

Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 49(41):547-555, 2009

www.mz.usp.br/publicacoes
www.revistasusp.sibi.usp.br
www.scielo.br/paz

ISSN impresso: 0031-1049
ISSN on-line: 1807-0205

A TAXONOMIC REVIEW OF THE DARK-WINGED TRUMPETER *PSOPHIA VIRIDIS* (AVES: GRUIFORMES: PSOPHIIDAE)

MARINA OPPENHEIMER^{1,2}
LUÍS FÁBIO SILVEIRA^{1,3}

ABSTRACT

The Dark-winged Trumpeter, *Psophia viridis* (Gruiformes, Psophiidae) is a Brazilian endemic species and includes three subspecies: *Psophia viridis viridis* Spix, 1825; *Psophia v. dextralis* Conover, 1934, and *Psophia v. obscura* Pelzeln, 1857, as well as *P. v. interjecta* Griscom & Greenway, 1937, whose validity has been questioned by several authors. These taxa are allopatric in distribution along the south of the Amazon River, although the precise limits of their distribution still remain unknown. This complex has never been taxonomically reviewed and this work aims to test the validity of its taxa based on the Phylogenetic Species Concept. Morphometrical characters and plumage colour patterns were analyzed, and the distribution of the taxa was also revised. In this study, 108 specimens from 41 localities were examined (all types included), with each reliable literature-based locality being included in order to delimit the geographical distribution of the complex. Morphometrical data did not point out significant differences between the taxa, also showing no sexual dimorphism among them. Meanwhile, plumage characters showed consistent and distinct patterns for each of the taxa, except for *P. v. interjecta*, whose features indicated by authors as diagnosable are the result of individual variation. No clinal variation or intergradation were observed, even at regions close to the rivers headwaters, where supposedly populations could be in contact. It is suggested that the currently accepted subspecies be elevated to the species level, such as: *Psophia viridis* Spix, 1825, distributed in the Madeira-Tapajós interfluvium, *P. dextralis*, found in the Tapajós-Tocantins interfluvium, and *P. obscura*, which occurs from the right bank of the Tocantins River to the west of the State of Maranhão.

KEYWORDS: Psophiidae; *Psophia*; *Psophia viridis*; Taxonomy.

INTRODUCTION

The genus *Psophia* Linnaeus, 1758 includes three species, all restricted to Amazon basin forests.

The Gray-winged Trumpeter (*Psophia crepitans*) occurs north of the Amazon river, from French Guiana to Peru and Ecuador; the White-winged Trumpeter (*P. leucoptera*) is found north and south of the Ama-

1. Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Caixa Postal 11.461, 05422-970, São Paulo, SP, Brasil; Seção de Aves, Museu de Zoologia, Universidade de São Paulo, Caixa Postal 42.494, 04218-970, São Paulo, SP, Brasil.

2. E-mail: marinaopp@yahoo.com.br

3. E-mail: lfsilvei@usp.br

zon, from eastern Peru to the Madeira river in the west, and Bolivia. The Dark-winged Trumpeter (*P. viridis*), is a Brazilian endemic and also occurs south of the Amazon river, but east of the Madeira river to the state of Maranhão (Sherman, 1996).

Depending on the author, the Dark-winged Trumpeter may include three or four taxa. The nominate form occurs in the region between the Madeira and Tapajós rivers, and *P. v. dextralis* occurs between the Tapajós and Xingu rivers. The putative and debateable *P. v. interjecta* occurs from the east bank of the Xingu to the west margin of the Tocantins river, being replaced by *P. v. obscura* from the east bank of the Tocantins to western Maranhão (Peters, 1934; Blake, 1977; Pinto, 1978; Sherman, 1996; Sick, 1997).

Spix (1825:66) described *Psophia viridis* based on a specimen from "Villa Nuova" (= Parintins, Amazonas), the only island locality for *Psophia*. He describes the purple iridescence in the lower neck, the green back, and calls attention to dark green scapulars, whereas the greater wing-coverts are rusty. *Psophia obscura* Pelzeln, 1857 was the next to be described, based on three specimens collected by J. Natterer. The type locality given by Pelzeln (1857) was simply "Brasília", later changed by him to "Pará" (Pelzeln, 1871). Natterer (*in* Pelzeln, 1857) states that he collected three specimens on January 1835. At that time he was in Belém or nearby (Vanzolini, 1993), which suggests that the type locality should be Belém, as also suggested by Hellmayr & Conover (1942) and Pinto (1978). Pelzeln (1857) pointed that *P. obscura* differs from *P. viridis* by its brownish-green mantle and discreet purple iridescence at the base of the neck.

Psophia viridis dextralis Conover, 1934, was described based on an adult male collected by A.M. Olalla on 02 December 1932 at Tauari, Tapajós river, Pará. The diagnostic characters of *P. v. dextralis* are the greenish olive mantle and that the iridescence of the wings is almost absent and, when not, is greenish. Three years after *P. v. dextralis* was described, *P. v. interjecta* was described from an adult male from Cameté, left (west) bank of the Tocantins river (Griscom & Greenway, 1937). *Psophia v. interjecta* was considered as a combination of characters from *P. v. obscura* and the nominate form. The only specimen used to describe this taxon was different from two topotypic pairs of *P. v. dextralis* available to the authors, which led them to consider *P. v. interjecta* to be a valid taxon (Griscom & Greenway, 1937). Diagnosis is based on the purple iridescence of the wing and on the brown upper part of the mantle, thus separating it from *P. v. obscura*.

Sharpe (1894) considered *Psophia obscura* to be a full species, while Peters (1934) made it subordinate to *P. viridis*, as it is treated today. Griscom & Greenway (1937) observed that *P. v. interjecta* has features of both *P. v. obscura* and *P. v. viridis*, while intermediate geographically between *P. v. obscura* and *P. v. dextralis*. Haffer (1974) stated that *P. v. interjecta* is indistinguishable from *P. v. dextralis* and suggested that it is an intergradation of *P. v. dextralis* and *P. v. obscura*, and only subtly different from them, being possibly found in sympatry with both. Although he did not synonymize the two, Haffer's treatment (1974) was followed by many (*e.g.* Sherman, 1996), yet Pinto (1978) considered *P. v. interjecta* to be valid while recognizing that its diagnosis from the others remains uncertain.

Since the original descriptions, the taxa belonging to the *Psophia viridis* complex have not been extensively reviewed. Here, we address this question by examining all of the taxa involved to examine and compare their morphological variation and geographic distribution.

MATERIAL AND METHODS

We analyzed 108 adult specimens of the *Psophia viridis* complex from 41 localities, comprising all described taxa (Appendix 1). These specimens are housed in the collections of Museu de Zoologia da Universidade de São Paulo, São Paulo (MZUSP), Museu Paraense Emílio Goeldi, Belém (MPEG), and Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro (MNRJ). Type specimens of *Psophia v. viridis* (Zoologische Staatssammlung München, Munich, Germany – ZSM B11) and *P. v. dextralis* (Field Museum of Natural History, Chicago, USA – FMNH 410480) were analyzed by us, while the type specimens of, *P. v. interjecta* (Museum of Comparative Zoology, Cambridge, USA – MCZ 173207) and *P. v. obscura* (Naturhistorisches Museum Wien, Wien, Austria – NHMW 39401) were analyzed from photographs. Measurements of bill, wing, tail and tarsus length followed Baldwin *et al.* (1931).

Colors were determined following the catalogs of Smithe (1975; hereafter S) and of Munsell (1994; hereafter M). All specimens were analyzed under natural light. Plumage characters used included some that were used in the past to separate taxa, and included: a) color of the mantle in the upper (proximal to the neck), intermediate, and lower portion (distal from the neck); b) iridescence in the neck (presence – absence); and c) purple in the wing (presence – absence).

Colors of other body parts were not used here due to the inherent variation found in museum specimens.

When not included with the specimens, the collecting locations were determined following Paynter Jr. & Traylor (1991) and Vanzolini (1992). All locations were mapped with ArcView (ArcView 3.3 for Windows, ESRI, 2002). Map preparation also included data from Spix, 1825; Pelzeln, 1857; Brabourne & Chubb, 1912; Snelhage, 1914; Naumburg, 1930; Peters, 1934; Conover, 1934; Griscom & Greenway, 1937; Pinto, 1938, 1978; Hellmayr & Conover, 1942; Gyldenstolpe, 1945; Schauensee, 1970; Blake, 1977; Graves & Zusi, 1986; Stotz, 1986; Oren, 1990, 1991; Novaes & Lima, 1991.

RESULTS AND DISCUSSION

We found no morphometric differences between the sexes and among the described taxa (data not shown, available under request). Color patterns resulted in three well defined groups. Birds from the region between the Madeira and Tapajós rivers (24 specimens) have, with one exception, the distal part of the mantle Parrot Green (S 160 and 260). The exception was specimen MNRJ 9645, which has this area Olive Green (S 47). The intermediate

portion of the mantle varied between Parrot Green (S 260) and Olive Green, while the proximal portion was Dark Green (S 162A). Again, the exception was specimen MNRJ 9645, which has Very Dark Brown (M 7.5YR/2.5/3). This appears to be an individual variation since another specimen collected 70 km of this specimen (MZUSP 76728) is typical to the remainder of those birds. All specimens from this region have iridescent purple on their wings and neck (Table 1; Figures 1-3a).

A second group (n = 73), collected between the Tapajós and the Tocantins rivers, is very homogeneous in color. The distal portion of the mantle is Olive Green (S 46), with two exceptions (MPEG 51281 and 51284), with the former being Leaf Green (S 146) and the latter being Greenish Olive (S 49). Two other specimens in this same series (MPEG 51282 and 51283) have the distal portion of the mantle Olive Green, in agreement with all the other specimens. The intermediate and proximal mantle of all but two specimens are Very Dark Brown (M 7.5YR/2.5/3 and /2). However, there are two exceptions: specimens from Santana do Araguaia, Pará (MPEG 48495 and 48496), have the entire mantle Leaf Green and two specimens from Carajás, Pará (MPEG 37204 and 37205) have the intermediate part of the mantle Leaf Green and Olive Green, respectively. Wings and neck



FIGURE 1: Pattern of the mantle coloration. Specimens from Madeira-Tapajós interfluvium (a, MZUSP 62339); Tapajós-Xingu interfluvium (b, MPEG 22098), Xingu-Tocantins interfluvium (c, MPEG 37970), and to the east of Tocantins river and west of Maranhão (d, MZUSP 43899).

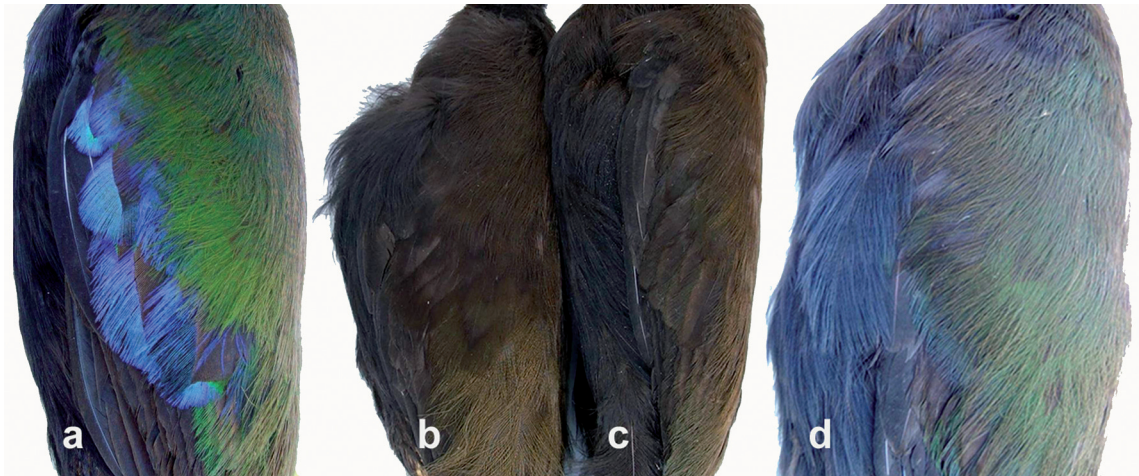


FIGURE 2: Pattern of the wing coloration. Specimens from Madeira-Tapajós interfluvium (a, MZUSP 62339); Tapajós-Xingu interfluvium (b, MPEG 22098), Xingu-Tocantins interfluvium (c, MPEG 37970), and to the east of Tocantins river and west of Maranhão (d, MZUSP 43899).

iridescence is almost or entirely absent in all specimens analyzed (Table 1; Figures 1-3b, c).

The third group ($n = 11$), found from eastern Tocantins to Maranhão, has the distal and intermediate portion of mantle consistently Dark Green (S 162A and 262), while the proximal portion is Dark Brown (M 7.5YR/3/2). Wings and neck iridescence is almost or entirely absent on this group (Table 1; Figures 1-3d).

Psophia viridis, according to Spix (1825), has a green mantle and the lower neck is iridescent purple, both considered to be diagnostic features for this species. The colors found in the holotype and in a topotype (MZUSP 10938) are in agreement with the original description and are constant in the specimens between the Madeira and Tapajós rivers. Also, *P. viridis* Spix, 1825 can be separated from other *Psophia* by having the distal and intermediate portion of the mantle Par-

rot Green and the proximal portion Dark Green. The neck and wings have a conspicuous purple iridescent.

Conover (1934) compared a specimen of *Psophia viridis* collected on the east bank of the Tapajós river (Tauari) with three specimens from Madeira river (including the type) and two *P. obscura* from the Natural History Museum of Wien to describe *P. v. dextralis*. Additionally, he refers to a specimen from the Camaraipi River (Pará) that has more in common with *P. v. obscura* than with *P. v. dextralis*, suggesting that specimen is perhaps transitional between *P. v. dextralis* and *P. v. obscura* (see below). Two topotypes in the MZUSP have the distal portion of the mantle Olive Green, in agreement with the holotype (FMNH 410480). Also, purple iridescence on the wings and neck is almost absent. These characters are consistent in specimens from the area between the Tapajós-Tocantins rivers. *Psophia viridis dextralis* Conover, 1934

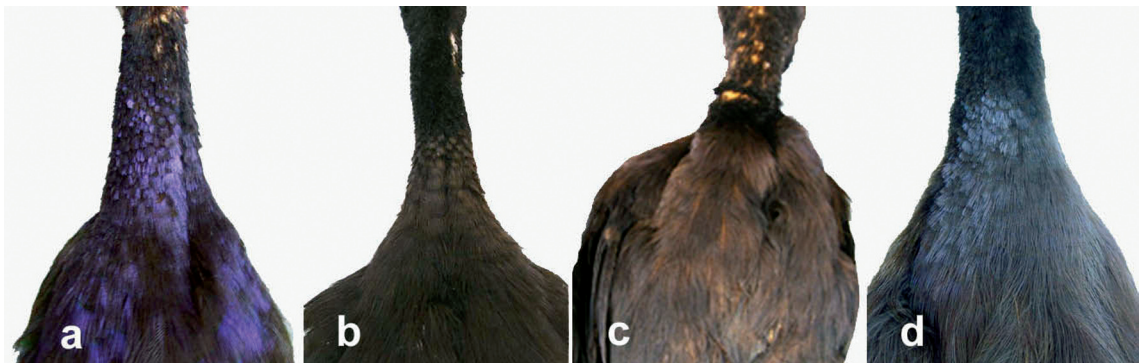


FIGURE 3: Pattern of coloration of the base of the neck. Specimens from Madeira-Tapajós interfluvium (a, MZUSP 62339); Tapajós-Xingu interfluvium (b, MPEG 22098), Xingu-Tocantins interfluvium (c, MPEG 37970), and to the east of Tocantins river and west of Maranhão (d, MZUSP 43899).

TABLE 1: Plumage patterns found on dark-winged trumpeters

Character		Interfluvium			
		Madeira-Tapajós	Tapajós-Xingu	Xingu-Tocantins	To the east of the Tocantins river
Mantle	Distal portion	Parrot Green (S 160) or (S 2600)	Olive Green (S 46)	Olive Green (S 46)	Dark Green (S 162A e 262)
	Intermediate portion	Parrot Green (S 260) and Olive Green (S 47)	Very Dark Brown (M 7.5YR/2.5/3)	Very Dark Brown (M 7.5YR/2.5/3)	Dark Green (S 262)
	Proximal portion	Dark Green (S 162A)	Very Dark Brown (M 7.5YR/2.5/2)	Very Dark Brown (M 7.5YR/2.5/2)	Dark Brown (M 7.5YR/3/2)
Iridescence	Wing	Purple	Almost or entirely absent	Almost or entirely absent	Almost or entirely absent
	Lower neck	Purple	Almost or entirely absent	Almost or entirely absent	Almost or entirely absent

has as unambiguous diagnostic characters the lower portion of the mantle Olive Green, intermediate and upper parts of the mantle Dark Brown, and iridescence on the wings and neck discreet or absent.

Griscom & Greenway described *P. v. interjecta* based in a single specimen, and stated that this taxon presented a combination of the characters from *P. v. obscura* and the nominate form. The characters of *P. v. obscura* observed on *P. v. interjecta* would be the discreet iridescence both on the neck and the wings and the mantle darker than observed in *P. v. obscura*. Griscom & Greenway (1937) do not determine which

characters of the nominate form could be found in *P. v. interjecta*.

Our results show that specimens from the putative range of *P. v. interjecta* do not possess characters which can diagnose them from *P. v. dextralis*. Thus, according to morphological characters, *P. v. interjecta* cannot be considered a valid taxon, and therefore it is an individual variation of *P. v. dextralis*. Some authors have already recognized this, but also suggested that these may be intermediate between *P. v. dextralis* and *P. v. obscura* (Blake, 1977; Pinto, 1978; Sherman, 1996), but our analysis rejects this hypothesis.

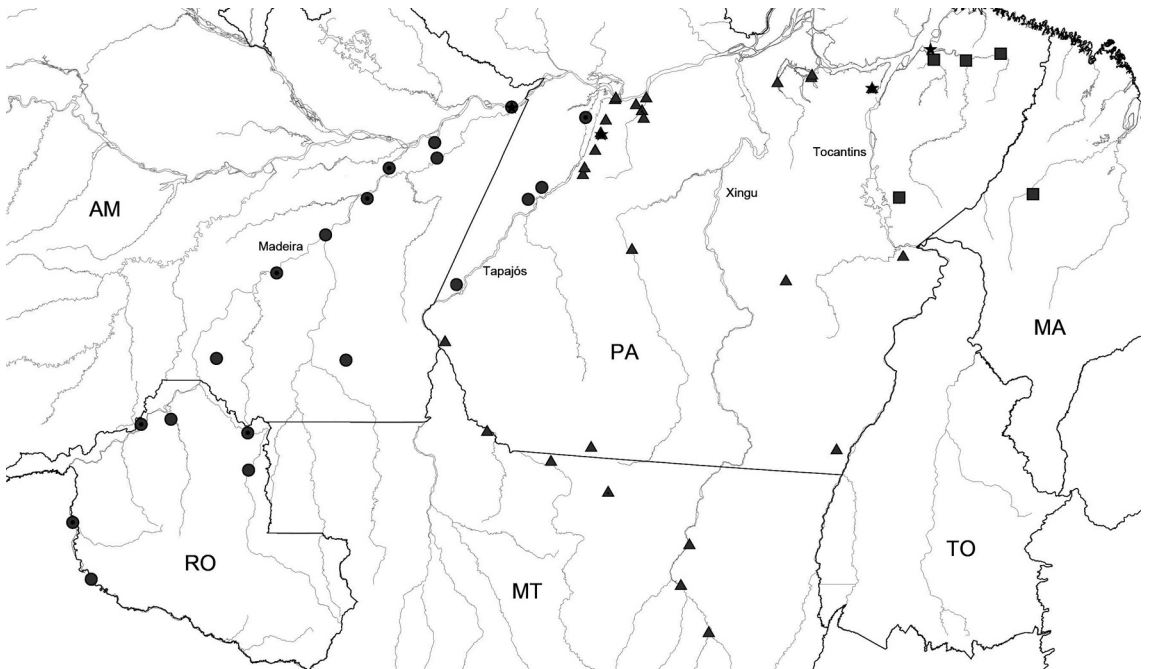


FIGURE 4: Distribution of dark-winged trumpeters in Brazil. Asterisk refers to the type-locality of each taxa. Points with a central dot refer to records obtained from literature. Circles refers to specimens analyzed of *Psophia viridis*, triangles to *P. dextralis* (including *P. v. interjecta*), and squares to *Psophia obscura*. Brazilian States are Amazonas (AM), Pará (PA), Rondônia (RO), Mato Grosso (MT), Tocantins (TO) and Maranhão (MA).

TABLE 2: Diagnostic characters for *Psophia viridis*, *Psophia dextralis* and *Psophia obscura*.

Taxon	Mantle			Lower Neck	Wing
	Distal portion	Intermediate portion	Proximal portion		
<i>P. viridis</i>	Parrot Green	Parrot Green	Dark Green	Purple iridescence present and conspicuous	Purple iridescence present and conspicuous
<i>P. dextralis</i>	Olive Green	Very Dark Brown	Very Dark Brown	Discreet or absent	Discreet or absent
<i>P. obscura</i>	Dark Green	Dark Green	Dark Brown	Very much reduced or absent	Very much reduced or absent

Although the original description of *P. v. interjecta* includes extensive blue and iridescent wing coverts (“*extensive blue apical spots to the wing-coverts*”), only one of the specimens analyzed (MPEG 37205) had this color on the wing coverts and therefore should be considered to be an individual variation as observed in the mantle of some specimens from this same area.

Pelzeln (1857) described *Psophia obscura* based on three individuals without designating a holotype, designating an adult male as the lectotype some years later (NHMW 39401, Pelzeln, 1871). Pelzeln (1857) noted that *P. obscura* differs from *P. viridis* due to its smaller bill and tarsus, discreet purple iridescence at the base of the neck and a brownish-green mantle. Here, we show that *P. v. obscura* can be separated both from *P. v. viridis* and *P. v. dextralis* based on the Dark Green (S 162A and S 262) color of the distal and intermediate portion of the mantle, being Dark Brown (M 7.5YR/3/2) in the upper region. The purple iridescence of the wings and the neck, when present, is less noticeable than in *P. v. viridis*.

We found five distinct and non-overlapping plumage characters that unambiguously diagnose each one of the three groups of specimens established above (see Table 2), and we also noted a lack of clinal variation and putative hybrids. Helbig *et al.* (2002) state that a taxon is diagnosable if individuals of the same age and sex are different from individuals of the same age and sex of all of the other taxa by at least one qualitative difference, or if one category of age and sex is separated by a complete discontinuity in at least one continuous and variable character (quantitative character) of the same category of age and sex of other related taxa. Based on morphological characters, our findings fulfill this definition and lead us to consider that the former *Psophia viridis* complex comprises three distinct species, which differ in their mantle color and in the iridescence of the wings and base of the neck. *Psophia viridis interjecta* Griscom & Greenway, 1937 shows no diagnostic character and should be considered as a junior synonym of *P. dextralis* Conover, 1934. The diversity of dark-winged trumpeters is represented by the following species:

Psophia viridis Spix, 1825

Type-locality: Parintins (“Villa Nuova”), Amazonas.

Diagnosis: distal and intermediate portions of the mantle Parrot Green (S 160; S 260), and upper portion Dark Green (S 162A); purple iridescence of the wings and neck present and conspicuous.

Distribution: Madeira-Tapajós interfluvium, with the northern limit at its type-locality, Parintins (Amazonas; MZUSP 10938), and the southern limit at Águas do Guaporé (Rondônia, MNRJ 9644; Figure 4).

Psophia dextralis Conover, 1934

Psophia viridis interjecta Griscom & Greenway, 1937
syn. jun.

Type-locality: Tauari, Pará.

Diagnosis: distinguished from the other taxa by presenting the distal portion of the mantle Olive Green (S 46), and the intermediate and proximal portion of the mantle Very Dark Brown (M 7.5YR/2.5/3 e M 7.5YR/2.5/2). The purple iridescence of the wings and the neck is discreet or absent.

Distribution: between the Tapajós and Tocantins rivers, with the northern limit at Portel (Pará, MPEG 40708 and MPEG 40709) and the southern limit at Sete de Setembro river (Mato Grosso, MPEG 14781; Figure 4).

Psophia obscura Pelzeln, 1857

Type-locality: Belém, Pará (*fide* Hellmayr & Conover, 1942).

Diagnosis: distinguished from the other species by the distal and intermediate portion of the mantle

Dark Green (S 162A and 262), being Dark Brown (M 7.5YR/3/2) in the proximal portion. The purple iridescence of the wings and neck is very much reduced or absent in most specimens.

Distribution: Occurs to the east of Tocantins river and west to Buriticupu (Maranhão, MPEG 37338; Oren 1990, 1991). The northern limit is Belém, the type locality, and the southern limit is Jacundazinho (Pará, MPEG 36328; Figure 4).

These species of Dark-winged Trumpeters are allopatric. The large rivers of the Amazon basin seems to be efficient barriers and may often prevent contact between related populations, as partially observed with these trumpeters. While complete isolation by rivers is rarely observed (Haffer 1974), the differences in plumage could disappear clinally towards the headwaters, and the river would be less effective as a barrier for dispersal, allowing contact between the populations. Despite the sampling of Dark-winged Trumpeters are far from ideal, most of the specimens were collected along the rivers and we examined specimens collected at the headwaters of some main rivers south of Amazon. We were able to check the constancy of the characters especially on these areas and we did not see any plumage variations associated with latitude, being conservative even at regions where the rivers are narrower and supposedly the taxa could be in contact. We found no evidence for clinal variation, and color patterns appeared consistent along the species' distribution. The Xingu river did not isolate (at least from a morphological point of view) populations of the Dark-winged Trumpeters while the Madeira, Tapajós and Tocantins rivers did, separating populations and eventually preventing gene flow between *Psophia viridis*, *P. dextralis* and *P. obscura*, respectively.

Taxonomic research can also be an important tool for conservation of the Dark-winged Trumpeters. While subspecies are not often considered when addressing the issue of threatened taxa, *Psophia obscura* is in the Brazilian list of threatened birds (as *P. v. obscura*, IBAMA, 2003). The Belém center of endemism, where *P. obscura* is found, is an area with many endemic and/or threatened birds, such as the Golden Parakeet (*Guarouba guarouba*), among others (Roma, 1996; Silveira & Belmonte, 2005) and is the most degraded and logged area in the Brazilian Amazon. Trumpeters require quite large home ranges and are sensitive to hunting, and hence are much more likely to disappear in disturbed sites. The main conservation strategy for

P. obscura is the urgent conservation of the remaining forested areas of the east of Pará and Maranhão (Oppenheimer, 2008). The creation and effective protection of conservation units or private reserves on the remaining preserved forests in the Belém center of endemism is essential not only for this taxon but for the other endemic and threatened species in this region.

RESUMO

Os jacamins-de-costas-verdes, Psophia viridis (Gruiformes, Psophiidae) são endêmicos da Amazônia brasileira e contam, atualmente, com três subespécies reconhecidas: Psophia viridis viridis Spix, 1825; Psophia v. dextralis Conover, 1934, e Psophia v. obscura Pelzeln, 1857, além de P. v. interjecta Griscom & Greenway, 1937, cuja validade tem sido questionada por diversos autores. Estes táxons distribuem-se alopatriicamente ao sul do rio Amazonas, embora os limites precisos de suas distribuições sejam ainda pouco conhecidos. Os táxons deste complexo nunca passaram por uma revisão taxonômica, e o presente trabalho teve como objetivos testar a validade dos mesmos. Com base no Conceito Filogenético de Espécie, os caracteres morfométricos e de colorido da plumagem foram analisados, além de refinar a distribuição geográfica dos táxons do complexo. Foram examinados 108 espécimes procedentes de 41 localidades, incluindo todos os tipos, e foram considerados também os registros confiáveis de literatura para delimitar-se a distribuição geográfica. Os dados morfométricos não indicaram diferenças significativas entre os táxons, não apontando também qualquer dimorfismo sexual. Entretanto, a análise dos caracteres de plumagem evidenciou padrões consistentes e distintos para cada um dos táxons, exceto para P. v. interjecta, cujos caracteres indicados pelos autores como diagnósticos são resultado de variação individual. Não foi observada variação clinal ou sinal de intergradação entre estes táxons, mesmo nas regiões próximas às cabeceiras dos grandes rios amazônicos, onde supostamente as populações poderiam entrar em contato. Sugere-se que as subespécies correntemente aceitas sejam elevadas ao nível de espécie, a saber: Psophia viridis Spix, 1825, que ocorre no interflúvio Madeira-Tapajós; P. dextralis Conover, 1934, encontrado no interflúvio Tapajós-Tocantins, e P. obscura Pelzeln, 1857, que distribui-se da margem direita do rio Tocantins até o oeste do Estado do Maranhão.

PALAVRAS-CHAVE: Psophiidae; *Psophia*; *Psophia viridis*; Taxonomia.

ACKNOWLEDGMENTS

We thank the Conselho Nacional de Desenvolvimento Científico – CNPq – and the Programa de Apoio à Pós-Graduação (PROAP) for financial support. We also appreciate the help and collaboration of the curators at the Brazilian ornithological collections for providing access to the collections, especially Alexandre Aleixo (MPEG) and Marcos Raposo (MNRJ) and our colleagues at MPEG, MNRJ, USP and MZUSP from their support. We also thank the curators of foreign ornithological collections for their help with information about the type specimens. We would like to give special thanks to Prof. Dra. Elizabeth Höfling, Prof. Dr. Herculano Alvarenga, Prof. Dr. Miguel Trefaut Rodrigues, and Vitor Q. Piacentini. An anonymous reviewer makes important suggestions in the manuscript.

REFERENCES

- BALDWIN, S.P.; OBERHOLSER, H.C. & WORLEY, L.G. 1931. *Measurements of birds*. Cleveland Museum of Natural History, Cleveland.
- BLAKE, E.R. 1977. *Manual of Neotropical Birds: Spheniscidae (Penguins) to Laridae (Gulls and Allies)*. University of Chicago Press, Chicago, v.1, 674 p.
- BRABOURNE, L. & CHUBB, C. 1912. *The Birds of South America*. R.H. Porter, London, v.1, 1.504 p.
- CONOVER, H.B. 1934. A new trumpeter from Brazil. *Proceedings of the Biological Society of Washington*, 47:119-120.
- ESRI (Environmental Systems Research Institute). 2002. ArcView 3.3.
- GRAVES, G.R. & ZUSI, R.L. 1986. *Preliminary survey of the avifauna of the east bank of the lower Rio Xingu*. [Relatório não publicado].
- GRISCOM, L. & GREENWAY, J.C. 1937. *Psophia viridis interjecta*. *Bulletin of the Museum of Comparative Zoology*, Harvard, 81(2):419.
- GYLDENSTOLPE, N. 1945. The bird fauna of Rio Juruá in Western Brazil. *Kungliga Svenska Vetenskaps akademis Handlingar*, 22(3):1-338.
- HAFFER, J. 1974. Avian speciation in tropical South America. *Publications of Nuttall Ornithological Club*, 14:1-390.
- HELBIG, A.J.; KNOX, A.G.; PARKIN, D.T.; SANGSTER, G. & COLLINSON, M. 2002. Guidelines for assigning species rank. *Ibis*, 144:518-525.
- HELLMAYR, C.E. & CONOVER, B. 1942. Catalogue of birds of the Americas and the adjacent islands in Field Museum of Natural History. *Publications of Field Museum of Natural History*, 13(1):308-314.
- IBAMA (INSTITUTO BRASILEIRO DO MEIO AMBIENTE E DOS RECURSOS NATURAIS RENOVÁVEIS). 2003. *Lista das Espécies da Fauna Brasileira Ameaçadas de Extinção*. Anexo à Instrução Normativa Nº 3, de 27 de maio de 2003 do Ministério do Meio Ambiente. Disponível em: www.ibama.gov.br/fauna. Acesso em: 30/Maio/2005.
- LINNAEUS, C. 1758. *Psophia*. In: Linnaeus, C. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis...* 10. ed. L. Salvii, Holmiae, p. 154.
- MUNSELL. 1994. *Soil color charts*. Revised edition. Macbeth Division of Kollmorgan Instruments Corporation, New Windsor, New York.
- NAUMBURG, E.M.B. 1930. *Birds of Mato Grosso, Brazil: A report on the birds secured by the Roosevelt-Rondon expedition*. *Bulletin of the American Museum of Natural History*, 60:83-84.
- NOVAES, F.C. & LIMA, M.F.C. 1991. As aves do rio Peixoto de Azevedo, Mato Grosso, Brasil. *Revista Brasileira de Zoologia*, 7(3):351-381.
- OPPENHEIMER, M. 2008. *Psophia viridis* obscura Pelzeln, 1857. In: Machado, A.B.M.; Drummond, G.M. & Paglia, A.P. (Eds.), *Livro vermelho da fauna brasileira ameaçada de extinção*. Ministério do Meio Ambiente, Brasília; Fundação Biodiversitas, Belo Horizonte. (Série Biodiversidade, 19).
- OREN, D.C. 1990. New and Reconfirmed Bird Records from the State of Maranhão, Brazil. *Goeldiana Zoologia*, (4):1-13.
- OREN, D.C. 1991. *Aves do Estado do Maranhão*, Brasil. *Goeldiana Zoologia*, (9):1-55.
- PAYNTER JR., R.A. & TRAYLOR, M.A. 1991. *Ornithological gazetteer of Brazil*. Museum of Comparative Zoology, Cambridge, 2v., 788 p.
- PELZELN, A. VON. 1857. *Psophia obscura*. *Sitzungsbericht mathematisch-naturwissenschaften. Classe Akademie der Wissenschaften*, Wien, 24:373.
- PELZELN, A. VON. 1871. *Zur Ornithologie brasiliens: Resultate von Johann Natters Reisen in den Jahren 1817 bis 1835*. A. Pichler's Witwe & Sohn, Viena, 462 p.
- PETERS, J.L. 1934. *Check-list of birds of the world*. Harvard University Press, Cambridge, v. 2.
- PINTO, O.M.O. 1938. Catálogo das aves do Brasil e lista dos exemplares que as representam no Museu Paulista (1ª parte). *Revista do Museu Paulista*, 22:1-566.
- PINTO, O.M.O. 1978. *Novo Catálogo das Aves do Brasil*. Empresa Gráfica da Revista dos Tribunais, São Paulo, v. 1.
- ROMA, J.C. 1996. *Composição e vulnerabilidade da avifauna do leste do Estado do Pará, Brasil*. (Dissertação de Mestrado). Universidade Federal do Pará, Belém.
- SCHAUENSEE, R.M. 1970. *A guide to the birds of South America*. Oliver & Boyd, Edinburgh.
- SHARPE, R.B. 1894. *Catalogue of the Fulicariae and Alectorides, in the collection of the British Museum*. British Museum (Natural History), London, v. 13, 354 p.
- SHERMAN, P.T. 1996. Family Psophiidae (trumpeters). In: Del Hoyo, J.; Elliott, A. & Sargatal, J. (Eds.), *Handbook of the birds of the world*. Lynx Edicions, Barcelona, v. 3, p. 96-107.
- SICK, H. 1997. *Ornitologia Brasileira*. 3. ed. Nova Fronteira, Rio de Janeiro, 912 p.
- SILVEIRA, L.F. & BELMONTE, F. 2005. Comportamento reprodutivo e hábitos da ararajuba, Guarouba guarouba, no município de Tailândia, Pará. *Ararajuba*, 13(1):89-93.
- SMITHE, F.B. 1975. *Naturalist's Color Guide*. American Museum of Natural History, New York.
- SNETHLAGE, E. 1914. Catálogo das aves amazonicas: contendo todas as especies descritas e mencionadas até 1913. *Boletim do Museu Paraense Emilio Goeldi*, 8(1911-12):1-530.
- SPIX, J.B. VON. 1825. *Psophia viridis*. In: *Avium species novae quas in itinere per Braziliam – annis 1817-20 collegit et descripsit*. Impensis, Monachii, v. 2, p. 66.
- STOTZ, D.F. 1986. *Report of field work at Cachoeira Nazaré, Rio Jiparaná, Rondonia, Brasil, May to July 1986*. [Relatório não publicado].
- VANZOLINI, P.E. 1992. *A supplement to the Ornithological Gazetteer of Brazil*. Museu de Zoologia, Universidade de São Paulo, São Paulo, 252 p.
- VANZOLINI, P.E. 1993. As viagens de Johann Natterer no Brasil, 1817-1835. *Papéis Avulsos de Zoologia*, 38(3):17-60.

Recebido em: 18.08.2009

Aceito em: 07.10.2009

Impresso em: 18.12.2009

Apoio:



Ministério da Educação

Ministério da Ciência e Tecnologia



APPENDIX: SPECIMENS EXAMINED (FOR ABBREVIATIONS, SEE TEXT)

Psophia viridis ($n = 24$): MZUSP 709, ♂, Aripuaná, AM; MZUSP 10938, ♂, Parintins, AM; MZUSP 17764, ♂, Lago do Baptista, AM; MZUSP 21855, ♂, Lago do Baptista, AM; MZUSP 62339, ♀, Rio Aripuaná, Periquito, AM; MZUSP 76728, ♂, Paca, rio Abacaxis, AM; MPEG 13749, ♀, Vila Braga, rio Tapajós, PA; MPEG 39336, ♀, Cachoeira Nazaré, rio Ji-Paraná, RO; MPEG 39337, ♂, Cachoeira Nazaré, rio Ji-Paraná, RO; MPEG MG 58403, ♀, Itaituba, BR 230, km 64, PA; MPEG 58655, ♂, Traíra-Chororó, AM; MNRJ 9637, ind., Jamari, RO; MNRJ 9640, ♂, Vila Braga, rio Tapajós, PA; MNRJ 9644, ind., Mata do Pirocoluina, Águas do Guaporé, RO; MNRJ 9645, ind., Machado, MT; MNRJ 20557, ♂, Lago do Baptista, AM; MNRJ 20559, ♂, Lago do Baptista, AM; MNRJ 20560, ♂, Igarapé do Arary, AM; MNRJ 20561, ♂, Amazonas, AM; MNRJ 20563, ♂, Lago do Baptista, AM; MNRJ 20564, ♂, Igarapé do Arary, AM; MNRJ 20565, ♀, Lago do Baptista, AM; MNRJ 32872, ♀, Jacareacanga, PA; ZSM B11, Parintins, AM (Type).

Psophia dextralis ($n = 73$): MZUSP 10610, ♂, Taperinha, PA; MZUSP 10611, ♂, Taperinha, PA; MZUSP 20903, ♂, Piquiatuba, PA; MZUSP 20904, ♀, Bom Jardim, PA; MZUSP 20905, ♀, Caxiricatuba, PA; MZUSP 20461, ♂, Bom Jardim, PA; MZUSP 21272, ♀, Piquiatuba, PA; MZUSP 21311, ♂, Piquiatuba, PA; MZUSP 21413, ♂, Piquiatuba, PA; MZUSP 21419, ♀, Caxiricatuba, PA; MZUSP 21762, ♀, Caxiricatuba, PA; MZUSP 21766, ♂, Caxiricatuba, PA; MZUSP 21800, ♀, Bom Jardim, PA; MZUSP 21801, ♂, Piquiatuba, PA; MZUSP 21820, ♂, Caxiricatuba, PA; MZUSP 21821, ♀, Caxiricatuba, PA; MZUSP 21822, ♂, Piquiatuba, PA; MZUSP 21823, ♀, Caxiricatuba, PA; MZUSP 21858, ♀, Caxiricatuba, PA; MZUSP 21859, ♀, Caxiricatuba, PA; MZUSP 21860, ♂, Caxiricatuba, PA; MZUSP 21923, ♂, Bom Jardim, PA; MZUSP 21950, ♂, Caxiricatuba, PA; MZUSP 21951, ♂, Caxiricatuba, PA; MZUSP 21952, ♂, Piquiatuba, PA; MZUSP 21953, ♂, Piquiatuba, PA; MZUSP 21984, ♀, Caxiricatuba, PA; MZUSP 22001, ♀, Caxiricatuba, PA; MZUSP 22098, ♂, Caxiricatuba, PA; MZUSP 22345, ♀, foz do Rio Curuá, PA; MZUSP 22502, ♂, Bom Jardim, PA; MZUSP 32918, ♂, Rio Tapajós, PA; MZUSP 46278, ♀, Fordlandia, PA; MZUSP 46279, ♂, Tapaiuna, PA; MZUSP 46280, ♂, Urucurituba, PA; MZUSP 46281, ind., Fordlandia, PA; MZUSP 58106, ind, Fordlandia, PA; MZUSP 58107, ♂, Fordlandia, PA; MZUSP 58108, ♂, Fordlandia, PA; MZUSP 58109, ♀, Tauari, PA; MZUSP 58110, ♀, Tauari, PA; MZUSP 58111, ♀, Fordlandia, PA; MZUSP 58507, ♀, Fordlandia, PA; MZUSP 58508, ♀, Fordlandia, PA; MPEG 14781, ♂, Rio Sete de Setembro, Posto Garapu, MT; MPEG 26398, ♂, Caxiricatuba, PA; MPEG 37204, ♂, Carajás, Serra Norte, PA; MPEG 37205, ♀, Carajás, Serra Norte, Mata da Lixeira, PA; MPEG 37970, ♂, Marabá, Reserva CVRD, Rio Sororó, PA; MPEG MG 40707, ♀, R. Pracupy, Portel, PA; MPEG MG 40708, ♂, Portel, PA; MPEG MG 40709, ♂, Portel, PA; MPEG 48495, ♂, Santana do Araguaia, Faz. Barra das Princesas, PA; MPEG 48496, ♂, Santana do Araguaia, Faz. Fartura, PA; MPEG 51281, ♂, Alta Floresta, Rio Teles Pires, boca do Rio Cristalino, MT; MPEG 51282, ♀, Rio Cristalino, marg. direita, 15km acima do Teles Pires, MT; MPEG 51283, ♀, Alta Floresta, Rio Cristalino, marg. direita, 15km acima do Rio Teles Pires, MT; MPEG 51284, ♂, Alta Floresta, Rio Teles Pires, marg. esquerda, frente boca Rio Cristalino, MT; MPEG 58592, ind, Serra do Cachimbo, Base Aeronáutica, PA; MNRJ 20566, ♂, Caxiricatuba, PA; MNRJ 25249, ♂, Curuá-tinga, afluente do Curuá-una, PA; MNRJ 25251, ♂, Curuá-tinga, afluente do Curuá-una, PA; MNRJ 32866, ♂, Jacaré, baixo Culuene (Xingu), MT; MNRJ 32867, ♂, Jacaré, baixo Culuene (Xingu), MT; MNRJ 32868, ♀, Jacaré, baixo Culuene (Alto Xingu), MT; MNRJ 32869, ♀, Jacaré, baixo Culuene (Alto Xingu), MT; MNRJ 32870, ♀, Jacare, baixo Culuene, MT; MNRJ 32871, ♀, Diauarum, Alto Xingu, MT; MNRJ 32873, ♂, Cururú-assu; MNRJ 32874, ♀, Alto Cururu; MNRJ 32875, ♀, Alto Cururu; MNRJ 32876, ♀, Alto Cururu; FMNH 410480, ♂, Tauari, PA (Type).

Psophia obscura ($n = 11$): MZUSP 43898, ♂, Capim, BR 14, km 93, PA; MZUSP 43899, ♂, Capim, BR 14, km 93, PA; MPEG 1697, ♂, Rio Acará, PA; MPEG 1698, ♂, Rio Acará, PA; MPEG 6584, ♂, Jardim Zoológico; MPEG 14440, ♀, Rodovia Belem-Brasília, km 75; MPEG 32003, ♂, Ourem, Sitio Fé em Deus; MPEG 32002, ♂, Mun. Ourem, Sítio Fé em Deus; MPEG 32376, ♂, Ourem, Igarape Pedral, PA; MPEG 36328, ind., Tucuruí, Jacundazinho, PA; MPEG 37338, ind., Buriticupu, MA.