



New family host and records of *Acanthocrios furnarii* (Cordero & Vogelsang, 1928) (Hemiptera: Cimicidae) from Argentina, and implications in the transmission mechanism of cimicid bugs among birds' nests

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Abstract

Acanthocrios furnarii (Cordero & Vogelsang, 1928) [Hemiptera: Cimicidae: Haematosiphoninae] is an ectoparasite on avian hosts from Argentina and Uruguay. It has been mostly found in mud nests of *Furnarius rufus* (Gmelin, 1788) [Aves: Furnariidae], but its true hosts are some of the inquiline birds that use *F. rufus* nests. These inquiline hosts belong to the families Emberizidae, Hirundinidae, Icteridae, Passeridae, and Troglodytidae. Outside *F. rufus* mud nests, *A. furnarii* has been found in nests of other Furnariidae, Hirundinidae, and Passeridae. The present work adds the first nonpasserine host (Falconidae) of *A. furnarii*, together with new records in La Pampa, Argentina. The transmission mechanism of *A. furnarii*, together with all other cimicid bugs from Argentina and adjacent countries, is increased considering this new host; and we also take into account the birds that nidificate in nest boxes, the cavity-nesting birds in trees and earth, and the inquiline birds in stick nests of Furnariidae and Psittacidae.

Key words: bird bugs, Hemiptera, Cimicidae, Falconidae, new host, new records, Argentina

Introduction

Acanthocrios furnarii (Cordero & Vogelsang, 1928) [Hemiptera: Cimicidae: Haematosiphoninae] is an ectoparasite on avian hosts from Argentina and Uruguay. It has been mostly found in mud nests of *Furnarius rufus* (Gmelin, 1788) [Aves: Furnariidae], but its true hosts are the birds of the families Emberizidae, Hirundinidae, Icteridae, Passeridae, and Troglodytidae which regularly use the nests of *F. rufus* (Table 1). Outside the nests of *F. rufus*, *A. furnarii* was found in a stick nest of Furnariidae, in nests of Hirundinidae and Passeridae (Table 1), and inside nests boxes occupied by Emberizidae, Hirundinidae, and Passeridae (Table 2). Based on records of birds that nidificate inside nests of other birds and known hosts, the probable transmission mechanism of *A. furnarii* among birds' nests was proposed for the first time by Turienzo & Di Iorio (2007), and later enlarged and partially corroborated by the addition of new bird hosts (Turienzo & Di Iorio 2010). At the same time, Turienzo & Di Iorio (2010) differentiate between the places where *A. furnarii* were found but the hosts were not verified, and the nests made by bird hosts and infested with *A. furnarii* (Table 1).

The present work adds the first nonpasserine host (Falconidae), together with a new provincial record in Argentina. The transmission mechanism is enlarged considering this new host, and also taking into account the birds that nidificate in nest boxes, the cavity-nesting birds in trees and earth, and the inquiline birds in stick nests of Furnariidae and Psittacidae. An extended probable transmission mechanism of cimicid bugs among birds' nests from Argentina is provided, including not only *A. furnarii*, but also all other cimicid bugs on birds from Argentina and adjacent countries (Fig. 1).

Abbreviations of the Argentinian provinces used in the map and table

BA, Buenos Aires; Ca, Catamarca; Cb, Córdoba; CF, Capital Federal; Ch, Chaco; CH, Chubut; Co, Corrientes; ER, Entre Ríos; Fo, Formosa; Ju, Jujuy; LP, La Pampa; LR, La Rioja; Me, Mendoza; Mi, Misiones; Ne, Neuquén; RN, Río Negro; Sa, Salta; SC, Santa Cruz; SF, Santa Fe; SE, Santiago del Estero; SL, San Luis; SJ, San Juan; TF, Tierra del Fuego; Tu, Tucumán.

New host and locality records of *Acanthocrios furnarii* from Argentina

FALCONIDAE

Falco sparverius cinnamominus Swainson, 1837

ARGENTINA: La Pampa: Dto. Quemú Quemú, Route 7, near Colonia Inés y Carlota, J.M. Grande leg., 27-XII-2011, 2 nymphs [DIOC], on nestling # M8087, 1 adult [DIOC], in nest box # 36.

Remarks: A total of 50 wood nest boxes was installed between 21th and 26th of September 2011 in electric power lines along secondary roads in an agroecosystem landscape. During the 2011–2012 breeding season, 34 nest boxes (68%) were occupied by *F. sparverius*, and others by *Agelaiodes badius* (Vieillot, 1819) [Icteridae], *Passer domesticus* (Linnaeus, 1758) [Passeridae], *Xolmis irupero* (Vieillot, 1823) [Tyrannidae], and other unidentified passerine birds. Four of the nest boxes occupied by *F. sparverius* (including the # 36 where the cimicid bugs were found) had some nesting materials (sticks and/or grasses) used by passerine birds.

Only one box (2.9% of occupied boxes) was infested with cimicid bugs. This nest box (# 36) was empty on 25-X-2011. Nine days later (3-XI-2011), some sticks were present, together with 4 eggs of *F. sparverius*. Later an additional egg was laid, and the nestlings must have hatched around 4-XII-2011. Both nymphs of *A. furnarii* were found on one of the nestlings when they were banded 27-XII-11, and many bugs were located in corners of the box from where the adult was collected. Apparently the five nestlings may have fledged, as there were no remains of the fledglings in the box during a later visit (4-I-2012).

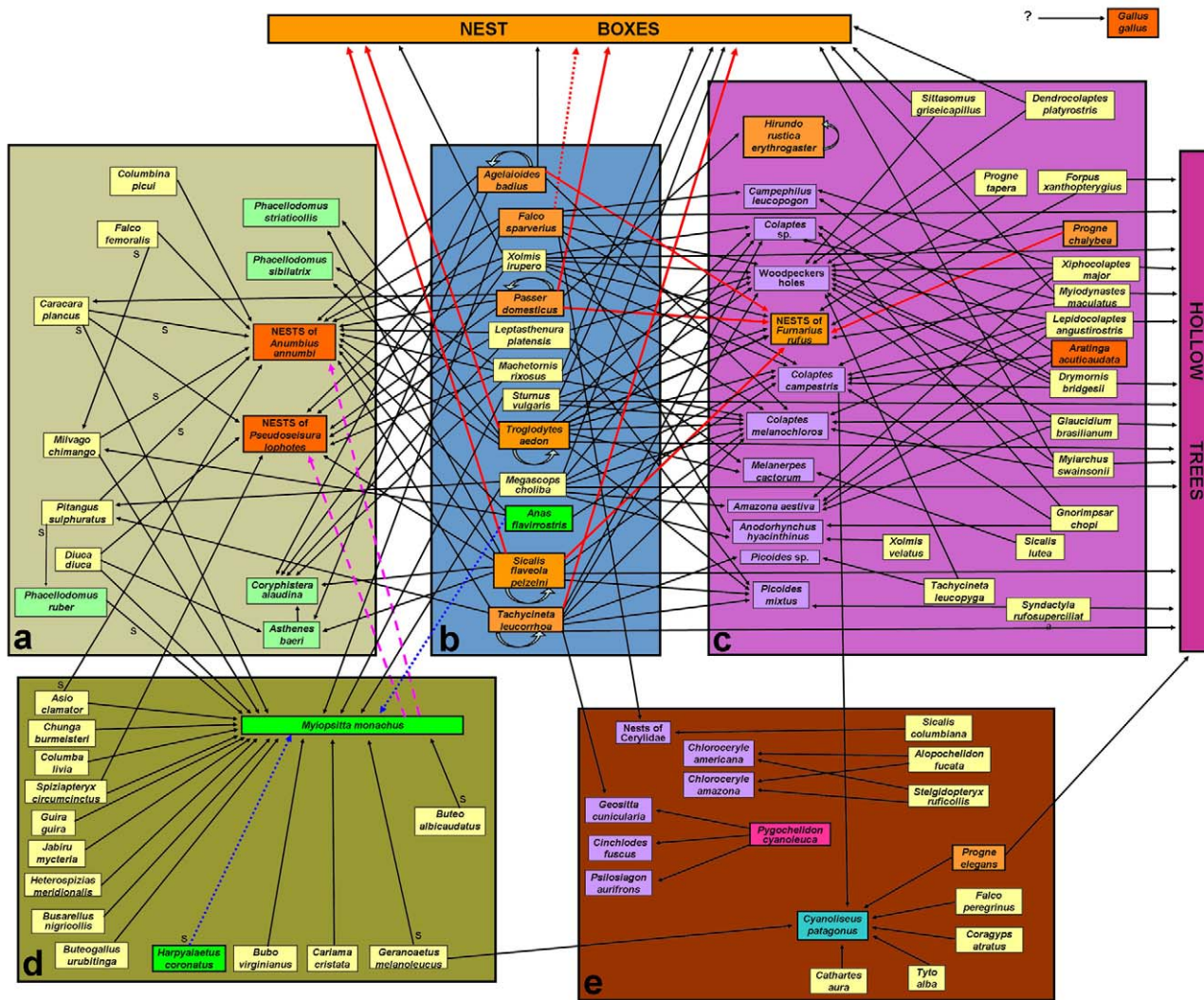
TROGLODYTIDAE

Troglodytes aedon Vieillot, 1809

ARGENTINA: La Pampa: 7 km E Paraje La Araña, 24-I-2012, L. Bragagnolo & M.A. Santillán leg., 94 exx. [DIOC], in nest box # P7.

Remarks: These nest boxes installed in 2005 were located in the cattle ranch “La Tapera ,” 7 km E Paraje La Araña, with pure stands of *Prosopis caldenia* Burk. [Mimosaceae], in a semiarid climate in the southwestern portion of the Espinal (Fig. 1). Every year all nest boxes are cleaned after the breeding season. From a total of 101 nest boxes in the breeding period 2011–2012, 61 (60.4%) were occupied by *T. aedon*, and only a single nest (1.6% of occupied boxes) was infested. In the infested nest box, two broods of *T. aedon* were produced: the first nest was built 9-XI-2011, 5 nestlings were born 27-XI-2011, and all fledged 10–11-XII-2011; in the second brood, the nest was built 20-XII-2011, 4 nestlings were born 9-I-2012, and all of them fledged 22–23-I-2012.

Between both broods, the nest box was not cleaned, because the male retires the materials of the bed, and the female builds the new bed upon the old platform of sticks (see nest building by *T. aedon* in Turienzo & Di Iorio [2010]: p. 16, figs. 29–30). The entire nest was retired one day after the nestlings of the second brood fledged, when the bugs were discovered (24-I-2012).



Hosts and places of cimicid bugs



FIGURE 1. Probable transmission mechanism of cimicid bugs among birds' nests from Argentina. a, birds that nidificate inside stick nests of Furnariidae and superimposed nests (s); b, birds that nidificate in more than one kind of nests; c, cavity-nesting birds on trees; d, stick nests of Psittacidae (*Myiopsitta monachus*) and superimposed nests (s); e, cavity-nesting birds in earth. Color inside frames of birds' names: brown, hosts of *Acanthocrius furnarii*; pale green and pale violet, primary builders; pale yellow color, inquilines; orange, hosts and/or places of *O. toledo*; light blue, host of *Cyanolicimex patagonicus*; dark pink, host of *Ornithocoris pallidus*; light green, hosts of *Psitticimex uritui*. All relationships among birds (arrows) were extracted from ornithological literature, as well as intraspecific brood parasitism (curved arrows), except some records given in the Appendix. Places of inquiline nests where they were found infested with cimicid bugs are signaled with tick arrows. A list of birds that nidificate in nest boxes was extracted from De la Peña (2005). See explanation in Discussion.

Discussion

Up to now, all known hosts of *A. furnarii* have been passerine birds (Tables 1–2). The finding of a nest box occupied by *Falco sparverius*, and infested with *A. furnarii* during its breeding period, allows us to count this nonpasserine bird as a host of *A. furnarii*. Nevertheless, as *Falco sparverius* does not build a nest or deliver any

nesting material, using cavities and/or old nests of other birds present in the nesting place (Di Giacomo 2005), and the fact that sticks were present in four nest boxes (including the nest box infested with *A. furnarii*), all suggest that passerine birds started to build a nest but were displaced by *F. sparverius*.

TABLE 1. Localities, hosts and places of *Acanthocrius furnarii* (Hemiptera: Cimicidae) in Argentina and Uruguay. Provinces and localities are ordered from north to south and west to east. References: [1], Cordero & Vogelsang 1928; [2], Del Ponte & Riesel 1945; [3], Wygodzinsky 1951; [4], Wygodzinsky, 1959; [5], Ronderos 1961; [6], Usinger 1966; [7], Aramburú & Carpintero 2006; [8], Carpintero & Aramburú 2007; [9], Turienzo & Di Iorio 2008; [10], Di Iorio *et al.* 2008; [11], Turienzo & Di Iorio 2010.

Country: Province: Locality	Host	Place	References
Ca: Santa María	Not verified	Nest of <i>Furnarius rufus</i>	[6]
Tu: Ruta 9, 10 km Tucumán city	Not verified	Nest of <i>Furnarius rufus</i>	[4], [6]
SE: San Ramón	Not verified	Nest of <i>Furnarius rufus</i>	[3], [5], [6]
SE: La Banda	<i>Passer domesticus</i>	Nest of <i>Passer domesticus</i>	[3], [5], [6]
Ch: Resistencia	Not verified	Nest of <i>Furnarius rufus</i>	[2], [10]
Co: Isla Antequera	Not verified	Nest of <i>Furnarius rufus</i>	[3], [5], [6]
Cb: Ea. El Sauce	<i>Sicalis flaveola pelzelni</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Vuelta de Obligado	<i>Passer domesticus</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Junin, Ea. La Brava	Undetermined bird	Nest of <i>Furnarius rufus</i>	[11]
BA: Otamendi	<i>Sicalis flaveola pelzelni</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Zelaya, Río Luján	<i>Sicalis flaveola pelzelni</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Zelaya, Río Luján	<i>Troglodytes aedon</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Río Lujan, F.C.G.B.M.	<i>Sicalis flaveola pelzelni</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Río Lujan, F.C.G.B.M.	<i>Troglodytes aedon</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Campo de Mayo	Not verified	Nest of <i>Anumbius annumbi</i>	[9]
BA: Don Torcuato	<i>Passer domesticus</i>	Nests of <i>Passer domesticus</i>	[11]
Capital Federal	Not verified	Nest of <i>Furnarius rufus</i>	[5], [6]
BA: Ciudad Universitaria	<i>Passer domesticus</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Ciudad Universitaria	<i>S. f. pelzelni</i> + <i>Passer domesticus</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Ciudad Universitaria	<i>Sicalis flaveola</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Parque de la Memoria	<i>Passer domesticus</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Puerto Madero	Undetermined Hirundinidae	Nest of <i>Furnarius rufus</i>	[11]
BA: Reserva Costanera Sur	<i>Passer domesticus</i>	Nests of <i>Passer domesticus</i>	[11]
BA: Pereyra	<i>Progne</i> sp.	Nest of <i>Progne</i> sp.	[11]
BA: La Plata	<i>Progne chalybea</i>	Nests of <i>Progne chalybea</i>	[7], [8]
BA: La Plata	<i>Progne chalybea</i>	On the body of adult birds	[8]
BA: Cañuelas	<i>Passer domesticus</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Chascomús	<i>Agelaiodes badius</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Chascomús	<i>Passer domesticus</i>	Nests of <i>Passer domesticus</i>	[11]
BA: Chascomús	<i>Passer domesticus</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Chascomús	<i>Progne chalybea</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Chascomús	<i>S. flaveola</i> + <i>P. domesticus</i>	Nest of <i>Furnarius rufus</i>	[11]
BA: Chascomús	<i>Sicalis flaveola pelzelni</i>	Nests of <i>Furnarius rufus</i>	[11]
BA: Mar Chiquita	<i>Hirundo rustica erythrogaster</i>	Nest of <i>H. r. erythrogaster</i>	[7], [8]
BA: Mechongué	<i>Hirundo rustica erythrogaster</i>	Nest of <i>H. r. erythrogaster</i>	[7], [8]
BA: Chivilcoy	Not verified	Nest of <i>Furnarius rufus</i>	[5], [6]

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TABLE 1. (Continued)

Country: Province: Locality	Host	Place	References
BA: Pdo. Olavarría, Ea. La Juanita	<i>Passer domesticus</i>	Nest of <i>Furnarius rufus</i>	[3], [5], [6]
BA: Carhué	<i>Progne elegans</i>	Nest of <i>Progne elegans</i>	[8]
URU: Colonia: near Colonia	Not verified	Nest of <i>Furnarius rufus</i>	[3], [5], [6]
URU: Nueva Palmira	Not verified	Nest of <i>Furnarius rufus</i>	[5], [6]
URU: Canelones: Los Cerrillos	Not verified	Nest of <i>Furnarius rufus</i>	[1]
URU: Rocha: India Muerta	Not verified	Nest of <i>Furnarius rufus</i>	[1]
URU: Rocha: Arroyo San Miguel	Not verified	Nest of <i>Furnarius rufus</i>	[1]
URU: Montevideo: Montevideo	<i>Passer domesticus</i>	On the body of one adult bird	[1]

TABLE 2. Provinces, localities, data, and hosts of *Acanthocrios furnarii* (Hemiptera: Cimicidae) in nest boxes from Argentina. Provinces and localities are ordered from north to south and west to east. (n), nest only [disassembled before egg laying in *Passer domesticus* from Chascomús]; (n+e) nest build + eggs (abandoned); (n+ne), nest build + nestlings. [10], [11] Same references as Table 1; [12], Present work; [13] Di Iorio, Massoni & Palmieri unpubl. data.

Province: Locality: Date	Box #	Hosts (sucessive inhabitants)	Exx.	Ref.
SF: Rafaela 2009-2010	2	<i>Passer domesticus</i> (n+ne) + <i>Passer domesticus</i> (n+ne)	2	[11]
SF: Rafaela 2009-2010	4	<i>Passer domesticus</i> (n+ne)	1	[11]
LP: Colonia Inés y Carlota	36	Passeriform bird (n) + <i>Falco sparverius</i> (n+ne)	1	[12]
LP: Colonia Inés y Carlota	36	<i>Falco sparverius</i> (ne)	2	[12]
LP: Paraje La Araña	P7	<i>Troglodytes aedon</i> (n+ne) + <i>Troglodytes aedon</i> (n+ne)	94	[12]
BA: Chascomús 2005-2006	G	<i>Tachycineta leucorrhoa</i> (n+ne) + <i>T. leucorrhoa</i> (n+ne)	69 + 931	[10]
BA: Chascomús 10-IV-10	34b	<i>Passer domesticus</i> (n) + <i>T. leucorrhoa</i> (n+ne) + <i>S. f. pelzelni</i> (n+e)	30	[13]
BA: Chascomús 10-IV-10	32	<i>T. leucorroa</i> (n+ne)+ <i>S. f. pelzelni</i> (n+ne) + <i>S. f. pelzelni</i> (n+e)	11	[13]
BA: Chascomús 10-IV-10	17	<i>Passer domesticus</i> (n) + <i>S. f. pelzelni</i> (n+ne) + <i>S. f. pelzelni</i> (n+ne)	7	[13]

Some others nest boxes of the same set were occupied by *Agelaiodes badius*, *Passer domesticus*, *Xolmis irupero*, and other unidentified passerine birds, the first two already recorded as hosts of *A. furnarii* in other areas (Tables 1–2). Nevertheless, the infested nest box was not previously occupied by *A. badius* and/or *P. domesticus*, which build its nests only with grasses. *X. irupero* (but also *T. aedon*) uses small sticks for building its nests (Narosky & Salvador 1998). Therefore, as it cannot be known who initiated the infestation in the nest box used by *F. sparverius*, this last bird could be an accidental and not a common host of *A. furnarii*.

A similar case of an accidental host may be the nestlings of *Harpyhaliaetus coronatus* (Vieillot, 1817) [Accipitridae], infested by *Psitticimex uritui* (Lent & Abalos, 1945) in a crowned eagle nest superimposed on a nest of *Myiopsitta monachus catita* (Jardine & Selby, 1830) [Psittacidae] (Santillán *et al.* 2009). As the nests of *M. m. catita* are used year-round for roosting (Navarro *et al.* 1992), *P. uritui* is not deprived of food in any moment of the year (Turienzo & Di Iorio 2011). Therefore, *P. uritui* cannot be supported a long time without food ingestion and thus, as the parrot nest was abandoned (Galmes pers. com.) due to the proximity of the eagles, the bugs were probably forced to find a new food source. Therefore, *H. coronatus* can be counted as an accidental host of *P. uritui*. In contrast, *F. sparverius* could be a potential host of *P. uritui* (Fig. 1), as the birds repeatedly use *M. monachus* nests for breeding (De Lucca 1992).

Falco sparverius has been also recorded nidificating in hollow trees, Cerylidae nests, unidentified woodpecker holes, holes of *Colaptes campestris* (Vieillot, 1818) [Picidae], holes of *Anodorhynchus hyacinthinus* (Latham, 1790) [Psittacidae], as well as in stick nests of *Anumbius anumbi* (Vieillot, 1817), and *Pseudoseisura lophotes argentina* Parkes, 1960 [Furnariidae] (Fig. 1). Some of these nesting places are also used by other cavity-nesting birds (Fig. 1), from which five have also been found to be hosts of *A. furnarii* but in other areas (Tables 1–2, Fig. 1).

T. aedon was one of the most habitual inquilines of *F. rufus*, and its nests inside the nests of *F. rufus* were found infested with *A. furnarii* more than once (Table 1). In the nest boxes from “La Araña,” *T. aedon* was the single occupant of the infested next box and therefore, the infestation originated by transportation on this bird. In general, second broods of *T. aedon* were produced by the same mating pairs in the same nest boxes, evidenced by filming and recaptures of banded individuals. Unfortunately both adults in the infested nest box had no band; therefore it cannot be ensured that this was the case in this box. Therefore, it can not be said if the infestation with *A. furnarii* was initiated by the parents in the first or in the second brood. Nevertheless, all fledglings in both broods fledged, although the nest box was colonized by an important number of *A. furnarii*. In the nest boxes from Chascomús (Table 2), it was not possible to know who initiates the infestation because all birds are hosts of *A. furnarii*.

With the incorporation of cavity-nesting birds into the transmission mechanism of *A. furnarii*, some interesting coincidences are remarkable. First, each circuit has different species of swallows, or has in common a swallow that nidificates in different kinds of nests and/or cavities (i.e., *Tachycineta leucorrhoa*). Second, some circuits have their proper cimicid bug: *Ornithocoris toledo* Pinto, 1927 in the cavity-nesting birds in trees (Di Iorio & Turienzo 2012), *Cyanolicimex patagonicus* Carpintero, Di Iorio, Masello & Turienzo, 2010 in the cavity-nesting birds in earth (Di Iorio *et al.* 2010), and *P. uritui* in the stick nests of *M. monachus*, its inquiline birds and superimposed nests, extended to the stick nests of Furnariidae remodeled and occupied by *M. monachus* (Turienzo & Di Iorio 2011) (Fig. 1).

As was stated by Zyskowski & Prum (1999), the clay dome of *Furnarius* is homologous to the burrow or cavities of other furnariids, and this hypothesis is further supported by the observation that some *Furnarius* are facultative or obligate cavity nesters. In this way, the nests of *F. rufus* are better located among the cavity-nesting birds on trees, but also some of its inquiline birds are located only in this circuit, and not shared with the stick nests of Furnariidae, i.e., *Myiodynastes maculatus* (Stadius Muller, 1776) [Icteridae], *Progne chalybea* (Gmelin, 1789), and *Progne tapera* (Vieillot, 1817) [Hirundinidae] (Fig. 1). Also *Hirundo rustica erythrogaster* Boddaert, 1783 [Aves: Hirundinidae] can be located among the cavity-nesting birds by its mud nests build on different substrates at certain altitude from the ground (Winkler & Sheldon 1993). In contrast, *Sturnus vulgaris* Linnaeus, 1758 [Sturnidae] can be maintained in the group of birds that nidificate indistinctly inside woodpecker nests, natural cavities in trees (see Appendix), in nests of *F. rufus*, and inside stick nests, because one nest found inside a nest of *M. monachus* (Turienzo & Di Iorio 2011) also belongs to *S. vulgaris*.

By these changes it may be seen that *A. furnarii* more properly belongs to the group of cavity-nesting birds on trees, and in this way, this circuit has also a second proper cimicid bug. Probably, *A. furnarii* may be accidental and/or occasional in stick nests of Furnariidae (Turienzo & Di Iorio 2008), but *P. uritui* is habitual in stick nests of Furnariidae occupied by *M. monachus*, sometimes in high numbers, just as in the proper nests of *M. monachus* (Turienzo & Di Iorio 2011).

Also by the changes made here, the probable transmission mechanism of *Ornithocoris toledo*, recently proposed by Di Iorio & Turienzo (2012), is equal to what is now for *A. furnarii*, but the difference between both mechanisms is the hosts parasitized by each bug (Fig. 1). Therefore, mixed infestations of *A. furnarii* and *O. toledo* in some birds' nests can be expected if a coincidence of two inquiline birds (one host of each bug) occurs one after the other in one nest and/or cavity-nest.

Only a single mixed infestation of two cimicid bird bugs is known in literature. *Oeciacus vicarius* Horvath, 1912 [host: cliff swallows, *Petrochelidon pyrrhonota* (Vieillot, 1817), Hirundinidae], and *Synxenoderus comosus* List, 1925 [host: white-throated swifts, *Aeronautes saxatalis* (Woodhouse, 1853), Apodidae] were found “in one nest of white-throated swifts,” but in a place where “the swifts were greatly outnumbered by cliff swallows” (Usinger 1966).

Nores (1993) mentions *O. toledo* in 2 nests and *P. uritui* in 2 nests from a total of 13 examined nests of *Anumbius annumbi*, and also *O. toledo* in 3 nests and *P. uritui* in 5 nests from a total of 11 examined nests of *Pseudoseisura lophotes*. Regrettably it was not said if *O. toledo* and *P. uritui* were co-inhabiting in some of these nests.

In any case, such mixed infestations probably occur because multiple inquilines can successively use the same nest for breeding, a fact observed in hole nests of woodpeckers and parrots (De la Peña 2005, Cornelius *et al.* 2008, Berkunsky & Rebores 2009, Cockle 2010), and in nests of *F. rufus* (Turienzo & Di Iorio 2010). Nevertheless, multiple inquilinisms are better detected when nests are dissected, and can be more extended in nature than the records of direct observations on birds (Turienzo & Di Iorio 2010).

A total of 14 species of birds from Argentina were recorded nidificating inside nest boxes (De la Peña 2005), from which 5 species (35.7 %) were found in nest boxes infested with *A. furnarii* (Fig. 1, Table 2). These five species belong to the group of birds that nidificate indistinctly inside stick nests of Furnariidae and/or inside cavity-nests on trees (Fig. 1). No infested nests of birds that nidificate only inside cavity-nests on trees and also in nest boxes are still known for *A. furnarii*. A single bird of the cavity-nesting group in earth was found infested with *A. furnarii*, i.e., *Progne elegans* (Fig. 1), but in a nest outside a cavity.

Finally, the southwestern limits of the distribution range of *A. furnarii* are enlarged, including the southwestern limit of the Espinal forests (Fig. 2). This large biome extends to the north and northeast for hundreds of km., and could link the distribution of the parasite with the locations in Chaqueniense forests from central Argentina (Fig. 2).

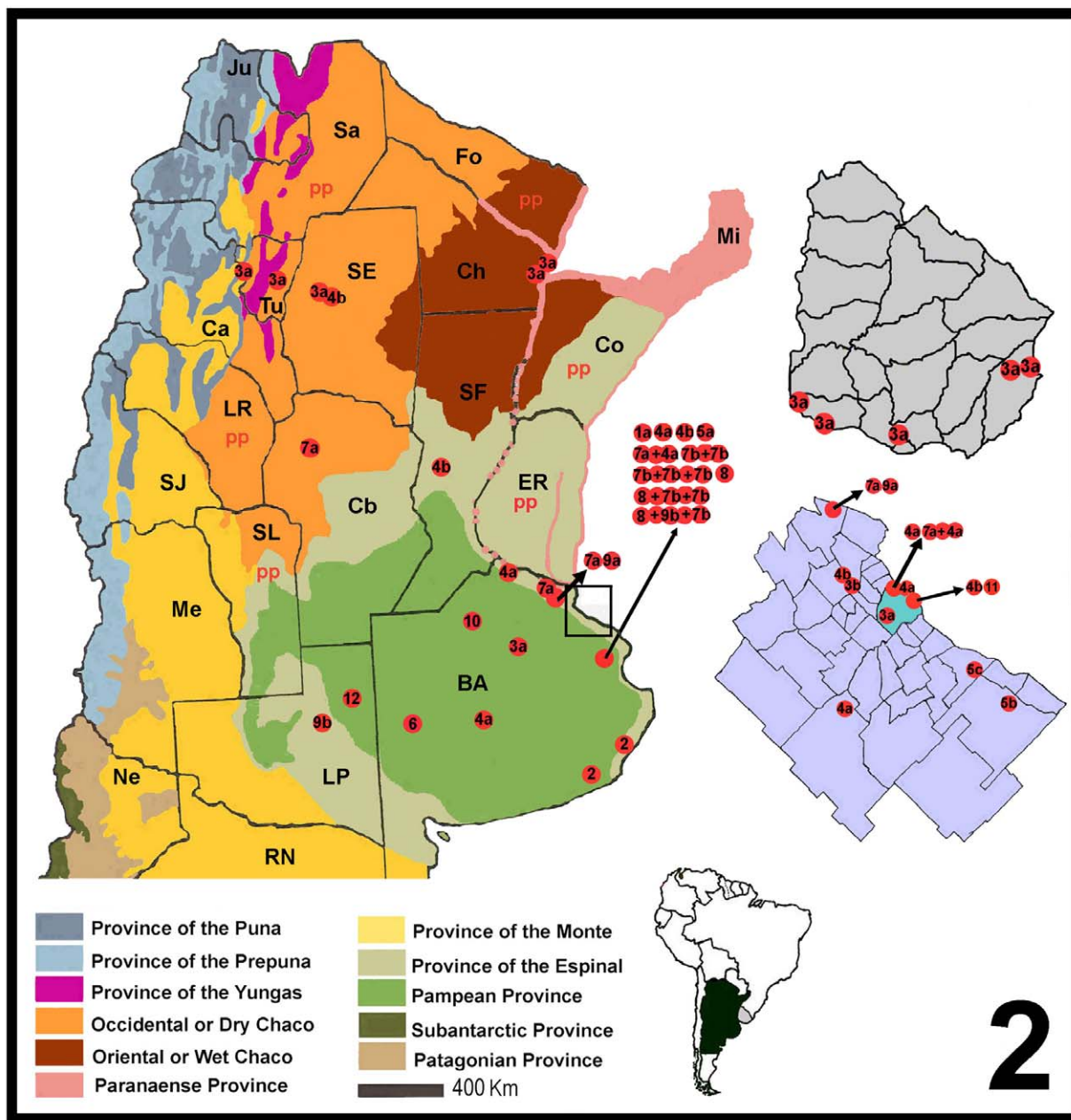


FIGURE 2. Current distribution, avian hosts, and places of *Acanthocrios furnarii* in Argentina and Uruguay (modified from Turienzo & Di Iorio 2010). 1, *Agelaiodes badius* (a, in nest of *Furnarius rufus*); 2, *Hirundo rustica erythrogaster* (in nest of *H. r. erythrogaster*); 3, hosts not verified (a, in nests of *Furnarius rufus*; b, in nest of *A. annumbi*); 4, *Passer domesticus* (a, inside nests of *F. rufus*; b, in nests of *P. domesticus*); 5, *Progne chalybea* (a, in nests of *F. rufus*; b, in nests of *P. chalybea*); 6, *Progne elegans* (in nest of *P. elegans*); 7, *Sicalis flaveola pelzelni* (a, in nests of *F. rufus*; b, in nest boxes); 8, *Tachycineta leucorrhoa* (in nest boxes); 9, *Troglodytes aedon* (a, in nests of *F. rufus*; b, in nest boxes); 10, Undetermined bird (in nest of *F. rufus*); 11, Undetermined Hirundinidae (in nest of *F. rufus*); 12, *Falco sparverius* (in nest box). Probable presence of *A. furnarii* in some provinces is indicated with pp.

Further samplings in nests of potential hosts should be carried out to find the ecological limits of *A. furnarii*. The results presented here clearly indicate that further research of the interactions between birds and the insect fauna in cavity-nests are urgently needed.

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APPENDIX

Inquilines and nesting records of birds from Argentina not previously published, and included in Fig. 1.

FURNARIIDAE

Anumbius annumbi (Vieillot, 1817)

ARGENTINA: Entre Ríos, Crespo, 26-XII-09 # 1, on *Acacia caven*, non inhabited, with a nest of *Passer domesticus* inside + one superimposed nest of *Passer domesticus* by outside; Crespo, 26-XII-09 # 2-3, on *Acacia caven*, two nests of *A. annumbi* superimposed: lower nest with a nest of *Passer domesticus* inside; upper nest also with a nest of *Passer domesticus* inside (Di Iorio pers. obs.); La Pampa: Santa Rosa, 8-IX-08, on *Populus* sp., non inhabited, with two nests of *Passer domesticus*, one inside the breeding chamber, and one outside, between the bifurcated branch and the nest of *A. annumbi* (Turienzo & Di Iorio pers. obs.); Buenos Aires: Río Lujan, 8-I-09, on *Schinus* sp., old nest, with a nest of *Passer domesticus* with one egg inside the breeding chamber (laterally opened) (Di Iorio pers. obs.); Río Lujan, F.C.G.B.M., 26-VI-09, on *Celtis tala*, bed of *A. annumbi* + bed of *Machetornis rixosus* with non incubated eggs + new bed of *A. annumbi* (Di Iorio pers. obs.); Cañuelas, 22-XI-09, *Gleditsia triacanthos*, old nest, a nest of *Sicalis flaveola pelzelni* inside the breeding chamber (Turienzo & Di Iorio pers. obs.).

Phacellodomus striaticollis (D'orbigny & Lafresnaye, 1838)

ARGENTINA: Buenos Aires: Río Luján F.C.G.B.M., 30-X-09, a nest of *Troglodytes aedon* with two eggs [DIOC] inside the breeding chamber (Di Iorio pers. obs.).

PICIDAE

Colaptes campestris (Vieillot, 1818)

ARGENTINA: Buenos Aires: Río Luján, 8-I-2009, a nest of *Troglodytes aedon* inside (Turienzo & Di Iorio pers. obs.).

STURNIDAE

Sturnus vulgaris Linnaeus, 1758

ARGENTINA: Buenos Aires: Los Polvorines, 12-I-2012, one nest inside a hollow bole of a *Melia azedarach* L. [Meliaceae] tree (Di Iorio pers. obs.).