OBSERVATIONS OF PARROTS AT A GEOPHAGY SITE IN BOLIVIA

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Abstract

Geophagy, or soil ingestion, is known from a wide range of animal taxa but is particularly common among macaws and parrots in the family Psittacidae. Current theory suggests that Neotropical parrots ingest soil to neutralize toxins in food such as seeds and unripe fruit and as a mineral supplement. Here, we document the occurrence of geophagy at a site in lowland forest in Bolivia. We recorded six species of parrot with a maximum of 1,044 birds on any one day. *Aratinga weddellii, Pionus menstruus* and Ara *severa* (maxima of 654, 337 and 108 birds respectively) were the most numerous species visiting the site. We recommend that the Valle de la Luna be afforded formal protection by incorporating the site into the nearby Parque Nacional Carrasco.

Key words: *geophagy, parrots, Psittacidae, lowland forest, Bolivia.*

Resumen

Geofagia, o consumiendo suelo, es conocido en un gran variedad de grupos de animals, pero es particularmente común entre las gucamayas y los loros de la familia Psittacidae. La teoría en curso sugere que los loros Neotropicales comsumen suelo para neutralizar toxinas en la dieta como semillas y frutas inmaduras y como suplemento mineral. Aqui, documentamos el acontecimiento de consumiendo suelo a un sitio en la selva de tierra-baja en Bolivia. Recordamos seis especies de loro con un maximo de 1,044 aves en un día. *Aratinga weddellii, Pionus menstruus* y Ara *severa* (con maxima de 654, 337 and 108 aves por cada una) estaban las especies mas numerosas que visitaron esto sitio. Recomendamos la protección formal para el Valle de la Luna por incorporando esto sitio en el Paque Nacional Carrasco.

Palabras-clave: *geofagia, gucamaya, loro, Psittacidae, selva de tierra-baja, Bolivia.*

Introduction

Geophagy, or soil ingestion, has been reported from a wide range of vertebrate and invertebrate taxa (reviewed in Abrahams & Parsons 1996, Jones & Hanson 1985, Klaus & Schmid 1998, Diamond et al. 1999). Within birds, geophagy has been described from observations of pigeons, cracids, grouse, hornbills, cassowaries and corvids (Prendergast & Boag 1970, Diamond et al. 1999), but is particularly well known to occur among species of the family Psittacidae (Diamond et al. 1999, Gilardi et al. 1999). Hypotheses proposed to explain the function of geophagy include soil as an aid to digestion, as a buffer against acids, as a mineral supplement, as an aid in the adsorption of dietary toxins, and in gastrointestinal cytoprotection (Diamond et al. 1999, Gilardi et al. 1999). Studies of some parrots in Peru suggest that geophagy may be important in the adsorption of toxins produced by plants as a defence against herbivory (Gilardi et al. 1999) and as a sodium supplement (Brightsmith & Aramburé 2004).

Although parrots are widespread throughout much of the Neotropics, little information has been published on geophagy sites attracting large numbers of species apart from the well-known sites in southeast Peru (Burger & Gochfeld 2003, Brightsmith 2004, Brightsmith & Aramburé 2004). Likewise, the importance of geophagy sites for the conservation of the parrot species utilizing them is also poorly known. However, parrots may be especially vulnerable to disturbance and trapping at or near such sites as birds often congregate in large numbers. Thus, the identification and protection of such sites should be considered as a component of conservation planning for parrots and macaws in the Neotropics. Here we report on an important and previously undescribed geophagy site for parrots in Bolivia.

Materials and Methods

The site, locally know as the Valle de la Luna, was located on the east side of the Río Leche, 0.5-1km north of the northern boundary of Parque Nacional Carrasco (PNC), Dpto. Cochabamba, Bolivia (17°17'58S; 65°45'83W). The Valle de la Luna, or Valley of the Moon, is an extensive, flat, largely unvegetated area at 450m above sea level, bounded by the Río Leche to the west, and by steep cliffs and primary forest to the east (Fig. 1). The valley floor was composed of accumulated layers of a soft cement-like material, presumably as a result of the run-off of rain from the cliffs. The topography of the cliffs, up to 50m in height, gave the valley an 'amphitheatre' shape. A ridge radiated out from the cliff, bisecting the 'amphitheatre'. The cliffs and ridge were heavily sculpted, forming bizarre and beautiful stalactite-like formations. Although these formations may be largely due to weathering such as the frequent tropical downpours, the presumably long-standing effects of parrot geophagy may have also been important in shaping the cliffs. Although the geological composition of the cliffs themselves was unknown, the exposed rock on which birds apparently feed was soft and friable. During our brief visit we also witnessed the effects of torrential rain on the valley. Where previously the valley had been completely dry, a number of fast-flowing streams ran from the cliffs to the nearby Río Leche. These streams had the dramatic effect of turning the river white and milky (giving the Río Leche its local name). Upstream of the Valle de la Luna, the Río Leche remained clear and uncolored. In the aftermath of such rains and the subsequent subsidence of the Río Leche, many small dead fish were found downstream of the Valle de la Luna. This event seemed to be the result of poisoning by toxins in the floodwater run-off from the cliffs. Alternatively, fine particles from the site may kill fish by clogging their lungs causing asphixiation (D. Brightsmith pers. comm.). Local communities confirmed that such 'poisoning' was a regular occurrence and that the water was not fit for human consumption.

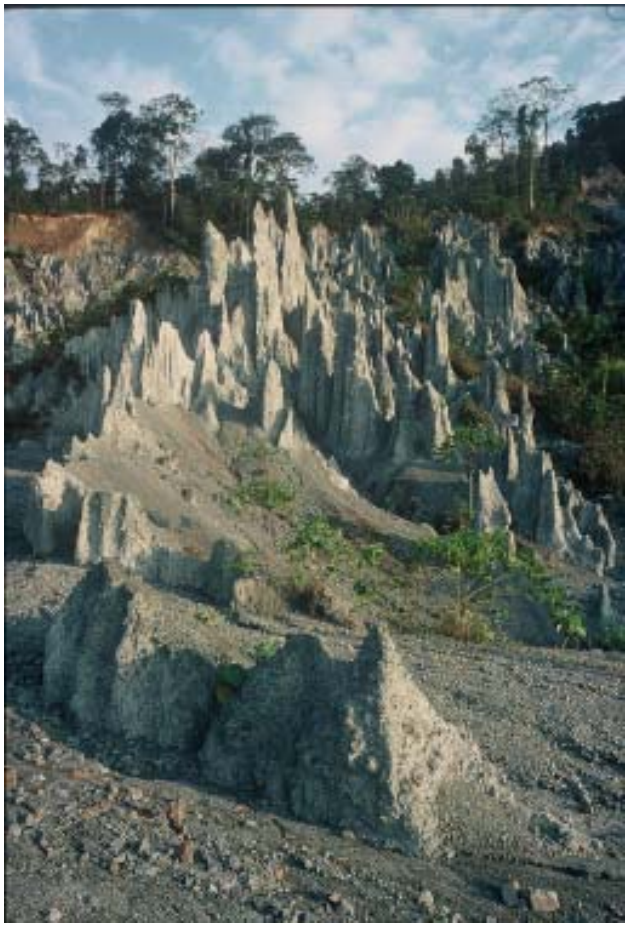

Figure 1. The Valle de la Luna geophagy site, Cochabamba Department, Bolivia.

We recorded birds visiting the Valle de la Luna geophagy site over nine days from September 25–October 8, 1998. During the period of observation birds visited the site in the early morning only (observations were made throughout the day on a casual basis confirming that birds

did not visit the site at other times). Thus, systematic observations were confined to this time period. At least two observers were in place by first light before the first birds arrived and, in most cases, remained until all birds had departed from the site. Parrots were identified to species by a combination of visual observations and vocalizations. Observers were positioned under cover of a small patch of riparian scrub 200-300m from the main cliffs with a clear view of the geophagy areas. Despite this, not all birds that alighted on the cliffs could be counted accurately because of fissures that hid some birds. Although birds occasionally took flight en masse, it was difficult to get a completely accurate figure of their numbers because some birds may have been double-counted (eg. when birds circled around for some time before re-alighting). We found the most reliable method of estimating bird numbers was counting all birds as they flew in to the site on arrival and again on departure. Birds departing were distinguished from birds that were temporarily flushed, as the former flew low and fast directly away from the site out of view while the latter circled for some time before re-alighting. Birds were identified visually on arrival with the aid of 10x50 binoculars and, on the cliff, with x30 telescope. We then recorded the following data: species, group size (flocks), time of arrival and departure, as well as weather conditions at the beginning and end of the observation period.

Results

Birds began to arrive at the Valle de la Luna site soon after daybreak (earliest 0605hrs) and the highest counts of birds at the site were between 0600-0800hrs. By mid-morning most birds had left the site and few birds were ever recorded after this time. Interestingly, almost all birds observed arriving at the site came from a west or northwest direction. We recorded six species of parrot feeding at the Valle de la Luna site. Numbers varied widely from day to day with a maximum one-day total of 1,044 birds (Table 1).

The most common species of macaw was Ara severa (39-108) while Aratinga weddellii was the most numerous parrot species (140-654) visiting the site. A. weddellii (mean=378, ± SD 142.0) and Pionus menstruus (mean=267, ± SD 70.9), and to a lesser extent A. severa (mean=53, ± SD 27.5), dominated totals recorded on all dates, comprising 57.7%, 29.7% and 9.5% of species maxima summed across all dates (Table 1). On the date of the maximum count, A. weddellii (63%) accounted for over half all bird recorded. While the smaller parrots arrived at the site from daybreak onwards, the two large macaws, Ara ararauna and Ara chloroptera arrived when most other parrots were already at the site. Although another parrot, Amazona farinosa, was common in the Río Leche-Sajta area, the species rarely visited the Valle de la Luna site and was never seen to actively feed on the cliffs. Based on the maximum counts of all species, up to 1,134 macaws and parrots utilized the site during the observation period. Apart from parrots, the only other bird species observed at the geophagy site was Penelope jacquacu, although this guan was not observed feeding at the site.

Discussion

We observed up to, and occasionally over, a thousand parrots visiting the geophagy site at the Valle de la Luna. Parrots arrived at the site soon after daybreak with numbers peaking in the early-mid morning. This suggests that most parrots at this site probably ingested soil before leaving off foraging for food. Although the numbers of parrot varied widely from day to day, the site appears to be used regularly (verified by the local PNC park-guard at the nearby community of Israel). No other geophagy sites were found during a two-month assessment of bird diversity in PNC (Mee et al., unpublished data) although another site, apparently similar in appearance to the Valle de la Luna, was visible from the Río Leche-Israel track, at a higher elevation and several kilometers away, within PNC. All parrots recorded visiting the site were primarily species of lowland forest,

Table 1. Parrots recorded during timed observations at Valle de la Luna, Dpto. Cochabamba, Bolivia, from September 25–October 8, 1998.

Species	Numbers of Parrots									
	25 Sep	Sep 30	1 Oct	2 Oct	3 Oct	4 Oct	5 Oct	7 Oct	8 Oct	∑max indiv*
Ara ararauna	4+	nc	7	23	8	8	3	0	5	23
Ara chloroptera	0	6†	3	1	0	3	0	2	2	6
Ara severa	50+	nc	50+	39	39	42	48	42	108	108
Aratinga weddellii	350	nc	140	309	407	654	414	358	395	654
Pionus menstruus	250+	nc	212	159	277	337	329	222	335	337
Amazona farinosa	0	nc	0	0	6	0	0	0	0	6
Daily totals	650+		412+	531	737	1,044	794	624	845	1,134

much of which had been heavily degraded or cleared to the west and north of the site in recent years. While lowland forest on the east bank of the Río Leche appeared to be largely pristine, forest clearance on the west side of the river had advanced to within 0.5km of the Valle de la Luna by 1998. It is likely that further forest clearance in or near the Valle de la Luna itself would have a detrimental effect on use of the site by parrots. Macaws in particular used nearby trees before flying down to feed at the Valle de la Luna site and as a retreat when disturbed. More importantly, disturbance by humans would have a negative effect on feeding patterns and could result in the abandonment of the site if disturbance levels are high and persistent. Further, the increasing presence of humans and knowledge of the site is likely to result in increasing effort to trap birds for the wild-bird trade. This had already taken place at the site in the past (per PNC park-guards) but is likely to be more important as settlers encroach on the site. However, the site is within one kilometer of the PNC boundary. Thus, we strongly recommend that the Valle de la Luna site be incorporated into PNC. The need for protection of this site is underlined by the fact that a population of the globally threatened Horned Curassow Pauxi unicornis was discovered in forest within 5klm of the Valle de la Luna geophagy site (Mee 1999) but had apparently been exterminated by hunting within just 5 years (R. McLeod in litt.). Formal protection would be possible by relocating the PNC boundary to the east of the Río Leche to include the site. As there were, as yet, no settlers or forest clearance in the immediate area of the Valle de la Luna site to the east of the Río Leche in 1998, this could be done without conflict with local people. Such action would formally protect, at least on paper, an important geophagy site for lowland forest parrots in eastern Cochabamba Department.

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