Matte or Tegu". This animal is found on both Trinidad and Tobago (commonly known as "Salempenta" on Tobago) and ranges through northern South America mainly east of the Andes. Underwood (1962) gives the snout to vent measurement as 30 cm, and tail 60 cm; he describes the lizard as yellowish-brown in general colouration with black bands of irregular outline across the neck, trunk and tail. There is a black line behind the eye, and the limbs have dark irregular speckling. Da Cunha (1961) gives a more detailed anatomical description of *Tupinambis nigropunctatus*.

*Tupinambis* are relatively easy to catch alive and have been kept at the Trinidad Regional Virus Laboratory (TRVL) for several months. During the course of ecological studies on the mongoose, *Herpestes auropunctatus*, at the abandoned Waller Field air base, *Tupinambis* were noted frequently. Most of our field observations and trappings of these lizards were undertaken in this area. In addition, we have trapped *Tupinambis* at Chaguaramas, Aripo/Cumuto, Turure Forest (Guaico Valencia Forest Reserve), and Bush Bush Forest (Nariva Swamp) in northern Trinidad within the past 6 years.

#### MATERIALS AND METHODS

Within the period 20 October 1970 to 14 April 1972, trapping was conducted in different localities at the Waller Field base. Part of the trapping included a grid of 72 traps (8 rows of 9 traps per row) which



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