The consumption of soils by birds, technically called geophagy, is widely reported in the literature (Abrahams and Parsons 1996, Diamond et al. 1999), particularly from Neotropical parrots and boreal carduelines, this is the first report of this behavior from birds in the Caribbean. Based on the known ecology of this crossbill and published reports of local soil characteristics, I suggest testable hypotheses on why soils may be ingested by this species, including the crossbills’ need for dietary salts and their need to detoxify the pine seeds which are their main diet items.

Key words: calcium, crossbills, diet, geophagy, Hispaniola, Loxia megaplaga, soil, toxicity

The consumption of soils by birds, technically called geophagy, is widely reported in the literature (Abrahams and Parsons 1996, Diamond et al. 1999), particularly from Neotropical parrots (Burger and Gochfeld 2003, Brightsmith and Muñoz-Najar 2004, Valdés-Peña et al. 2008). But the phenomenon is also known in temperate zones, especially among boreal carduelines including Red Crossbills (Loxia curvirostra; Benkman 1992). In both of these northern crossbills, the taking of grit from the base of trees and road cuts, and the consumption of salt spread on roads in winter is a well-known phenomenon (Benkman 1992, Adkisson 1996), but these activities have not been well studied or understood.

On 16 February 2007, while co-leading a tour group in the Aceitillar sector of the Sierra de Bahoruco National Park (18°07' N, 71°33’ W), we ascended the mountains to the pine zone at about 1,100 m elevation. Failing to find Hispaniolan Crossbills (Loxia megaplaga), one of our target species, at some of the more regular locales, such as an open water source, we proceeded to walk through adjoining pine forest listening for the telltale calls of the species. Finally, while making our way through regenerating pine along an abandoned access road to a bauxite test mine, we came across an apparent family group of an adult male, adult female, and three juveniles. Such groups are commonly seen together following breeding, which generally extends from December to April but may occur year-round (Latta et al. 2006). The birds were first heard quietly calling back and forth in mature Hispaniolan pines (Pinus occidentalis) of about 15–20 m in height, but the birds slowly descended to

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Abstract: I report an observation of endangered Hispaniolan Crossbill (Loxia megaplaga) feeding on soils near abandoned bauxite mines in the Sierra de Bahoruco, Dominican Republic. Although geophagy has been widely reported from a number of bird taxa, especially Neotropical parrots and boreal carduelines, this is the first report of this behavior from birds in the Caribbean. Based on the known ecology of this crossbill and published reports of local soil characteristics, I suggest testable hypotheses on why soils may be ingested by this species, including the crossbills’ need for dietary salts and their need to detoxify the pine seeds which are their main diet items.

Key words: calcium, crossbills, diet, geophagy, Hispaniola, Loxia megaplaga, soil, toxicity

Resumen: OBSERVACIÓN DE GEOFAGIA EN Loxia megaplaga EN UNA MINA DE BAUXITA ABANDONADA. Observé a Loxia megaplaga, especie amenazada de La Española, alimentándose de barro cerca de minas de bauxita abandonadas en la Sierra de Bahoruco, República Dominicana. Aunque la geofagia ha sido registrada ampliamente en numerosos taxones de aves, especialmente en loros y carduelíños boreales, este es el primer registro de esta conducta en el Caribe. Basado en el conocimiento de la ecología de esta especie y en los registros publicados sobre las características de los suelos locales, sugiero una hipótesis comprobable de por qué ingieren barro estas especies que incluye la necesidad de suplementos de sales y de detoxificar las semillas de pino que constituyen el principal artículo de su dieta.

Palabras clave: calcio, dieta, geofagia, La Española, Loxia megaplaga, barro, toxicidad

Résumé : OBSERVATION D’UN BEC-CROISÉ D’HISPANIOLA (Loxia megaplaga) PRÉSENTANT UN COMPORTEMENT DE GÉOPHAGIE DANS UNE MINA DE BAUXITE ABANDONNÉE. Un Bec-croisé d’Hispaniola (Loxia megaplaga) a été observé mangeant de la terre à proximité des minas de bauxite de la Sierra de Bahoruco, en République dominicaine. Bien que la géophagie soit bien connue chez de nombreux oiseaux, notamment chez les perroquets néotropicaux et les carduelins boréaux, il s’agit de la première mention d’un tel comportement concernant des oiseaux de la Caraïbe. Compte tenu de l’écologie de ce Bec-croisé et des données publiées sur les caractéristiques locales du sol, des hypothèses vérifiables sont proposées pour expliquer l’ingestion de terre par cette espèce, incluant la recherche de sels alimentaires et le besoin de détoxicification vis-à-vis des graines de pin qui constituent l’élément principal de son régime alimentaire.

Mots clés : Bec-croisé, calcium, géophagie, Hispaniola, Loxia megaplaga, régime alimentaire, sol, toxicité
young pines, and finally dropped down to the ground, with the adult male preceding the others. On the bare ground, the crossbills could be seen repeatedly scraping the reddish soil with their beaks, and then apparently ingesting the soil, before scraping more at the ground. Although the ground was liberally covered with dry pine needles, little vegetation grows on these sites, and in patches there are no needles at all, leaving exposed patches of generally hard, red soil.

The Aceitillar sector of Sierra de Bahoruco National Park has been widely disturbed for the extraction of bauxite since the 1960s. Large open pit mines, small test pits, and access roads are now a near-permanent part of the landscape. When several mines were closed, the area was graded and terraced, and plugs of natural vegetation and exotic trees were planted. While the vegetation on the mines has mostly survived for > 25 yr, it remains stagnant and rarely spreads beyond the original plug. The ground remains hard and only permits very slow revegetation, most frequently in the smaller pits where erosion provides new topsoil more amenable to plant growth. Most often this revegetation resembles in structure and species diversity the surrounding forest, which is dominated by Hispaniolan Pine; the only other common tree is the palm Coccothrinax scoparia. In some areas, particularly those disturbed by roadcuts, burning, or natural forces, Trema lamarcckiana may be prominent. A well-developed shrub layer is present, and common broadleaf species include Cestrum brevifolium, Chamaescrsta glandulosa, Coreopsis buchii, Hypericum hypericoides, Lyonia truncata, L. microcarpa, Myrica picardae, and Senecio picardae, as well as the succulent Agave antillana (Fisher-Meewor and Judd 1989). The ground is also covered in places by grasses and ferns.

While generally considered detrimental to bird populations, the abandoned bauxite mines may provide access to a unique resource for Hispaniolan Crossbills. In studies from similar bauxitic soils in Jamaica, Greenberg and Wilding (2007) found that the physical properties of both pre- and post-mined soils were mostly clay. But after open pit mining, bauxite lands are reshaped, such that the resulting post-mined soils are significantly higher in underlying limestone rock fragments than the pre-mined soils. The primary constituents of bauxitic soils are aluminum (Al) and iron (Fe) oxides, but these marginally reclaimed lands had significantly higher pH levels than pre-mined soils, as well as higher extractable calcium and CaCO₃ equivalent.

This suggests two explanations for geophagy in crossbills. One possible explanation for the observed consumption of soil is that the crossbills may be obtaining dietary salts. Dawson et al. (1965) found experimentally that sodium chloride (NaCl) was not an essential nutrient, and that the ingestion of salt beyond that present in food was not necessary for the maintenance of a sodium balance or the apparent good health of Red Crossbills. They could not exclude, however, the possibility that consuming salt might satisfy a requirement for some co-occurring mineral that they do not obtain in sufficient quantity in their food. For example, Bennett and Hutto (1985) attributed geophagy by Red Crossbills in Montana to an extra-dietary need for salt ingestion that was satisfied by consumption of calcium carbonate (CaCO₃) leaching from stone walls of a building. It is possible then that Hispaniolan Crossbills are satisfying an extra-dietary need for calcium, aluminum, iron, or some other mineral found in the bauxitic soils.

A second explanation might be the crossbills’ need to detoxify their commonly eaten foods. Crossbills feed largely on pine seeds (Benkman 1992), which contain terpenoid components that play a major role in reducing or preventing herbivore attack (Mumm and Hilker 2006), but the seeds are relatively free of toxins and are commonly eaten by many species (Smith and Balda 1979). However, if toxins persist in the seeds, or if other diet items are detrimental to the birds, geophagy may protect them from dietary toxins, as has been shown for some geese (Wink et al. 1993) and parrots (Gilardi et al. 1999). Recent studies of Amazonian parrots have focused on their consumption of fine soils and clay that act to absorb toxins (Gilardi et al. 1999, Brightsmith and Muñoz-Najar 2004). In these species, consumed clay binds readily to alkaloid toxins, but is also thought to provide gastrointestinal cytotoxic protection and protect the gut from damage by dietary phenolics, alkaloids, and other toxins (Gilardi et al. 1999). Farther north, Maroon-fronted Parrots (Rhynchopsitta terrisi) of northern Mexico subsist primarily on pine seeds as well as acorns. Valdéz-Peña et al. (2008) suggested that this parrot consumes clay at licks as a mineral supplement, but also to absorb secondary compounds and to buffer acids. The nature of the clay-based bauxitic soils found in the Bahorucos may be a similar resource for Hispaniolan Crossbills.

Although the biological need for salts remains unanswered, as Bennett and Hutto (1985) have pointed out the behavior nonetheless presents inter-
esting management implications. While current thinking is that Hispaniolan Crossbills are most abundant in the Sierra de Bahoruco due to the size or regularity of the cone crop (Latta et al. 2000), or perhaps due to the regular access to otherwise scarce surface water (Klein et al. 1998), the occurrence of geophagy may suggest that their need for clay, salts, or some other soil-borne mineral also influences their distribution. Bauxite is not mined elsewhere on the island, and indeed, bauxitic soils are rare elsewhere on Hispaniola. If in fact pre- or post-mining bauxitic soils are unique in providing easily obtained access to CaCO₃ or other scarce resources on the island, then their availability for this endangered species should be managed. Further study should be made on soil properties and how they function in the ecology of this crossbill. It should be noted, too, that these same mines were recently shown to host nesting Golden Swallows (Tachycineta euchrysea), another endangered species found only on Hispaniola (Townsend et al. 2008). While this may not be a preferred habitat, the bauxitic soils and abandoned mines may not represent a total loss in habitat for these endangered endemics.

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LITERATURE CITED

