

# First observations of geophagy for two neotropical passerines species

## *Primeiras observações de geofagia em duas espécies de passeriformes neotropicais*

Guilherme WILLRICH<sup>1,3</sup> & Fernando Maciel BRÜGGEMANN<sup>2</sup>

### ABSTRACT

Geophagy is the consumption of soil, clay or sediments by animal species. In birds, this behaviour was documented to only 2% of the world's avifauna and several bird families lack evidence of geophagy. Here we present the first report of geophagy for the Parulidae family and only the fourth for Thraupidae, related to the species Tropical Parula (*Setophaga pitiayumi*) and Faw-breasted Tanager (*Pipraeidea melanonota*), respectively. We speculate that the observed behaviour could be related to mechanical digestion, protection against toxic food compounds or even mineral supplementation.

**Keywords:** Parulidae; *Pipraeidea*; *Setophaga*; soil consumption; Thraupidae.

### RESUMO

A geofagia é o consumo de solo, argila ou sedimentos por espécies animais. Em aves, esse comportamento foi documentado em apenas 2% da avifauna mundial, e diversas famílias de aves não apresentam evidências de geofagia. Apresenta-se aqui o primeiro relato de geofagia para a família Parulidae e apenas o quarto para a família Thraupidae, relacionado às espécies mariquita (*Setophaga pitiayumi*) e saíra-viúva (*Pipraeidea melanonota*), respectivamente. Especula-se que o comportamento observado possa estar relacionado à digestão mecânica, à proteção contra compostos tóxicos presentes nos alimentos ou mesmo à suplementação mineral.

**Palavras-chave:** consumo de solo; Parulidae; *Pipraeidea*; *Setophaga*; Thraupidae

Recebido em: 27 jan. 2026  
Aceito em: 23 mar. 2026

## INTRODUCTION

The intentional consumption of earth, clay or sediments by animal species is a behaviour known as geophagy (DIAMOND *et al.*, 1999). Several are the benefits from such behaviour, for example, mechanical digestion (GIONFRIDDO & BEST, 1999; DOWS *et al.*, 2019), mineral supplementation (GIONFRIDDO & BEST, 1999; BRIGHTSMITH *et al.*, 2008; COSTA-PEREIRA *et al.*, 2015; BURROUGS, 2020) or adsorption of toxins present on food resources (GILARDI *et al.*, 1999; BRIGHTSMITH *et al.*, 2008). Such benefits are not mutually exclusive and may vary according to the organism's requirements.

Among birds, geophagy was reported for at least 260 species, which corresponds to only 2% of the world's avifauna (DOWS *et al.*, 2019). This behaviour seems to be widespread in some bird families, such as Columbidae and Psittacidae (DIAMOND *et al.*, 1999, SYMES *et al.*, 2005; DOWS *et al.*, 2019), but uncommon or poorly reported for several other families, as Falconidae, Corvidae, Tyrannidae and Thraupidae (DOWS *et al.*, 2019; BURROUGHS, 2020; WILLRICH, 2020).

<sup>1</sup> Plaza Caldas da Imperatriz Resort & SPA, R. Princesa Leopoldina, n. 3355 – CEP 88145-160, Santo Amaro da Imperatriz, SC, Brasil.

<sup>2</sup> Rancho Queimado, SC, Brasil.

<sup>3</sup> Corresponding author: guigawillrich@hotmail.com.

Although recent studies have reported soil consumption for the first time in some bird families, such as Ramphastidae and Leiiothrichidae (MATINATA & PERRELLA, 2020; JENA *et al.*, 2023), a huge knowledge gap still exists, with around 75% of bird families lacking information regarding geophagy (DOWS *et al.*, 2019).

Therefore, the goal of the present study is to provide the first documented observation of geophagy for two neotropical passerines species from two families, Parulidae and Thraupidae.

## MATERIAL AND METHODS

The observations were made at the municipalities of Rancho Queimado and of Santo Amaro da Imperatriz, both in Santa Catarina state, southern Brazil, in 2024, during naturalistic observations of birds.

## RESULTS

Here we present the first report of geophagy for the Parulidae family and only the fourth for Thraupidae, related to the species Tropical Parula (*Setophaga pitiayumi*) and Faw-breasted Tanager (*Pipraeidea melanonota*), respectively.

### *Setophaga pitiayumi* (VIEILLOT, 1817) – TROPICAL PARULA

On 22 March 2024, at approximately 11:15 h, a Tropical Parula (*Setophaga pitiayumi*; Parulidae) was observed perching in a small ravine in an urban area of the municipality of Rancho Queimado, Santa Catarina state, southern Brazil (coordinates 27°40'27.56"S, 49°0'48.98"W; 813 m altitude). The individual remained in the ravine for approximately 5 minutes and ingested several small pieces of dry clay (figure 1). After this observation, no further visit of the species was noticed in the place. The ravine on which the bird was observed was human made through superficial soil excavation.



**Figure 1** – Observation of geophagy by Tropical Parula (*Setophaga pitiayumi*) in the municipality of Rancho Queimado, Santa Catarina state, southern Brazil. Photos: Fernando Maciel Brüggemann.

*Pipraeidea melanonota* (VIEILLOT, 1819) – FAWN-BREASTED TANAGER

The observation was made on 27 September 2024, at 10:38 h, in the yard of the Plaza Caldas da Imperatriz Resort & Spa, in the municipality of Santo Amaro da Imperatriz, Santa Catarina state, southern Brazil (coordinates 27°43'57.16"S, 48°48'33.96"W; 223 m altitude). A female Fawn-breasted Tanager (*Pipraeidea melanonota*; Thraupidae) was observed perching on a patch of exposed soil on the resort's garden lawn. She remained on the ground for approximately 2 minutes and ingested at least 5 pieces of humid clay (figure 2). A male was also observed nearby but did not come down to the ground.



Figure 2 – Observation of geophagy by Fawn-breasted Tanager (*Pipraeidea melanonota*) in the municipality of Santo Amaro da Imperatriz, Santa Catarina state, southern Brazil. Photos: Guilherme Willrich.

## DISCUSSION

The Tropical Parula is a canopy bird species that inhabit tropical forests, forest edges and also wooded yards (SICK, 1997; REGELSKI & MOLDENHAUER, 2020). Its diet is composed mainly by small arthropods, such as Hymenoptera, Diptera and Lepidoptera (ZOTTA, 1932; SCHUBART *et al.*, 1965; SICK, 1997; REGELSKI & MOLDENHAUER, 2020), but it can also consume fruits and other plant materials (SICK, 1997; BELLO *et al.*, 2017).

The Fawn-breasted Tanager is also a canopy species and feed on several small fruits, but also on arthropods, especially Lepidoptera (SICK, 1997; GONZALES *et al.*, 2020; the authors, pers. obs.).

Based on the diet of both species, one hypothesis to explain the observed behaviour is the ingestion of grains for the mechanical digestion of arthropods' chitinous exoskeletons (DOWS *et al.*, 2019). Moreover, fruits as well as arthropods (e.g., Lepidoptera and Hymenoptera) can also contain toxins and geophagy could help birds to deal with such potentially harmful compounds (GILARDI *et al.*, 1999; BRIGHTSMITH *et al.*, 2008; DOWS *et al.*, 2019). In the case of the Fawn-breasted Tanager, another possible explanation could be the ingestion of minerals for eggshell formation (SOLER *et al.*, 1993; WILLRICH, 2020; JENA *et al.*, 2023), since the behaviour was observed in the beginning of birds' breeding season in southern Brazil (BELTON, 1994; MAURÍCIO *et al.*, 2013).

These observations correspond to the first report of geophagy for the Parulidae family and only the fourth for Thraupidae, one of the most species-rich bird families in the world. The previously observations for Thraupidae were related to the Patagonian Sierra Finch (*Phrygilus patagonicus*) (GRIGERA & ALIOTTA, 1976), to the Blue-gray Tanager (*Thraupis episcopus*) (BRIGHTSMITH, 2004) and to the Plain-colored Seedeater (*Catamenia inornata*) (CADENA-ORTIZ *et al.*, 2021). Interestingly, the first observation of geophagy for Parulidae was regarding a forest canopy species that is rarely seen close to the ground, while for other neotropical warblers that are usually observed in lower strata, as the Golden-crowned Warbler (*Basileuterus culicivorus*) and the Neotropical River Warbler (*Myiothlypis rivularis*), geophagy was never reported. Therefore, we draw attention of ornithologists and birdwatchers to these “lower strata” species in order to try to observe this behaviour in such species in the future.

### ACKNOWLEDGEMENTS

We are grateful to Plaza Caldas da Imperatriz Resort & Spa by research support.

### REFERENCES

- Bello, C., Galetti, M., Montan, D., Pizo, M. A., Mariguela, T. C., Culot, L., Bufalo, F., Labecca, F., Pedrosa, F., Constantini, R., Emer, C., Silva, W. R., Silva, F. R., Ovaskainen, O. & Jordano, P. Atlantic frugivory: a plant-frugivore interaction data set for Atlantic Forest. *Ecology*. 2017; 98(6): 1729.  
doi: <https://doi.org/10.1002/ecy.1818>
- Belton, W. *Aves do Rio Grande do Sul, distribuição e biologia*. São Leopoldo: Unisinos; 1994. 584 p.
- Brightsmith, D. Effects of weather on parrot geophagy in Tambopata, Peru. *The Wilson Bulletin*. 2004; 116(2): 134-145.  
doi: <https://doi.org/10.1676/03-087B>
- Brightsmith, D. J., Taylor, J. & Phillips, T. D. The roles of soil characteristics and toxin adsorption in avian geophagy. *Biotropica*. 2008; 40(6): 766-774.  
doi: <https://doi.org/10.1111/j.1744-7429.2008.00429.x>
- Burroughs, J. Geophagy by a Wild Merlin. *Journal of Raptor Research*. 2020; 54(3): 326.  
doi: <https://doi.org/10.3356/0892-1016-54.3.326>
- Cadena-Ortiz, H., González-Camacho, G., Maya, D. & Alarcón, I. P. Primeiros registros de geofagia em sustratos artificiais por passerinos de Ecuador. *Revista Ecuatoriana de Ornitología*. 2021; 7: 19-23.  
doi: <https://doi.org/10.18272/reo.v7i1.1562>
- Costa-Pereira, R., Severo-Neto, F., Inforzato, I., Laps, R. R. & Pizo, M. A. Nutrients drive termite nest geophagy in Yellow-chevroned Parakeets (*Brotogeris chiriri*). *The Wilson Journal of Ornithology*. 2015; 127(3): 506-510.  
doi: <https://doi.org/10.1676/14-142.1>
- Diamond, J., Bishop, K. D. & Gilardi, J. D. Geophagy in New Guinea birds. *Ibis*. 1999; 141(2): 181-198.  
doi: <https://doi.org/10.1111/j.1474-919X.1999.tb07540.x>

- Dows, C. T., Bredin, I. P. & Wragg, P. D. More than eating dirt: a review of avian geophagy. *African Zoology*. 2019; 54(1): 1-19.  
doi: <https://doi.org/10.1080/15627020.2019.1570335>
- Gilardi, J. D., Duffey, S. D., Munn, C. A. & Tell, L. A. Biochemical functions of geophagy in parrots: detoxication of dietary toxins and cytoprotective effects. *Journal of Chemical Ecology*. 1999; 25: 897-922.  
doi: <https://doi.org/10.1023/A:1020857120217>
- Gionfriddo, J. P. & Best, L. B. Grit use by birds. In: Nolan-Jr, V., Ketterson, E. D. & Thompson, C. F. (ed.). *Current Ornithology*. Boston: Springer; 1999. v. 15, p. 89-148.
- Grigera, D. E. & Aliotta, G. Gastrolitos en tres especies de Fringílidos de la zona Bariloche, Río Negro (Aves). *Physis*, C. 1976; 35: 197-203.
- Gonzales, K., Richart, C. H. & Burns, K. J. Fawn-breasted Tanager (*Pipraeidea melanonota*), version 1.0. In: Schulenberg, T. S. (ed.). *Birds of the world*. Ithaca: Cornell Lab of Ornithology; 2020.  
doi: <https://doi.org/10.2173/bow.fabtan1.01>
- Jena, P., Pattnayak, S. P. & Prusty, B. A. K. First record of geophagy in Jungle Babbler (*Turdoides striata*) prior to egg-laying: an instinct for calcium supplement. *Animal Cognition*. 2023; 26: 1449-1452.  
doi: <https://doi.org/10.1007/s10071-023-01778-x>
- Matinata, B. S. & Perrella, D. F. First record of geophagy by a Ramphastidae species (Piciformes). *Ornithology Research*. 2020; 24: 174-177.  
doi: <https://doi.org/10.1007/s43388-020-00027-w>
- Maurício, G. N., Bencke, G. A., Repennig, M., Machado, D. B., Dias, R. A. & Bugoni, L. Review of the breeding status of birds in Rio Grande do Sul, Brazil. *Iheringia Série Zoologia*. 2013; 103(2): 163-184.  
doi: <https://doi.org/10.1590/S0073-47212013000200012>
- Regelski, D. J. & Moldenhauer, R. R. Tropical Parula (*Setophaga pitayumi*). In: Poole, A. F. (ed.). *Birds of the world*. Ithaca: Cornell Lab of Ornithology; 2020.  
doi: <https://doi.org/10.2173/bow.tropar.01>
- Schubart, O., Aguirre, A. C. & Sick, H. Contribuição para o conhecimento da alimentação das aves brasileiras. *Arquivos de Zoologia*. 1965; 12: 95-249.
- Sick, H. *Ornitologia brasileira*. Rio de Janeiro: Editora Nova Fronteira; 1997. 912 p.
- Soler, J. J., Soler, M. & Martínez, J. G. Grit ingestion and cereal consumption in five corvid species. *Ardea*. 1993; 81: 143-149.
- Symes, C. T., Hughes, J. C., Mack, A. L. & Marsden, S. J. Geophagy in birds of Crater Mountain Wildlife Management Area, Papua New Guinea. *Journal of Zoology*. 2005; 268(1): 143-149.  
doi: <https://doi.org/10.1111/j.1469-7998.2005.00002.x>
- Willrich, G. A review of geophagy in corvids (Aves: Corvidae) and a new report of geophagy in Azure Jay (*Cyanocorax caeruleus*). *Oecologia Australis*. 2020; 24(1): 249-251.  
doi: <https://doi.org/10.4257/oeco.2020.2401.25>
- Zotta, A. Notas sobre el contenido estomacal de algunas aves. *El Hornero*. 1932; 5: 77-81.