Taxonomy and Distribution of *Nonnapsylla* (Siphonaptera: Stephanocircidae: Craneopsyllinae)

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Taxonomy and Distribution of *Nonnapsylla* Wagner, 1938 (Siphonaptera: Stephanocircidae: Craneopsyllinae)

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ABSTRACT: The genus *Nonnapsylla* Wagner, 1938 (Craneopsyllinae) includes only 1 species, *Nonnapsylla rothschildi* Wagner, 1938. Two subspecies are recognized by the shape of the dorsal margin of the helmet, apical shape of the spines in helmet and genal combs, length of first and fourth segments of the maxillary palpus, and shape of the hilla of the spermatheca. The validity of the characters used to separate the 2 subspecies of *Nonnapsylla rothschildi* Wagner, 1938 is discussed based on information from the literature, as well as from direct observation of type specimens and specimens collected in northwestern Argentina. We conclude that *Nonnapsylla rothschildi wagneri* Johnson, 1957 should be considered as a synonym of the nominal subspecies. We also extend the southern limits of the distribution of the species and report its presence in Argentina.

Helmeted fleas belong to the Stephanocircidae; they are distinguished from other fleas by the division of the anterior portion of the head, which forms a "true helmet" with combs along its posterior margin, and by the presence of a genal comb (Johnson, 1957; Whiting et al., 2008). The family includes 2 subfamilies with 9 genera and 51 species. Stephanocircinae contains only 1 genus, associated with marsupials from the Australian region, while Craneopsyllinae has 8 genera associated with marsupials and rodents from South America (Hopkins and Rothschild, 1956; Johnson, 1957; Whiting et al., 2008). *Nonnapsylla* Wagner, 1938 (Craneopsyllinae) includes only 1 species, *Nonnapsylla rothschildi* Wagner, 1938; its description was on based of 4 females collected from the bird *Opisthocomus hoazin* Illiger, 1811 (Cuculiformes, Opisthocomidae), an accidental host from Río Yapacani, Santa Cruz, Bolivia. The genus is differentiated from other Craneopsyllinae based on the helmet, which is angled on its anterior margin and divided from the rest of the head only dorsally (Wagner, 1938; Hopkins and Rothschild, 1956; Johnson, 1957). Johnson (1957) described the subspecies *Nonnapsylla rothschildi wagneri* based on 8 females and 2 males collected from *Galea musteloides* Meyen, 1832 (Rodentia, Caviidae) at 2 localities in Peru (Pisacoma and 4 km northwest of Pomata, Puno Department); these fleas are distinguished by the shape of the dorsal margin of the helmet, the apical shape of the spines in the helmet and genal combs, the length of first and fourth segments of the maxillary palpus, and shape of the hilla of the spermatheca.

Beaucournu and Gallardo (1989) reported *N. r. wagneri* based on specimens (a male and 3 females) collected on *Octodontomys gliroides* (Gervais and d'Orbigny, 1844) (Rodentia, Octodontidae) and *Abrocoma cinerea* Thomas, 1919 (Rodentia, Abrocomidae) from Iquique, Parnicota (Tarapacá Region), Chile. Differences in the phallosome of these specimens, compared with those described by Johnson (1957), were mentioned, but they were not detailed (Beaucournu and Gallardo, 1991). However, the latter authors suggested that the characters used to differentiate females of the 2 subspecies were weak and that probably *N. r. wagneri* is a synonym of the nominal subspecies.

Here, we add *N. rothschildi* to the flea fauna of Argentina and analyze the strength of the diagnostic characters used in the literature to differentiate these subspecies. Fleas were collected at the following 2 localities in Jujuy Province in northwestern Argentina: Cuesta del Hurón, 29 km west of Cienegüillas on provincial route 64 (22°06′S, 66°03′W; 3,835 m, Santa Catalina Department), and Curques, 24 km north of Susques, on provincial route 74 (23°16′S, 66°27′W; 4,100 m, Susques Department) (Fig. 1). The Jujuy Province is bordered by the Argentine province of Salta on the east and south, Bolivia to the north, and Chile to the west. The mammal hosts were captured alive, and fleas were collected by examining their pelage. Fleas were fixed in 96% ethanol and prepared; they were photographed following conventional techniques for their study using light microscopy. Voucher specimens were deposited at the section of Annexes of the Colección Mamíferos Lillo (CML), Universidad Nacional de Tucumán, Argentina. For comparison purposes, the holotype and allotype of *N. r. wagneri*, deposited at the Collection of Division of Insects of the Field Museum of Natural History (Chicago, Illinois), were examined as well as drawn using a microscope equipped with a drawing tube; descriptions and figures (Wagner, 1938; Hopkins and Rothschild, 1956; Johnson, 1957) of the 2 subspecies were analyzed and compared.

The following 14 specimens of fleas (11 females and 3 males) were identified as *N. rothschildi* because they perfectly fit with diagnostic characters of the species: Curques, 24 km north of Susques, on provincial route 74: 2 females on *Eligmodontia puerulus* (Philippi, 1896) (Rodentia: Cricetidae) (MMD 7974-1/2); Cuesta del Hurón, 29 km west of Cienegüillas on provincial route 64: 1 male on *Galea musteloides* Meyen, 1832 (Caviidae) (CML 7136), 7 females and 2 males on *Octodontomys gliroides* (Gervais and d'Orbigny, 1844) (Octodontidae) (2 females on CML 7143-1/2 and 5 females and 2 males on CML7144-1/7), and 2 females on *Phyllotis xanthopygus* (Waterhouse, 1837) (Cricetidae) (CML 7969, 7970).

In these specimens, the following characters, frequently used to differentiate the 2 subspecies in the literature, were observed: males and females with helmets angled on their dorsal margins, with 10 dorsal spines

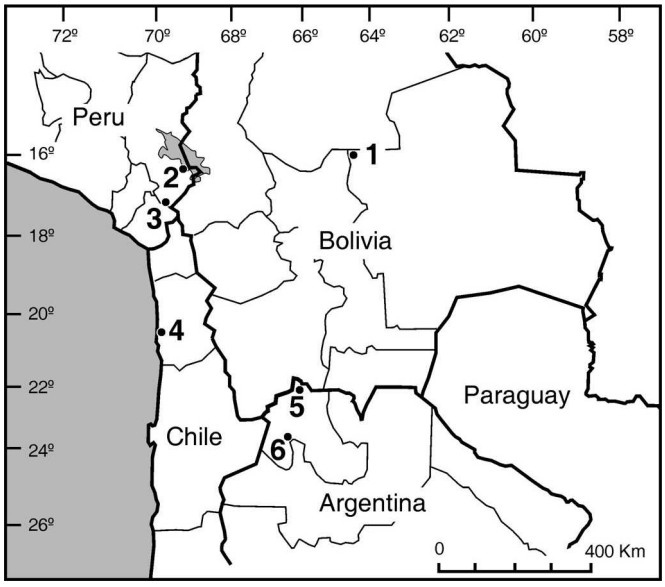

FIGURE 1. Distribution of *Nonnapsylla*. (**1**) Río Yapacani (Santa Cruz Department), Bolivia; (**2**) Pisacoma (Puno Department), Perú; (**3**) 4 km NW of Pomata (Puno Department), Perú; (**4**) Iquique, Parnicota (Tarapacá region), Chile; (**5**) Cuesta del Hurón, 29 km west of Cienegüillas on provincial route 64 (Santa Catalina Department, Jujuy), Argentina (22°06′S, 66°03′W; 3,835 m); (**6**) Curques, 24 km north of Susques, on provincial route 74 (Susques Department, Jujuy), Argentina (23°16′S, 66°27′W; 4,100 m). Localities 1 to 4 are written as in the literature; 5 and 6 were sampled by us, so the geographic coordinates are given as they were recorded in the field.

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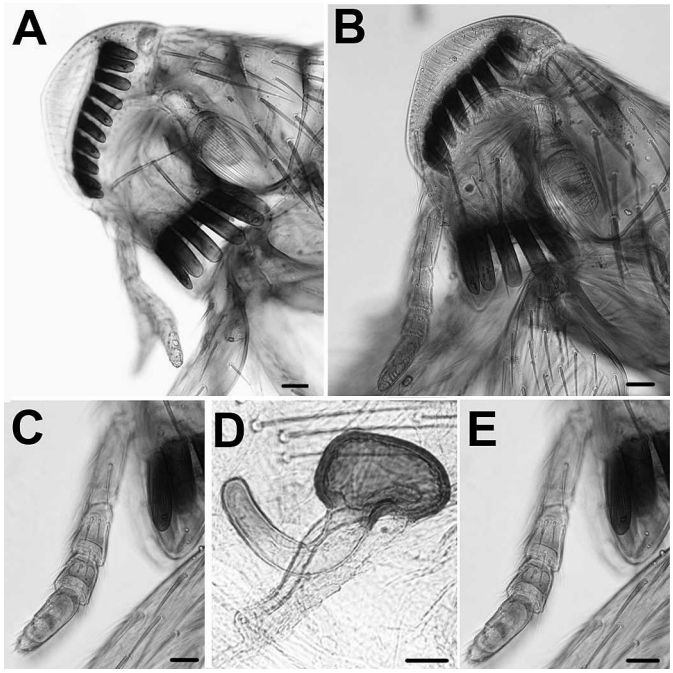

FIGURE 2. Optical micrographs of specimens of *Nonnapsylla rothschildi* collected in Argentina; bar = 50 μm. (**A**) Head of the female (CML 7144-1). (**B**) Head of the male (CML 7136). (**C**) Detail of maxillary palpus of the female (CML 7144-1). (**D**) Spermatheca (CML 7969). (**E**) Detail of maxillary palpus of the male (CML 7144-6).

in females, and 8 (CML 7136) or 9 (CML 7144-6) in males (CML 7144-7 with helmet broken); the first spines are rounded, while the latter are rather square (Fig. 2A, B); maxillary palpus with the first segment slightly longer than the fourth (Fig. 2C, E); genal comb with 5 spines, the first rounded apically, while the other 4 are somewhat square (Fig. 2A, B); the bulga of the spermatheca rounded (Fig. 2D); phallosome similar to figure and description given by Johnson (1957).

The distribution of *N. rothschildi* is known through just a few records from Peru (Johnson, 1957) and Chile (Beaucournu and Gallardo, 1989) for *N. r. wagneri*, and from Bolivia for the nominal subspecies (Wagner, 1938). *Nonnapsylla rothschildi* is reported for the first time in Argentina, making this country the only one where all 7 genera of Craneopsyllinae have been recorded (Autino and Lareschi, 1998; Beaucournu and Castro, 2003; Colombetti et al., 2008). Moreover, this is the first report of cricetid rodents associated with *Nonnapsylla.* The new records of the present study extend the southern limits of *N. rothschildi* to 23°16′S and allow us to refine the distributional limits of the species to an area in midwestern South America between 23°16′ and 16°46′S and 64°30′ and 70°11′W (Fig. 1).

Our specimens of *N. rothschildi* fit well with the diagnosis from the original description by Wagner (1938), as well as with the characters observed in the holotype and allotype of *N. r. wagneri*. It is notable that some characters reported for the type specimens do not coincide with those of the original description given by Johnson (1957) as diagnostic characters to differentiate the 2 subspecies. For example, in the Argentine specimens, the helmet is angled in both males and females, as in the types (Fig. 3A, B), but it is not ''sharply rounded medially'' in females, as described by Johnson (1957). Spines of the helmet are variable in the shape of their tips—the first ones are rounded, and the last ones are square—in accordance with the types (Fig. 3A, B), but they differ from the drawings and descriptions given by Johnson (1957, page 64), who said that they are ''somewhat sinuate, not straight dorsally, the dorsal most spine is sharply rounded, not squared as in Wagner's figure.'' The length of the first segment of the maxillary palpus is slightly longer than the fourth, as in the types, and it is not ''obviously longer'' as expressed by Johnson (1957). Spines from the genal comb and hilla of the spermatheca in the Argentine specimens are similar to those of the types and agree with the description of *N. r. wagneri*; we maintain that no differences can be observed between

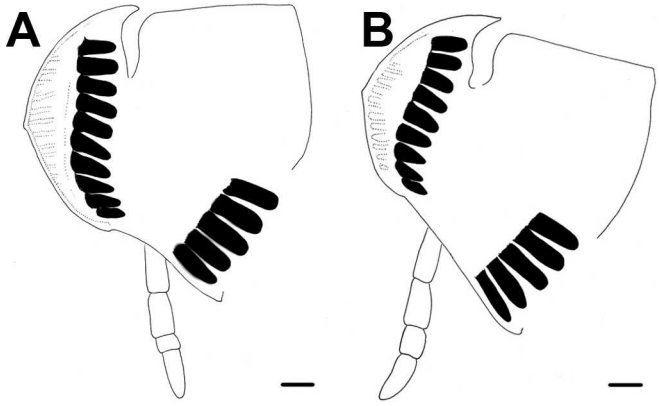

FIGURE 3. Drawings of type specimens of *Nonnapsylla rothschildi wagneri*; bar = 50 μm. (**A**) Holotype. (**B**) Allotype.

these specimens and the drawings given by Wagner (1938). Thus, since no differences can be found among the characters of *N. rothschildi* given by Wagner (1938) and the types of *N. r. wagneri*, and both compare favorably with the specimens from Argentina, we consider that at least some of the diagnostic characters used by Johnson (1957) to differentiate 2 subspecies are inadequate. Consequently, we conclude that *N. rothschildi* is a monotypic species and that only 1 subspecies should be recognized.

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