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UPDATE RECORDS AND DISTRIBUTION OF *Digitonthophagus gazella* (COLEOPTERA: SCARABAEIDAE) IN ARGENTINA: A POTENTIAL INVASIVE SPECIES

*Actualización de registros y distribución de Digitonthophagus gazella (Coleoptera:
Scarabaeidae) en Argentina: una potencial especie invasora*

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Abstract. The distribution of *Digitonthophagus gazella* in Argentina is updated. A total of 246 individuals were captured between 2012 and 2022, through different techniques, including manual collection, light traps, and baited pitfall traps. The species is present in ten provinces, six of which are first records. In addition, *D. gazella* was recorded for the first time in five ecoregions, Atlantic Forest, the Espinal, Subtropical Grasslands, Northern Monte, and Parana Delta. The potential consequences of this introduced species on native dung beetles assemblages should be assessed in future studies.

Key words. Onthophagini, Ecoregions, Dung Beetle

Resumen. Se actualiza la distribución de *Digitonthophagus gazella* en Argentina. Se capturaron 246 individuos entre 2012 y 2022, por medio de diversas técnicas, colecta manual, trampas de luz y trampas de caída cebadas con diferentes tipos de excrementos. Esta especie fue recolectada en diez provincias, de las cuales seis de ellas constituyen primeros registros. Además, *D. gazella* se registra por primera vez en cinco ecorregiones, Bosque Atlántico, Espinal, Pastizal Subtropical, Monte Norte y Delta del Paraná. Las consecuencias potenciales de esta especie introducida sobre los ensambles de escarabajos coprófagos nativos, deben evaluarse en futuros estudios.

Palabras claves. Onthophagini, ecorregiones, escarabajo estercolero

INTRODUCTION

Digitonthophagus gazella Fabricius is a tunneling coprophagous species (paracoprid) characterized by processing large quantities of dung during feeding and nesting (Bornemissza, 1970). Because of this ability, *D. gazella* has been intentionally introduced into livestock systems to facilitate the burial of cattle manure and as a biological control agent in several countries in the Americas, such as the United States, Brazil, Chile, as well as Australia, and southwest Pacific (Noriega et al., 2020).

The genus has recently been revised. The species that has been introduced is native to southeastern Africa and is part of a complex of four species (*Digitonthophagus biflagellatus* Génier, *Digitonthophagus petilus* Génier, *Digitonthophagus viridicollis* Génier, and *D. gazella* Fabricius) distributed throughout Africa and India (Génier and Moretto, 2017).

It is unknown whether this species has been intentionally introduced into Argentina; it probably expanded its distribution from Paraguay, Bolivia and/or Brazil, expanding its distribution towards the south of the country (Álvarez Bohle et al., 2009). In Argentina, *D. gazella* was previously reported in the provinces of Salta, Catamarca, Córdoba, Corrientes, Formosa, and Mendoza and the ecoregions of Chaco, Southern Monte and Ibera wetlands (Álvarez Bohle et al., 2009). The species has not been studied in the country except in the study performed by Álvarez Bohle et al. (2009). Based on this lack of information, our objective in this note is to update the distribution of *D. gazella* in the country.

RESULTS

We presented 246 records of *D. gazella* collected from 2012 to 2022, using manual collection, light traps, and baited pitfall traps

with different droppings in natural ecosystems and different land uses (Table I).

This data extended the original distribution to six new provinces: Chaco, Entre Ríos, Misiones, San Juan, Santa Fe, and Santiago del Estero (Figure 1). Also, the distribution is extended to five new ecoregions: Atlantic Forest, Espinal, Subtropical Grasslands, Northern Monte, and Parana Delta. In addition, from the specimens collected in San Juan, we recorded the species at an altitude above 1200 meters above sea level, much higher than previous records in Argentina. Also, in a street light in the city of Las Toscas, the new record for Santa Fe extends its distribution to urbanized areas. On the other hand, the new records from Corrientes show that *D. gazella* also uses dung of native mammals (*Tapirus terrestris* and *Alouatta caraya*) and prefers it over other resources, including dung of several native vertebrates (*Hydrochoerus hydrochaeris*, *Rhea americana*, *Ozotoceros bezoarticus*), rotten meat and cow (Y. Bobadilla personal communication).

A study by Filho et al. (2018) showed that the presence of this species modifies the structure of native dung beetle assemblages. The ecological tolerance of *D. gazella* to temperature and annual precipitation is broad, ranging between 6-30°C and 90-4400 mm in mean (Noriega et al., 2020). In addition, the species can withstand broad climatic conditions different from its native distribution (Noriega et al., 2020). Also, the diversity of land uses where it has been recorded accounts for its large phenotypic plasticity. Considering the distribution of the species in Argentina and its invasive potential, future studies of its impact on dung beetle native communities are necessary.

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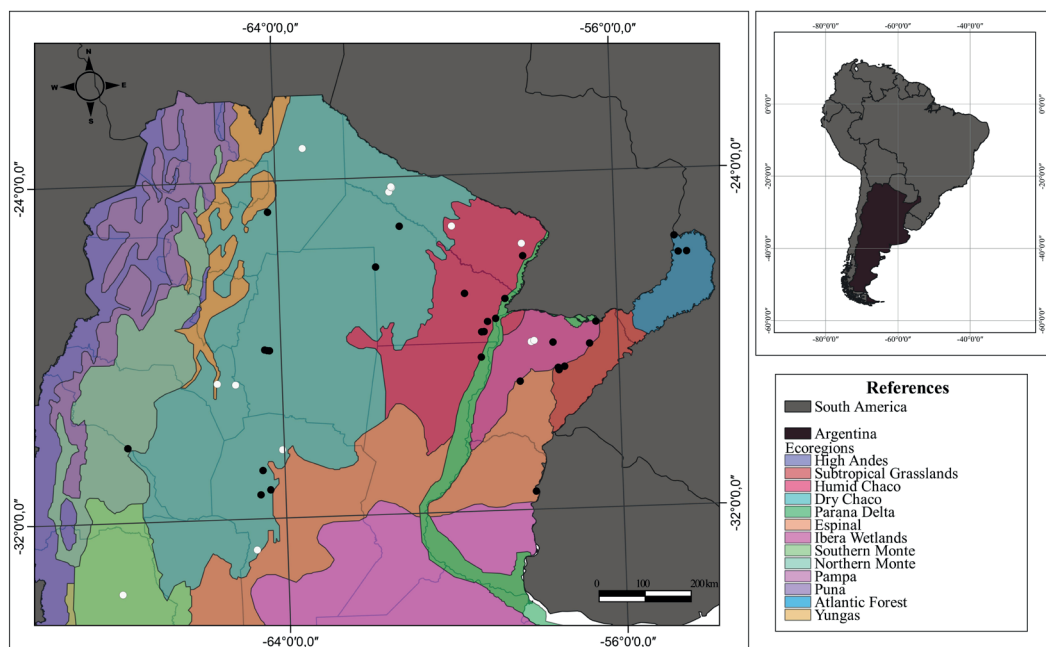


Figure 1 - Records of *Digitonthophagus gazella* in Argentina, white circles: previous records (Álvarez Bohle et al., 2009), black circles: new records. Ecoregions by Burkart et al. (1999).

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DISTRIBUTION OF *Digitonthophagus gazella* IN ARGENTINA

Table 1 - Examined material

Province	Locality	Altitude (m)	Date of collection	Repository*	Land use	Collection method	N. of specimens
Chaco	Capitán Solari	80	10-XI-2016	IBSI-Sca-57268 IBSI-Sca-57269 IBSI-Sca-57270	Cattle pasture	Pitfall/ Human feces	3
Chaco	Rio Muerto	154	30-X-2016	IBSI-Sca-61292 IBSI-Sca-61512 IBSI-Sca-61537	Cattle pasture	Pitfall/ Human feces	3
Chaco	Antequeras	53	29-IX-2014	CARTROUNNE-9545	Palm	Light trap	5
Chaco	Est. María Zaida	54	19.XI.2014	CARTROUNNE-9547	Cattle grassland	Light trap	11
Chaco	Est. San Carlos	56	7.XII.2015	CARTROUNNE-9551	Cattle grassland	Light trap	1
Chaco	Est. La Querencia	52	23.XI.2015	CARTROUNNE-9550	Cattle grassland	Light trap	2
Chaco	Est. San Francisco	55	17.X.2013	CARTROUNNE-9543	Native forest	Light trap	1
Chaco	P.N. El Impenetrable	140	1-4.XI.2021	CARTROUNNE-9556	Grassland and forest	Light trap	116
Córdoba	La Calera	551	8-I-2018	https://www.inaturalist.org	-	-	1
Córdoba	Cuesta Blanca	942	17-II-2022	https://www.inaturalist.org	-	-	1
Córdoba	Capilla del Monte	983	3-II-2022	https://www.inaturalist.org	-	-	1
Corrientes	Forestal Pomera	90	19.III.2015	CARTROUNNE-9549	Grassland and Pine plantation	Light trap	44
Corrientes	Cápita Mini	72	7.III.2014	CARTROUNNE-9544	Cattle grassland	Light trap	4
Corrientes	Paraje Galarza	72	2.II.2013	CARTROUNNE-9542	Cattle grassland	Light trap	1
Corrientes	Forestal Ycaparapa	76	05.XI.2014	CARTROUNNE-9546	Pine forest	Light trap	2
Corrientes	Uguay	78	13-19.XII.2018	CARTROUNNE-9552	Cattle grassland	Pitfall/ <i>T. terrestris</i> feces	4
Corrientes	Uguay	73	13-19.XII.2018	CARTROUNNE-9553	Cattle grassland	Pitfall/ <i>T. terrestris</i> feces	1
Corrientes	Uguay	70	13-19.XII.2018	CARTROUNNE-9554	Cattle grassland	Pitfall/ <i>T. terrestris</i> feces	3
Corrientes	Uguay	70	13-19.XII.2018	CARTROUNNE-9556	Cattle grassland	Pitfall/ <i>Alouatta caraya</i>	1
Corrientes	Uguay	71	13-19.XII.2018	CARTROUNNE-9555	Native grassland	Pitfall/ <i>T. terrestris</i> feces	1
Entre Ríos	Puerto Yerua	244	2-V-2021	https://www.inaturalist.org	-	-	1
Formosa	Estancia Guaycolec	71	29-X-2015	IBSI-Sca-46789	Cattle pasture	Pitfall/ Human feces	1
Misiones	Puerto Iguazú	170	4-IV-2020	https://www.inaturalist.org	Urbanized area and cattle	-	1
Misiones	-	264	15-I-2014	IBSI-Sca-1097	Perennial crop of <i>Ilex paraguayensis</i>	Pitfall/ Human feces	1
Misiones	Wanda	229	15-I-2014	IBSI-Sca-1388	Perennial crop of <i>Ilex paraguayensis</i>	Pitfall/ Human feces	1
Salta	Las Lajitas	488	21-IX-2014	https://www.inaturalist.org	-	-	1
San Juan	Baldecitos	1261	18-IV-2022	COLScaIMCN00014-000026	Forest with extensive livestock	Manual/Bovine feces	13
San Juan	Baldecitos	1267	14-III-2020	COLScaIMCN00001-000013	Forest with extensive livestock	Manual/Horse feces	13
Santa Fe	Las Toscas	51	23.XII.2012	CARTROUNNE-9548	Urbanized area - street lighting	Manual	2
Santiago del Estero	Pampa Muyo	234	13-17-XII-2021	IBSI-Sca-63120 IBSI-Sca-63121 IBSI-Sca-63122 IBSI-Sca-63123	Cattle grassland	Pitfall/human feces and rotting meat	4
Santiago del Estero	Arraga	219	13-17-XII-2021	IBSI-Sca-63124	Silvopastoral system	Pitfall/ Bovine feces	1
Santiago del Estero	Arraga	190	13-17-XII-2021	IBSI-Sca-63125	Silvopastoral system	Pitfall/ Bovine feces	1