Ecology of Volcán Chiles - high-altitude ecosystems on the Ecuador-Colombia border

Pebble & Shell - Espeletia giant rosette plants are reliable biological indicators of time since fire in Andean grasslands

Variability in nectar supply: implications for high-altitude hummingbirds

Sam Woods* and Paul M. Ramsay
Department of Biological Sciences, University of Plymouth, Plymouth, PL4 8AA, UK
*Current Address: 16 Gravel Hill, Leatherhead, Surrey, KT22 7HG, UK

SUMMARY

The relationship between hummingbird activity and nectar production by *Puya hamata* was investigated in a high-altitude páramo on the Ecuador-Colombia border. Bird behaviour was recorded and nectar sampled in a small plot containing 16 *Puya* plants. Nectar concentration and sugar mass, but not volume, of *Puya* flowers were temporally variable, with distinct morning and afternoon peaks. Nectar production varied significantly between flowers but not between plants. Perching frequency correlated with nectar sugar concentration, but other aspects of behaviour—including territorial activities like chasing—were unrelated to nectar quality. It is suggested that hummingbirds at high altitudes may be flexible foragers and less dependent on particular nectar sources than hummingbirds at lower altitude, despite being strongly resource-limited overall. Agricultural burning of the páramos may alter the distribution patterns of hummingbird food plants. This, in turn, may change the competitive balance between hummingbird species and the foraging strategies they adopt.

RESUMEN

Se investigó la relación entre la actividad de colibríes y la producción de néctar de *Puya hamata* en un páramo de gran altitud en la frontera Ecuador-Colombia. Se registró el comportamiento de las aves y se realizaron muestreos de néctar en una pequeña parcela que contenía 16 plantas de *Puya*. La concentración, mas no el volumen, del néctar y la cantidad de azúcar variaron con el tiempo, presentándose picos claros de producción en la mañana y en la tarde. La producción de néctar varió significativamente entre flores mas no entre plantas. La frecuencia en encaramado (percheo) estuvo correlacionada con la concentración de azúcar en el néctar, pero otros aspectos del comportamiento—incluyendo actividades territoriales como la persecución—no guardaron ninguna relación con la calidad del néctar. Se sugiere que los colibríes de gran altitud pueden ser forrajeros flexibles y menos dependientes de fuentes particulares de néctar que los colibríes de menores altitudes, a pesar de estar, en general, fuertemente limitados por recursos. La quema agrícola de los páramos puede alterar los patrones de distribución de las plantas de alimentación de los colibríes. Esto, a su vez, puede alterar el balance competitivo entre las diferentes especies de colibrí y las estrategias de forrejeo que éstas adoptan.

Key words: foraging strategies, Colombia, Ecuador, páramo

INTRODUCTION

Hummingbirds (Trochilidae) are often resource limited and feed almost exclusively on nectar, with few alternative sources of food (Feinsinger and Colwell 1978, Wolf and Gill 1986, Wiens 1989). Insects provide an important additional source of vitamins, proteins, fatty acids and other essential elements of their diet (Wolf and Gill 1980, Baltosser 1989), but insect- catching comprises just 3% of time budgets at high altitudes (Hainsworth and Wolf 1976, Wolf *et al.* 1976, Wolf and Gill 1986). Nectar sugar is the primary source of energy for hummingbirds (Wolf and Gill 1986).

This dependence on nectar results in close association between behaviour and nectar availability (Feinsinger and Colwell 1978, Wolf and Gill 1986, Wiens 1989), and hummingbirds are responsive to resource variation (Gass and Lertzman 1980, Wolf and Gill 1986, Wiens 1989). Foraging behaviour is reported to be unaffected by predation which occurs mainly at the nestling stage (Carpenter 1978, Wolf and Hainsworth 1983, Baltosser 1986).

Nectar availability is not uniform but often varies spatially and temporally (Feinsinger 1978, Wolf 1978, Feinsinger 1983, Feinsinger *et al.* 1985, Trevelyan 1995). There is often a bi-modal pattern of diurnal production, with distinct morning and afternoon peaks (Stiles 1975), and consequent variations in the levels of hummingbird activity (Hixon *et al.* 1983, Powers and McKee 1994).

Five principal foraging strategies have been identified in hummingbird communities (Feinsinger and Colwell 1978) which maintain positive energy budgets—where energetic benefits exceed energetic costs. *High-reward trapliners* follow a repeated foraging circuit among successive dispersed flowers (trapline), specializing in nectar-rich flowers but do not defend them. *Territorialists* defend dense clumps of smaller flowers, usually with lower nectar production per flower. *Low-reward trapliners* are excluded from clumped flowers by territorialists and follow a trapline of moderate to low nectar-producing flowers. *Territory parasites* steal nectar from clumped flowers defended by resident territorialists, while *generalists* both trapline and steal nectar from defended flowers. The strategy adopted by a particular individual may be flexible and depends on three factors (Feinsinger and Colwell 1978):

- the distribution and relative abundance of nectar sources
- the morphology of the bird which constrains its feeding options, *e.g.*, high-reward trapliners tend to feed on flowers with distinctive corolla morphology which in turn is reflected in the bill morphology of the birds themselves
- competition from other individuals of the same or different species for the rewards.

Most studies have been performed on lowland hummingbird communities (e.g., Wolf and

P.M. Ramsay (ed.), 2001, *The Ecology of Volcán Chiles: high-altitude ecosystems on the Ecuador-Colombia border*. Plymouth: Pebble & Shell. Pp. 209-217.

Description: -
-
Violin music -- History and criticism.
Violin -- Methods.
Jesus Christ.
Mary, -- Blessed Virgin, Saint.
AIDS (Disease) -- Treatment.
Mental health services.
Substance abuse -- Treatment.
Minorities -- Medical care -- United States.
Transcultural medical care -- United States.
Zen priests -- Korea -- Biography
Zen priests -- China -- Biography
Spiritual life -- Zen Buddhism
Health insurance -- United States.
Library signs.
Biotic communities -- Chiles Volcano (Ecuador and Colombia)
Mountain ecology -- Chiles Volcano (Ecuador and Colombia)ecology of Volcán Chiles - high-altitude ecosystems on the Ecuador-Colombia border
-ecology of Volcán Chiles - high-altitude ecosystems on the Ecuador-Colombia border
Notes: Includes bibliographical references.
This edition was published in 2001

Tags: #Pollinator #response #to #within

Impacts of climate change on the aquatic flora of Lagunas Verdes,

Chiles Volcano, Ecuador

Chiang Mai Journal of Science 41 5. Publicaciones del Herbario QCA, Pontificia Universidad Católica del Ecuador, Quito.

Fire regimes and pollinator behaviour explain the genetic structure of Puya hamata (Bromeliaceae) rosette plants

In Heyer W R, Vanzolini P E eds Proceedings of the Neotropical Biotic Distribution Pattern Workshop. Local and regional palm Arecaceae species richness patterns and their cross-scale determinants in the western Amazon.

Pollinator response to within

Journal of Ethnopharmacology 123: 335—342. Wuchsformuntersuchungen im Páramo Costa Ricas.

BG

This is the only place on the equator where snow can be found on the ground. The study was carried out in the páramo grasslands of El Ángel and Volcán Chiles, in northern Ecuador near the border with Colombia.

Searching for Altitudinal Zonation: Species Distribution and Vegetation Composition in the Superpáramo of Volcán Iliniza, Ecuador, Plant Ecology

Co-editor of Botanica Austroecuatoriana — Estudios sobre los recursos vegetales en las provincias de El Oro, Loja y Zamora-Chinchipe. Aarhus University, 30 March 2004. Paleoecology of volcanic soils in the Colombian Central Cordillera Parque Nacional Natural de Los Nevados.

Henrik Balslev

About 45 % of this area is covered by peatlands Iturraspe, 2012 while little is known about these ecosystems because of their poor accessibility Iturraspe, 2012. This study aims to assess carbon and nitrogen concentrations in soil and vegetation, aboveground carbon stocks distribution and soil organic carbon stocks along an altitudinal range in the páramo region in the Ecuadorian Andes.

Related Books

- Ali Baba aur chalis chor
- Çağdaş Türk resminde minyatür etkileri
- Musica et Scolica enchiriadis, una cum aliquibus tractatulis adjunctis
- Some geographical problems of land use in West Africa
- On zymotic and preventable diseases.