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A new species and five new records of chewing lice (Insecta: Phthiraptera: Ischnocera) from an isolated population of the solitary tinamou *Tinamus solitarius* (Aves: Tinamiformes)

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Abstract

We report the first records of chewing lice from an isolated population of the solitary tinamou (formerly known as *Tinamus solitarius pernambucensis* Berla, 1946) in the Pernambuco Centre of Endemism (PCE), Brazil. All louse records previously published from the solitary tinamou came from the populations south of the São Francisco River, formerly known as *Tinamus solitarius solitarius* (Vieillot, 1819). Five known species of the family Heptapsogasteridae were identified from the northern population of this host: *Heptarthrogaster grandis* Carriker, 1936; *Ornicholax alienus* (Giebel, 1874); *Pterocotes solitarius* Guimarães & Lane, 1937; *Rhopaloceras oniscus* (Nitzsch [in Giebel], 1866); and *Strongylocotes wernecki* Guimarães & Lane, 1937. Also, the new species *Heptagoniodes guimaraesi* is described and illustrated from the northern population of this host, and a key for identification of all the species of *Heptagoniodes* Carriker, 1936 is included. The discovery of *H. guimaraesi* is the first Brazilian example of a bird ectoparasite represented by two different species of the same genus living on two distinct populations of the same host species. Records of eight louse species and 31 new localities from the southern population of the solitary tinamou in Brazil are given, and an updated list of all the chewing lice known from both host populations [subspecies] is included.

Key words: chewing lice, Phthiraptera, Heptapsogasteridae, *Heptagoniodes*, *Heptagoniodes guimaraesi*, new species, *Heptarthrogaster*, *Ornicholax*, *Pterocotes*, *Rhopaloceras*, *Strongylocotes*, tinamous, *Tinamus solitarius solitarius*, *Tinamus solitarius pernambucensis*, Brazil, Pernambuco Centre of Endemism

Introduction

The chewing louse family Heptapsogasteridae comprises a large group of species, all endemic to the Neotropical Region and restricted to the bird families Tinamidae (Tinamiformes) and Cariamidae (Gruiformes) (Carriker 1936, 1944). Many genera have been described to include the species from Tinamidae, and the only two species which occur on members of the non-related family Cariamidae are included in the genus *Heinrothiella* Eichler, 1942. Lice of this family appear to occupy the niche formed by the down feathers near the skin, the same niche occupied by species of Gonioididae parasitic on other basal group of neognathous birds (i.e. Galliformes) (Clay 1957: 155). Tinamou lice are of particular interest because a large number of species may be found co-infesting a single host species, with the most extreme examples of diversity being the brown tinamou, *Crypturellus obsoletus punensis* (Chubb, 1917), with 11 species belonging to 10 genera, and the solitary tinamou, *Tinamus solitarius* (Vieillot, 1819), with eight species in eight genera (Price *et al.* 2003: 384), but increased in this paper to 12 species in nine genera (see below). In both examples, the louse genera belong to three families from two suborders.

Although the last world checklist of chewing lice (Price *et al.* 2003, following Hellenthal *et al.* 2002) regarded the Heptapsogasteridae as a junior synonym of Philopteridae, here we follow the original proposal of Carriker (1936) for this odd morphological, ecological and geographical suprageneric taxon of ischnoceran lice parasitic on

Many taxa found in the isolated forests of PCE have their sister species outside that center of endemism. However, many others have not been critically reviewed and may prove to be simply varieties with no taxonomic significance. Amaral & Silveira (2004) reviewed the taxonomy of *Tinamus* from the Atlantic Forest and found no plumage or other morphological differences between *T. solitarius solitarius* and *T. s. pernambucensis*, making the latter name a junior synonym of the former. However, the geographical barrier of the São Francisco River has led to an unusual distribution pattern of *Heptagoniodes* lice parasitising *T. solitarius*. (Fig. 13). There are other known examples of chewing lice represented by different species on hosts of the same species, which are separated by geographical barriers (Clay 1964, 1976). The case of *H. guimaraesi* and *H. clayae* could be a Brazilian example of ectoparasite speciation caused by a geographic barrier separating its host populations and resulting in two allopatric louse species (Fig. 13). However, to accept this hypothesis the morphological similarity between *H. guimaraesi* and the Amazonian *H. agonus* has to be regarded as result of convergent evolution. Another, more likely scenario to explain that two species of *Heptagoniodes* parasitise two apparently identical but isolated host populations is that the northern population of *T. solitarius* was, at some point, in contact with the Amazonian host *T. tao tao* (Fig. 13). That contact would have allowed a successful host-switch of *Heptagoniodes* from *T. tao tao* onto *T. solitarius*, with a subsequent speciation and an extinction of the original *Heptagoniodes* population on the latter host. This is the most parsimonious hypothesis to explain the morphological similarity of *H. guimaraesi* with *H. agonus*, and not with *H. clayae* in the south of the São Francisco River.

The presence of *H. guimaraesi* only on the northern population of the solitary tinamou would corroborate the original hypothesis of Berla (1946), reopening the question about the validity of *T. s. pernambucensis*. Regardless the validity of this taxon, it is interesting that only one genus of lice, in a set of six, split into two species while the others remained exactly identical to those parasitic on the southern population of the host. Furthermore, it may be significant that *Heptagoniodes* is one of the “rarest” genera of chewing lice collected on *Tinamus* hosts (e.g. Carriker 1936, 1944; Guimarães & Lane 1937).

Judging from the geographic distribution of the specimens studied, *H. guimaraesi* does not appear to occur in any sample from southeastern or southern Brazil (Fig. 13). Considering that the small and restricted northern host population – of less than 100 individuals 40 years ago – is on the verge of extinction (Coimbra-Filho 1971; Silveira *et al.* 2003), it is likely that *H. guimaraesi* is also critically threatened, if not already extinct. Molecular studies of fresh samples of chewing lice may elucidate the true relationship among *H. guimaraesi*, *H. agonus* and *H. clayae*, perhaps showing if the morphological similarity is genetic or due to convergence. Unfortunately, all the material available for this study was stored in suboptimal conditions for an extended period of time, and DNA studies were not possible.

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References

- Amaral, F.S.R. & Silveira, L.F. (2004) *Tinamus solitarius pernambucensis* Berla, 1946 é sinônimo de *Tinamus solitarius* (Vieillot, 1819). *Ararajuba*, 12 (1), 33–41.
- Berla, H.F. (1946) Lista das aves colecionadas em Pernambuco, com descrição de uma subespécie N., de um alótipo fêmea e notas de campo. *Boletim do Museu Nacional do Rio de Janeiro*, 65, 1–35.
- Carriker, M.A. Jr. (1903) Mallophaga from birds of Costa Rica, Central America. *Nebraska University Studies*, 3 (2), 123–197, 9 pls.
- Carriker, M.A. Jr. (1936) Studies in Neotropical Mallophaga, Part I. – Lice of the tinamous. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 88, 45–186, 32 pls.
- Carriker, M.A. Jr. (1944) Studies in Neotropical Mallophaga (III) [Tinamidae N°. 2]. *Proceedings of the United States National Museum*, 95 (3180), 81–233.

<http://dx.doi.org/10.5479/si.00963801.95-3180.81>

- Carriker, M.A. Jr. (1955) Studies in Neotropical Mallophaga XII (Part 4). Lice of the tinamous. *Boletín de Entomología Venezolana*, 11 (3–4), 97–131.
- Clay, T. (1937) Mallophaga from the Tinamidae. *Proceedings of the Zoological Society of London Series B*, 107, 133–159.
- Clay, T. (1951) An introduction to a classification of the avian Ischnocera (Mallophaga): Part I. *Transactions of the Royal Entomological Society of London*, 102, 171–195.
- Clay, T. (1954) The post-spiracular seta and sensillus in the Mallophaga (Insecta). *Annals and Magazine of Natural History*, Series 12, 7, 716–718.
- <http://dx.doi.org/10.1080/00222935408651780>
- Clay, T. (1957) The Mallophaga of birds. In: Baer, J.G. (Ed.), *Première symposium sur la spécificité parasitaire des parasites de vertébrés*. Institut de Zoologie, Université de Neuchâtel, Neuchâtel, pp. 120–158.
- Clay, T. (1964) Geographical distribution of the Mallophaga (Insecta). *Bulletin of the British Ornithologists' Club*, 84 (1), 14–16.
- Clay, T. (1976) Geographical distribution of the avian lice (Phthiraptera): a review. *Journal of the Bombay Natural History Society*, 71 (3), 536–547.
- Coimbra-Filho, A.F. (1971) Três formas da avifauna do nordeste do Brasil ameaçadas de extinção: *Tinamus solitarius pernambucensis* Berla, 1946, *Mitu mitu mitu* (Linnaeus, 1766) e *Procnias a. averano* (Hermann, 1783) (Aves – Tinamidae, Cracidae, Cotingidae). *Revista Brasileira de Biologia*, 31, 239–247.
- Dickinson, E.C. (Ed.) (2003) *The Howard and Moore complete checklist of the birds of the world. 3rd Edition*. Princeton University Press, New Jersey, 1039 pp.
- Eichler, W. (1942) Notulae Mallophagologicae. VIII. *Heinrothiella inexpectata* nov. gen. et spec. und einige andere z. T. neue Federlinge. *Zoologischer Anzeiger*, 139 (1–2), 27–31.
- Eichler, W. (1947) Notulae Mallophagologicae. XVIII. Ueber Einige Heptapsogastridae [sic]. *Revista de Entomologia*, 18 (1–2), 167–172.
- Giebel, C.G.A. (1874) *Insecta epizoa. Die auf Säugetieren und Vögeln schmarotzenden Insecten nach Chr. L. Nitzsch's Nachlass bearbeitet*. O. Wiegand, Leipzig, xvi + 308 pp., 20 pls.
- Guimarães, L.R. (1942a) Sobre alguns gêneros e espécies de Heptapsogastridae [sic] (Mallophaga). – I. *Papéis Avulsos de Zoologia, São Paulo*, 2 (2), 15–37.
- Guimarães, L.R. (1942b) Sobre alguns gêneros e espécies de Heptapsogastridae [sic] (Mallophaga). – II. *Papéis Avulsos de Zoologia*, 2 (12), 151–170.
- Guimarães, L.R. (1942c) Sobre as espécies do gênero *Pseudolipeurus* (Mallophaga-Philopteridae). *Papéis Avulsos de Zoologia*, 2 (20), 267–290.
- Guimarães, L.R. (1943) Sobre alguns gêneros e espécies de Heptapsogastridae [sic] (Mallophaga). – III. *Papéis Avulsos de Zoologia*, 3 (2), 19–37.
- Guimarães, L.R. (1948) Sobre algumas espécies de Malófagos encontrados em *Tinamus tao tao* Temminck e *Tinamus tao septentrionalis* Brabourne e Chubb. *Boletim do Museu Paraense (E. Goeldi) de Historia Natural e Ethnographia*, 10, 161–173.
- Guimarães, L.R. (1950) Pequenas notas sobre malófagos. II. *Papéis Avulsos de Zoologia*, 9 (21), 321–340.
- Guimarães, L.R. & Lane, F. (1937) Contribuições para o conhecimento das Mallophagas das aves do Brasil. VI – Novas espécies parasitas de Tinamiformes. *Revista do Museu Paulista*, 23, 1–21.
- Hellenthal, R.A., Price, R.D. & Timm, R.M. (2002) A review of the chewing louse genus *Tinamotaecola* (Phthiraptera: Philopteridae), with the description of three new species. *Journal of the Kansas Entomological Society*, 74 (3), 136–141.
- Hopkins, G.H.E. (1942) Stray notes on Mallophaga – V. *Annals and Magazine of Natural History*, Series 11, 9, 108–119.
- Hopkins, G.H.E. & Clay, T. (1952) *A check list of the genera & species of Mallophaga*. British Museum of Natural History, London, 362 pp.
- Johnson, K.P., Adams, R.J. & Clayton, D.H. (2001) Molecular systematics of Gonioididae (Insecta: Phthiraptera). *Journal of Parasitology*, 87 (4), 862–869.
- <http://dx.doi.org/10.2307/3285146>
- Kéler, S. von (1938) Über brasilianische Mallophagen. 1 Beitrag. *Arbeiten über Morphologische und Taxonomische Entomologie aus Berlin-Dahlem*, 5 (4), 305–326.
- Kéler, S. von (1939) Über brasilianische Mallophagen. 2 Beitrag. *Arbeiten über Morphologische und Taxonomische Entomologie*, 6 (3), 222–253.
- Mey, E. (1994) Beziehungen zwischen Larvemorphologie und systematik der adulti bei den vogel - Ischnozeren (Insecta, Phthiraptera, Ischnocera). *Mitteilungen aus dem Zoologischen Museum in Berlin*, 70 (1), 3–84.
- Palma, R.L. (1978) Slide mounting of lice: a detailed description of the Canada Balsam technique. *New Zealand Entomologist*, 6 (4), 432–436.
- <http://dx.doi.org/10.1080/00779962.1978.9722313>
- Paynter, R.A.J. & Traylor, M.A. (1991) *Ornithological gazetteer of Brazil. Vol. 1. & 2*. Museum of Comparative Zoology, Cambridge, viii + 789 pp.
- Price, R.D., Hellenthal, R.A. & Palma, R.L. (2003) World checklist of chewing lice with host associations and keys to families and genera. In: Price, R.D., Hellenthal, R.A., Palma, R.L., Johnson, K.P. & Clayton, D.H. (Eds.), *The chewing lice. World*

- checklist and biological overview. Illinois Natural History Survey Special Publication*, 24 (Champaign), pp. 1–448.
- Silveira, L.F., Olmos, F. & Long, A.J. (2003) Birds in Atlantic Forest fragments in north-east Brazil. *Cotinga*, 20, 32–46.
- Silveira, L.F., Olmos, F. & Long, A.J. (2004) Taxonomy, history and status of Alagoas curassow *Mitu mitu* (Linnaeus, 1766), the world's most threatened cracid. *Ararajuba*, 12 (2), 125–132.
- Smith, V.S. (2000) Basal ischnoceran louse phylogeny (Phthiraptera: Ischnocera: Gonioididae and Heptapsogasteridae). *Systematic Entomology*, 25, 73–94.
<http://dx.doi.org/10.1046/j.1365-3113.2000.00095.x>
- Smith, V.S. (2001) Avian louse phylogeny (Phthiraptera: Ischnocera): a cladistic study based morphology. *Zoological Journal of the Linnean Society*, 132, 81–144.
<http://dx.doi.org/10.1111/j.1096-3642.2001.tb02272.x>
- Taschenberg, O. (1882) Die mallophagen mit besonderer Berücksichtigung der von Dr. Meyer gesammelten Arten systematisch bearbeitet. *Nova Acta der Kaiserlich Leopoldinisch-Carolinisch Deutschen Akademie der Naturforscher*, 44 (1), 1–244, 7 pls.
- Valim, M.P. (2009) Type specimens of lice (Insecta: Phthiraptera) held in the Museu de Zoologia da Universidade de São Paulo, Brazil. *Papéis Avulsos de Zoologia*, 49 (17), 197–219.
<http://dx.doi.org/10.1590/s0031-10492009001700001>