

he placed the species name in brackets indicating a hypothetical status. He mentioned August and September sight records for both coasts. We have seen 1 to 3 Least Terns on the following dates at the mouth of the Rio Los Esclavos, Santa Rosa Department: 2 and 4 May 1974, 24 April 1975 and 29 April 1976. An adult collected 24 April 1974 was identified by John Farrand, Jr. as *S. a. antillarum*, the race of central and eastern United States and of the Caribbean region.—ROBERT W. DICKERMAN, *Dept. Microbiology, Cornell Univ. Medical College, 1300 York Avenue, New York 10021. Accepted 20 Oct. 1976.*

Feeding behavior of two hummingbirds in a Costa Rican montane forest.—

Between the end of April and mid-June 1974, I made observations on hummingbirds feeding in primary forest between 1480 and 1680 m at Monteverde on the Pacific slope of the Cordillera de Tilaran of Costa Rica. At this level the forest is transitional between the Lower Montane Rain Forest and the Lower Montane Wet Forest (Holdridge, Life Zone Ecology, Tropical Science Center, San Jose, Costa Rica, 1967). Within the shade of this forest the 2 most abundant resident hummingbirds were the Purple-throated Mountain Gem (*Lampornis calolaema*) and the Guy's Hermit (*Phaethornis guy*). At Monteverde these 2 species largely overlap in habitat and altitudinal range, as they do elsewhere in their geographical range (Slud, *Bull. Am. Mus. Nat. Hist.* 128, 1964), but I observed no overlap in the flowers visited for nectar (Table 1). These hummingbirds also differ in size and proportion; the mean measurements, sexes combined, of Guy's Hermit are: weight 5.8 g (N = 3), wing 61 mm (N = 20), culmen 42.5 mm (N = 20) (Wetmore, *The Birds of the Republic of Panama, Part 2, Smiths. Misc. Coll.* 150, 1968). Those for the Mountain Gem, treating the sexes separately, are: female—weight 4.2 g (N = 2), wing 56 mm (N = 6), culmen 22.1 mm (N = 6); male—weight 5.6 g (N = 7), wing 63 mm (N = 7), culmen 21.4 mm (N = 6) (Feinsinger, *Organization of a Tropical Guild of Nectarivorous Birds*, Ph.D. thesis, Cornell Univ., Ithaca, N.Y., 1974 for weights quoted). In addition the Guy's Hermit has the typical curved bill of the hermits and the Mountain Gem a straight bill.

Except for 1 tree (*Quararibea* sp.) the feeding records were from vines, shrubs, herbaceous plants, or epiphytes (Table 1). With the exception of the epiphytes, the other plants appeared to be shade tolerant species growing and flowering under unbroken canopy or in the partial shade of mountain paths or very steep slopes. The herbaceous plants flowered at heights of 30–90 cm and the shrubs and vines at 0.6–6 m. Of the 2 epiphytes, *Columnnea magnifica* grew sparsely on trees just below canopy level and continued to grow and flower in partial shade on fallen trees; whereas the epiphytic heath (Thibaudiae) grew in large clumps locally dominating its host tree and enjoying full sunlight, but was not seen flowering on fallen trees in partial or heavy shade.

Guy's Hermits were feeding at 3 levels, between 30 and 90 cm when feeding at herbaceous plants, between 1.5 and 2 m when feeding at vines, and just below the canopy at 12–18 m when feeding at the epiphyte. The Mountain Gem fed at shrubs between 60 cm and 6 m, at the epiphyte between 6 and 10.5 m, and at the *Quararibea* tree between 12 and 15 m.

I defined a feeding record as a bout of feeding by an individual hummingbird at 1 plant species. The actual number of flowers visited in a feeding bout varied greatly depending on flower size; thus a record of Guy's Hermit feeding on *Drymonia conchocalyx* would consist of probes into 2 or 3 flowers, while a record of a Mountain Gem at *Palicourea* typically consisted of probes into 20 or more flowers. To attempt to adjust the data to number of flowers visited would distort the results because some nectar

TABLE I
FLOWER CHARACTERISTICS AND HUMMINGBIRD FEEDING RECORDS

	Plant form	Color	Corolla length ¹ (mm)	Width (mm)	<i>Lampornis calolaema</i>		<i>Phaethornis guy</i>
					♂	♀	
Gesneriaceae							
<i>Drymonia conchocalyx</i>	vine	dark pink	56	10		1*	4
<i>Drymonia</i> sp.	vine	orange	38	8			1
<i>Alloplectus tetragonus</i>	herb	red	44	6			1
<i>Besleria formosa</i>	shrub	orange	16	6	2	15	
<i>Campanaea humboldtii</i>	vine	green	—	6		3	
<i>Columnnea magnifica</i>	epiphyte	orange	28	4.5			1
Rubiaceae							
<i>Cephaelis elata</i>	shrub	white†	17	2.0	7	4	
<i>Palicourea lasiorrhachis</i>	shrub	yellow	14	2.5	13	9	
Lobeliaceae							
<i>Centropogon solanifolius</i>	herb	red	43	7.5			2
Musaceae							
<i>Heliconia tortuosa</i> ‡	herb	yellow†	34	4.0			2
Bombacaceae							
<i>Quararibea</i> sp.	tree	white	23	2.0	11		
Ericaceae (Thibaudiae)							
	epiphyte	pink	19	3.0	3	2	
				Total	36	34	11

* Corolla pierced.

† Red bracts.

‡ Taxon H-5 (Stiles 1975).

¹ Corolla lengths measured are the distance from the opening of the corolla tube to the nectar chamber. One typical corolla measured from each species.

sources were more scattered than others and a feeding hummingbird in the forest is more quickly lost to view when feeding on scattered flowers than on the more concentrated ones.

Except for the record of the Mountain Gem piercing the corolla of *Drymonia conchocalyx*, no other hummingbirds were seen feeding at the flowers exploited by the Guy's Hermit within the 1480–1680 m altitudinal limits. Below these altitudes the Violet Sabrewing (*Campylopterus hemileucurus*) commonly fed at *Heliconia tortuosa* and the Stripe-tailed Hummingbird (*Eupherusa eximia*) occasionally did so.

There was more competition for the flowers exploited by the Mountain Gem. The larger clumps of the epiphytic heath were dominated by the Fiery-throated Hummingbird (*Panterpe insignis*), and the Slaty Flower-piercer (*Diglossa plumbea*) also fed at it. The Stripe-tailed Hummingbird was the only other hummingbird seen exploiting any of the nectar sources of the Mountain Gem listed in Table 1. I have 3 records of it feeding at *Palicourea lasiorrhachis*; 2 were below 1480 m. Feinsinger (op. cit.) frequently recorded

the Mountain Gem below 1480 m where it defended high density nectar sources in more open habitats of secondary growth and forest edge and competed with several other hummingbird species. The flowers it visited were all different from those listed in Table 1.

There are several differences between the flowers exploited by Guy's Hermit and the Mountain Gem. The 6 hermit flowers are larger, with an average corolla length of 44 mm and a width at the base of the corolla of 7.2 mm. The corollas are curved and colored either orange, red, or dark pink (in *Heliconia tortuosa* the corolla is yellow but the flower is embedded in a red bract). The color of the 6 species at which the Mountain Gem fed are more varied and include pink, orange, yellow, white, and green. The corollas are all straight rather narrow tubes with an average length of 18 mm and a basal width of 3.1 mm. The vine *Campana humboldtii* is an exception and not included in the above average; its corolla is a large open bell with a width of 30 mm at the mouth. The Mountain Gem feeds at this flower with its whole head inside the bell.

These differences in feeding niche between the Guy's Hermit and the Mountain Gem are generally similar to the differences in Trinidad between the Guy's Hermit and the Blue-chinned Sapphire (*Chlorestes notatus*), a straight-billed forest hummingbird slightly smaller than the Mountain Gem (Snow and Snow, J. Anim. Ecol. 41:471-485, 1972).

Guy's Hermits were not seen defending nectar resources and are evidently "trapline" feeders as are other hermit hummingbirds that have been studied (Stiles, Ecology 56: 285-301, 1975). Mountain Gems, on the other hand, were frequently seen defending their nectar resources against conspecifics. Since the sexual difference in plumage is apparent in this species before the young leave the nest (Skutch, Publ. Nuttall Ornithol. Club 7, 1967) it was possible to separate with certainty the feeding records of the sexes.

The differences in the feeding niches of the sexes (Table 1) reflect the male's dominant behavior over the richer resources. *Quararibea* sp., a tree reaching canopy level, was a concentrated source over which males held feeding territories; they also held territories at the smaller patches of the epiphytic heath, the larger patches being dominated by the Fiery-throated Hummingbird, and at the shrub *Palicourea lasiorrhachis*. *Palicourea*, growing to 6 m with an abundance of small flowers, is the biggest of the 3 shrubs at which I recorded the Mountain Gem feeding and the one over which males most frequently held territories. *Palicourea lasiorrhachis* grows in 2 forms; both have similar yellow corollas, but 1 form, common between 1400 and 1540 m, has a red calyx and pedicel; the other form, not noted growing below 1530 m and generally a smaller plant, has a green calyx and pedicel. Nine of 13 records of male Mountain Gems feeding at *Palicourea* were from the red-calyxed form, but only 4 of 9 records of females feeding at *Palicourea* were from this form and 2 of these appeared to be permitted intrusions by a male into his territory (see below). *Besleria formosa* is a much smaller shrub than *Palicourea*, growing to only 90 to 120 cm, and is thinly scattered through deeply shaded forest; typically each shrub has between 4 and 8 open flowers at one time, but more where it grows at path edges. Exploited largely by females, individual shrubs were re-visited on an average of every 10 min. Between feeding circuits females usually perched near one of the larger clumps of *Besleria* from which conspecifics were driven off.

Periodically during a bout of aerial nectar extraction, both male and female Mountain Gems perch to feed at one particular flower, and re-perch at the same flower at each subsequent visit. This was noted when they were feeding at *Besleria*, *Quararibea*, and the epiphytic heath. Skutch (op. cit.) also noted this behavior of Mountain Gems feeding at epiphytic heaths. Observations on the insect searching strategy of Mountain Gems produced 2 records of males hawking for aerial insects from their territorial perches 6 to 12 m up, and 2 records of females searching amongst very dense vegetation, presumably for resting insects, once in the herbaceous layer at 60 to 120 cm and once in the foliage

of a small tree at 3 to 6 m. On each occasion the female's wings were audibly hitting the leaves as she hovered amongst them.

While Skutch (op. cit.) has described the nesting of the Mountain Gem and once observed a young male, still being fed by his mother, who was persistently singing a very faint song, he has never heard song from adult males or observed any other courtship activity. During my observations both male and female Mountain Gems were usually silent except for occasional flight notes uttered during longer flights between nectar sources. But on 11 June I observed a male briefly uttering an insect-like song from a perch beside a *Palicourea* shrub at which it was periodically feeding. Another observation suggested that there may at times be a sharing of nectar resources between the sexes. Between 11:40 and 12:00 on 13 June I watched a male Mountain Gem which held a feeding territory over 3 flowering *Palicourea* shrubs. During this time he was observed both feeding at the shrubs and chasing off a female from them; then at 12:00 a female came to one of the *Palicourea* shrubs and began to feed, and between each probe she uttered a short call which I transcribed as *trrrt*. While she fed, the male was perched immediately below her on the same perch he had been using the previous 20 min. He remained perched there throughout the female's feed and once uttered an answering *trrrt*. The only other occasion when this call was heard was earlier on the same day when a female, feeding at the same *Palicourea*, was noted as uttering the call between each feeding probe.

Interpretation of this behavior on a single observation would be premature, but it suggests that males may have a special relationship with particular females, and may allow them to share the nectar in their feeding territories. Wolf and Stiles (Evolution 24:759-773, 1970) found that male Fiery-throated Hummingbirds allowed females with whom they mated to feed within their defended territory.

I acknowledge with thanks financial assistance from the Frank M. Chapman Memorial Fund of the American Museum of Natural History. I should also like to thank Dr. Luis Poveda and Dr. Richard Baker for botanical identifications.—BARBARA K. SNOW, *Old Forge, Wingrave, Aylesbury, Bucks, England. Accepted 12 Oct. 1976.*

Black-legged Kittiwakes nesting on snowbank.—On 4 July 1975 we found 20 nests of the Black-legged Kittiwake (*Rissa tridactyla*) being built on a snowbank at St. Paul Island, Pribilof Islands, Alaska (Fig. 1). The snowbank, approximately 10 m high, 100 m long and sloping at an angle of 75°, was blocking access to an area of south-facing cliff just east of Southwest Point. More Black-legged Kittiwakes and several other species of seabirds were nesting on the cliffs on either end of the snowbank.

The nests on the snowbank were not noted on 28 June, the date of the previous visit to the area. During the next 10 days after 4 July, the nests disintegrated and fell as the snow melted. No eggs were seen nor were the adults noted incubating. These nests were built relatively late in the breeding season, as the first eggs of this species on the island were seen on 27 June. On 7 July 85% of the Black-legged Kittiwake nests in a nearby study area were being incubated.

It is unclear whether this use of a snowbank as a nest substrate was the result of site tenacity on the part of the kittiwakes or of the lack of suitable alternative nest sites. Sealy (Auk 92:528-538, 1975) discusses a similar situation in which Least Auklets (*Aethia pusilla*) and Crested Auklets (*A. cristatella*) on St. Lawrence Island laid eggs on snow. Snow nesting of the auklets was restricted to those birds faithful to nesting habitat that remained snow covered until mid-July. Belopol'skii (Translated from Russian book *Akademiya Nauk SSSR, Karelskii filial*. U.S. Dept. of Commerce 61-11487, p. 118, 1957) states that Herring and Great Black-backed gulls (*Larus argentatus* and *L. marinus*)