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RELATION BETWEEN DESCRIPTION DATE, BODY SIZE AND GEOGRAPHICAL RANGE OF SOUTH AMERICAN OWLS (STRIGIFORMES)

Relação entre Data de Descrição, Tamanho Corporal e Distribuição Geográfica de Corujas (Strigiformes) Sul-Americanas

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RESUMO: O objetivo deste estudo foi avaliar os padrões das datas de descrição das corujas (Strigiformes) sul-americanas, através da correlação entre as datas de descrição com o tamanho corporal e a área de distribuição geográfica. Analisamos 43 espécies nativo-residentes e distribuídas na área contínua do continente, sendo todos os dados provenientes da literatura. O tamanho corporal foi significativo para a descrição das espécies (r= -0,547, p= 0,0001), demonstrando assim que espécies maiores foram descritas preliminarmente. A correlação com a distribuição geográfica demonstrou que espécies de ampla distribuição foram descritas inicialmente em relação às de distribuição restrita (r= -0,779, p<0,0001). Assim, recomendamos que os estudos futuros concentrem-se na busca por espécies pequenas de áreas mais restritas, para ampliar o conhecimento dos Strigiformes sul-americanos.

Palavras chave: Macroecologia, Aves, Correlação de *Pearson*.

ABSTRACT: The objective of this study was to evaluate the patterns of South Americans owl's (Strigiformes) dates of description, through the correlation with body size and geographical distribution. It was analysed 43 native-resident species distributed in the continuous area of the continent, being all the data from the literature. The body size was significant for the description of the species (r = -0.547, p = 0.0001), demonstrating that the larger species were described preliminarily. The correlation with the geographical distribution showed that species of wide distribution were initially described in relation to the restricted distribution ones (r = -0.779, p <0.0001). Therefore, researcheson smaller

owls in more restricted areasare recommended in order to increase the knowledge of South American Strigiformes.

KEYWORDS: Macroecology.Birds.Pearson's correlation.

Introduction

The main objective of macroecology is to study the partition of physical and geographic space as well asresources among organisms, based on the empirical derivation models of ecological correlation variables, such as body size, population density and geographical distribution, measured in wide taxonomic groups and continental scales (BROWN; MAURER 1987; 1989; BROWN, 1995; MAURER, 1999; GASTON; BLACKBURN, 2001). It is distinguished from the "classic" community ecology for greater focus on the observation of empirical standards rather than experimental treatments, beingthus, more inductive to the ecology experiment or to theoretical models adjustment (BROWN, 1995).

The description of the species may be influenced by factors such as rate, biogeographical region, body size and breadth of geographicalrange (GASTON, 1991 a, b; 1994; GASTON et al., 1995). Hence, regarding the body size and geographical range, usually large and widely distributed species - more visible and easier to find - are described preliminarily, being the opposite for small species with restricted geographic distribution (BLACKBURN; GASTON, 1995; REED; BOBACK, 2002; COLLEN et al., 2004; DINIZ-FILHO et al., 2005; SANTOS; BLAMIRES, 2012). In this regard, knowing the proportion of unknown species and the factors that determine the descriptive processes in a lineage can be essential in both situations, to designate effective strategies for taxonomic research as well as optimizing future efforts (BASELGA et al., 2007).

Owls belong to the Strigiformes order, which is divided into Tytonidae and Strigidae families, consisting of nocturnal species, predatory arthropods and small vertebrates (SICK, 1997; SIGRIST, 2014). Accordingto SACC (2015), about 44 species of owls are currently known in the South American continent, but few macroecological studies have been developed with Strigiformes in South America involving phylogenetic analyses and restriction envelopes (SANT'ANNA; DINIZ-FILHO, 1997; 1999), and no work has approached the influence of description dates in macroecological variables of this lineage. Therefore, this study evaluated

the standards of South American owls description dates based on the correlation with the body size and the geographical range.

Material and Methods

Forty three (43) species of owls have been analysed, distributed in continuous area of South America, belonging to the native-resident category according Birdlife International (2015) (Table 1). The dates of description (the year in which each species has been primarily described and considered an independent taxonomic unit), the body size (cm) and the geographical range (km²) of each speciesdata were based on the primary literature (ERIZE; RUMBOLL; MATA, 2006; SIGRIST, 2014; BIRDLIFE INTERNATIONAL, 2015). The geographical ranges were compiled in a grid map with all the continental extension of South America (scale = 1: 40000000, see DINIZ-FILHO; BINI, 2005), with approximately 374 squares of 220 km aside (48400 km²).

Table 1. South American owls' species. **DD**: Date of description; **T**: body size (cm); **R**: geographical range (km²). Scientific names and taxonomic sequence accordingto SACC (2015).

SPECIES	DD	T	R
Tyto alba	1769	35	17424000
Megascopscholiba	1817	22	13063160
Megascopsroboratus	1918	21	145200
Megascopskoepckeae	1982	22	24200
Megascopsclarkii	1935	25	53240
Megascopscolombianus	1952	28	82280
Megascopsingens	1897	28	503360
Megascopspetersoni	1986	21	53240
Megascopsmarshalli	1981	23	280720
Megascopswatsonii	1848	22	6664680
Megascopshoyi	1989	24	179080
Megascopsatricapilla	1822	24	711480
Megascopssanctaecatarinae	1897	25.5	469480
Megascopsalbogularis	1850	25	522720
Lophostrixcristata	1800	41	4588320
Pulsatrixperspicillata	1790	50	12337160

Pulsatrixkoeniswaldiana	1901	42	580800
Pulsatrixmelanota	1844	42	304920
Bubo virginianus	1788	55	9045960
Strixhylophila	1825	36	798600
Strixchacoensis	1921	40	842160
Strixrufipes	1828	40	629200
Ciccabavirgata	1850	35	8862040
Ciccabanigrolineata	1859	34	605000
Ciccabahuhula	1800	34	7777880
Ciccabaalbitarsis	1850	35	546920
Glaucidiumnubicola	1999	16	62920
Glaucidiumjardinii	1855	15	363000
Glaucidiumbolivianum	1991	15	275880
Glaucidiumparkeri	1995	13	67760
Glaucidiumgriseiceps	1875	13	67760
Glaucidiumhardyi	1990	13	3576760
Glaucidiummooreorum	2002	14	24200
Glaucidiumminutissimum	1821	13	774400
Glaucidiumbrasilianum	1788	17	13687520
Glaucidiumperuanum	1991	17	440440
Glaucidium nana	1828	20	595320
Xenoglauxloweryi	1977	14	19360
Athenecunicularia	1782	25	8712000
Aegoliusharrisii	1849	21	1098680
Pseudoscopsclamator	1807	35	6897000
Asiostygius	1832	37	3170200
Asioflammeus	1763	36	6645320

The body size and geographical range were initially logarithmic to normalize the distribution, being then, confronted with the dates of description through a parametric correlation of Pearson (ZAR, 1999) to check if the description dates were being significantly influenced by these variables.The program BIOESTAT 5.3, of Ayres et al. (2007), was usedfor calculating the correlation among the data.

Results and Discussion

The Pearson correlation between the description of dates and body size was negative and significant, demonstrating that the larger Strigiformes species have been described preliminarily in relation to the smaller species ($r = -0.547$; $p = 0.0001$;. Figure 2A). Similarly, the relation between geographic range and dates of description was negative and significant ($r = -0.779$, $p < 0.0001$; Fig. 2B), or owls species with greater geographical distribution were generally described preliminarily in relation to species of restricted geographical distribution. Although, these correlations can vary between lineages throughout the world (GASTON et al., 1995; DOLPHIN; QUICKE, 2001).Regarding the South American owls, which are considered large and widely distributed species, at first were described preliminarily, occurring the opposite for smaller species with restricted geographic distribution, thus corroborating with previous studies for other animal lineages (BLACKBURN; GASTON, 1995; REED; BOBACK, 2002; COLLEN et al., 2004; DINIZ-FILHO et al., 2005; SANTOS; BLAMIRES, 2012).

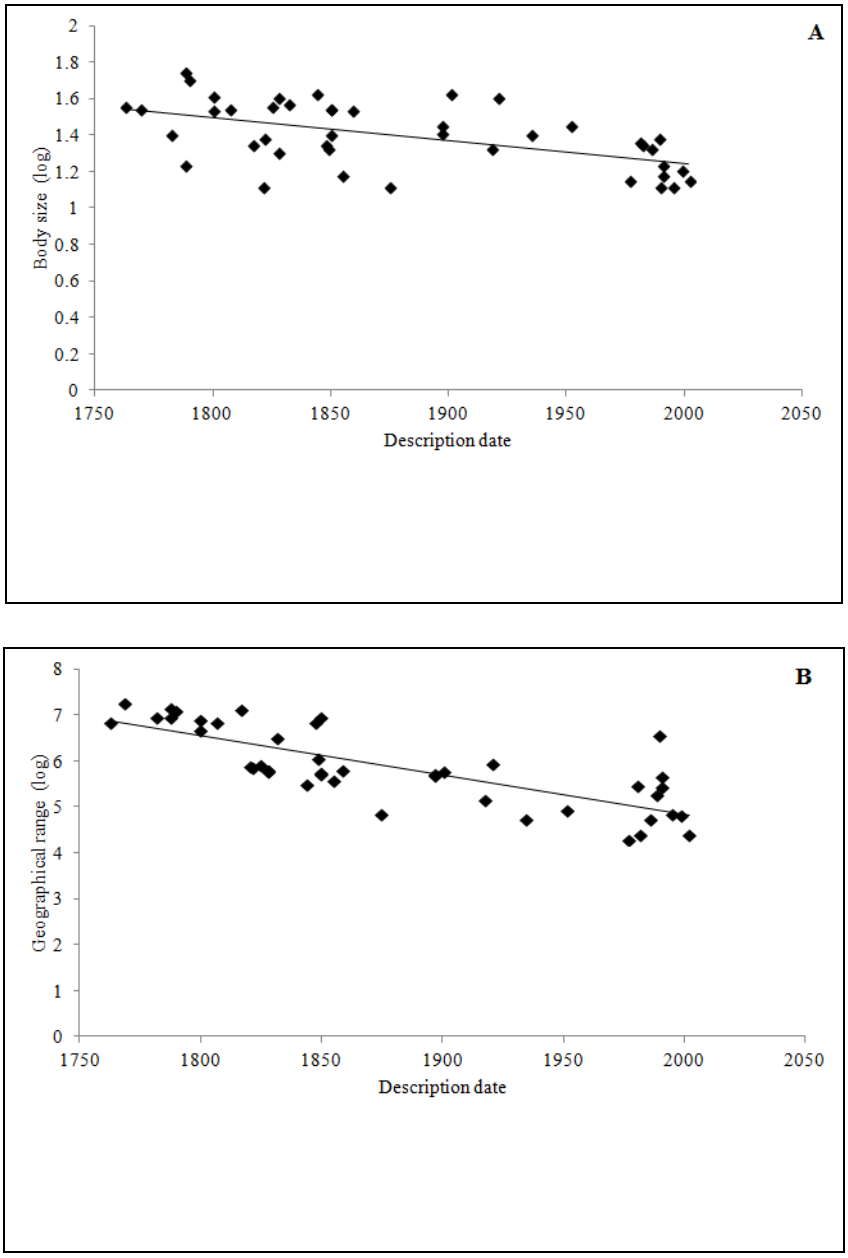

Figure 1. Relation between the variables date of description and body size (A), and date of description and geographical distribution (B), for the 43 studied Strigiformes species

This study showed that the body size variables and geographical distribution were relevant for describing the species. Considering that the species of larger body size and wide range were in general described initially, researches on smaller owls and in more restricted areas are recommended in order to increase the knowledge of South American Strigiformes.

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