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Description of nymphs and additional information on *Nabis ashworthi* (Hemiptera: Heteroptera: Nabidae) from Patagonia, Argentina

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Abstract. Immature stages III–V are described for the first time and additional information on the males and females of *Nabis ashworthi* Faúndez & Carvajal, 2014 (Hemiptera: Heteroptera: Nabidae: Nabinae) are given, including descriptions of their genitalia, based on specimens from the Argentine Patagonia. This is the first record of this species from Argentina. The geographical distribution and habitat of *Nabis ashworthi* are discussed.

Key words. Heteroptera, Nabidae, genitalia, nymph, new record, Patagonia, Argentina

Introduction

The Nabidae (Hemiptera: Heteroptera), commonly known as damsel bugs, are generalist predators feeding on a wide variety of small arthropods (Harris 1928, Lattin 1989). They are valued for their predatory potential in suppressing insect pests in crops such as alfalfa, soybean and cotton (Braman 2000). Nabids are a relatively small group with 31 genera and about 386 species distributed in all biogeographic regions of the world (Henry 2009). Recently, Coscarón et al. (2015) provided information about the general morphology, biology and ecology of this group. In the Neotropical Region, 11 genera and 83 species have been recorded so far (Volpi & Coscarón 2010, Coscarón & Volpi 2013). *Nabis* Latreille, 1802 belongs to the tribe Nabini of the subfamily Nabinae, and is represented by eight species in Argentina (Volpi & Coscarón 2010, Coscarón & Volpi 2013, Coscarón in press).

According to Harris (1939), the *Nabis punctipennis* complex is comprised of four species: *N. argentinus* Meyer-Dür, 1870, *N. faminei* Stål, 1859, *N. paranensis* Harris, 1931 and *N. punctipennis* Blanchard, 1852. In Argentina, all the four species of the complex are present

(Cornelis & Coscarón 2013). More recently, *N. ashworthi* Faúndez & Carvajal, 2014 was described within this complex from Chile (Faúndez & Carvajal 2014).

Biological data, as life history and phenology for this species are unknown. In Argentina, contributions describing immature stages of *Nabis* are scarce: only Cornelis et al. (2012) described the nymphs of the cosmopolitan *N.* (*Tropiconabis*) *capsiformis* Germar, 1837.

In this study additional information on adults is given, as well as the first descriptions and photographs of male and female genitalia, the immature stages III–V of *N. ashworthi* are described and illustrated, and the geographical distribution including new record for Argentina are provided.

Materials and methods

Argentine Patagonia (situated between 55°S to 36°S and 42°W to 65°W), which extends over a surface of 786,983 km^2, is characterized by a mean temperature of 4–15°C and annual rainfall of 80–800 mm (Cabrera & Willink 1980; Morrone 2006, 2015).

The material presented here was collected by means of a sweep-net 35 cm in diameter and a suction sampler model 56/86 Stihl. The collected specimens were preserved in 96% ethanol. Observations were made with a Leica MZ95 stereoscope and measurements were taken with a micrometer eyepiece and expressed in millimeters. Images of adults and genitalia were taken with a digital camera (Kodak 3.1 megapixels) and a Wild M-Stereomicroscope. The terminology and the methodology for preparing and describing the male and female genitalia follow Cornelis & Coscarón (2013). Regarding the different states of wing reduction, we followed the criteria of Péricart (1987) and Larivière (1994), which state that brachypterous forms have hemelytra reaching one-third or two-thirds of the total length of the abdomen , and that the hemelytral membrane is absent or reduced to a narrow rudiment.

Specimen locations were georeferenced using Gps Garmin eTrex Legend. Location decimal degree coordinates were processed with Quantum Gis 1.0.8 (http://qgis.org/es/site/forusers/download.html) to generate species distribution maps.

Results

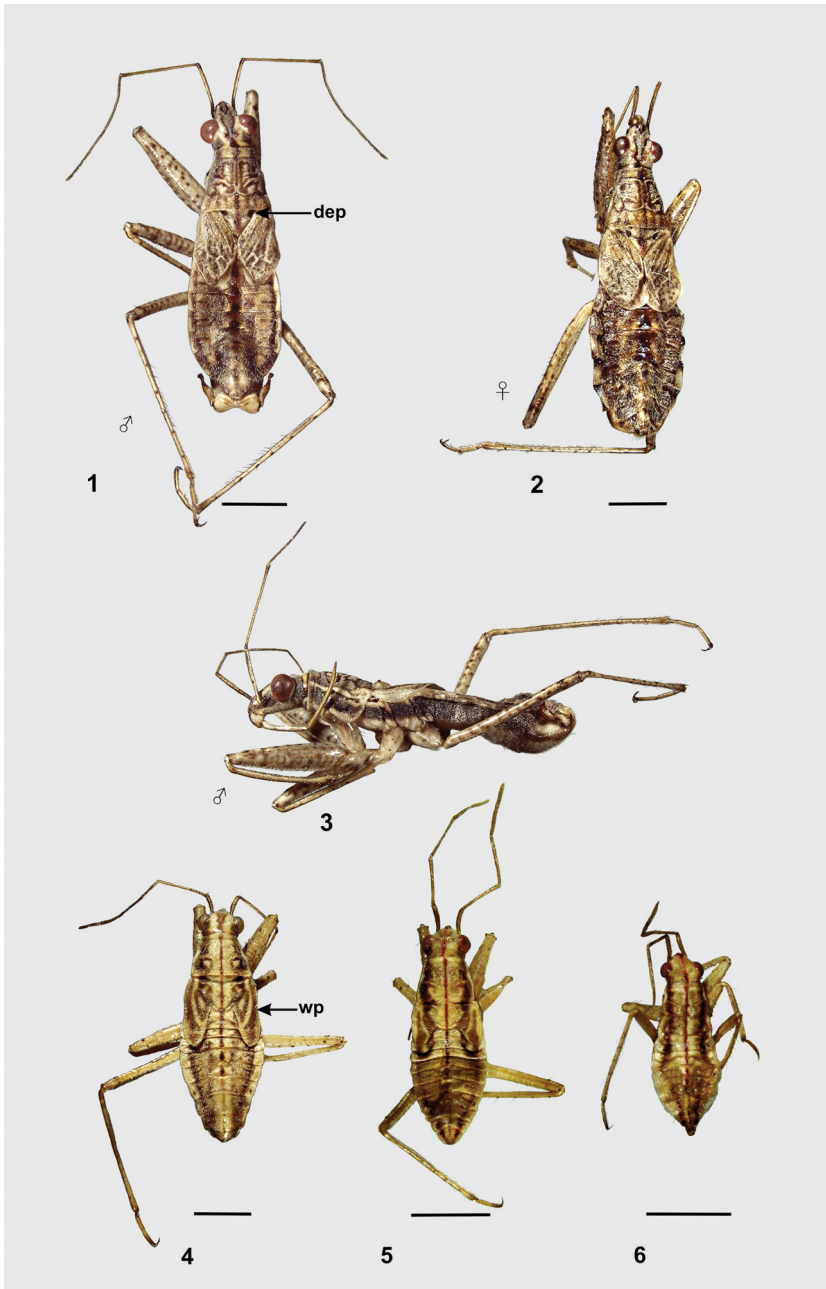
Nabis ashworthi Fáundez & Carvajal, 2014

(Figs 1–15, Table 1)

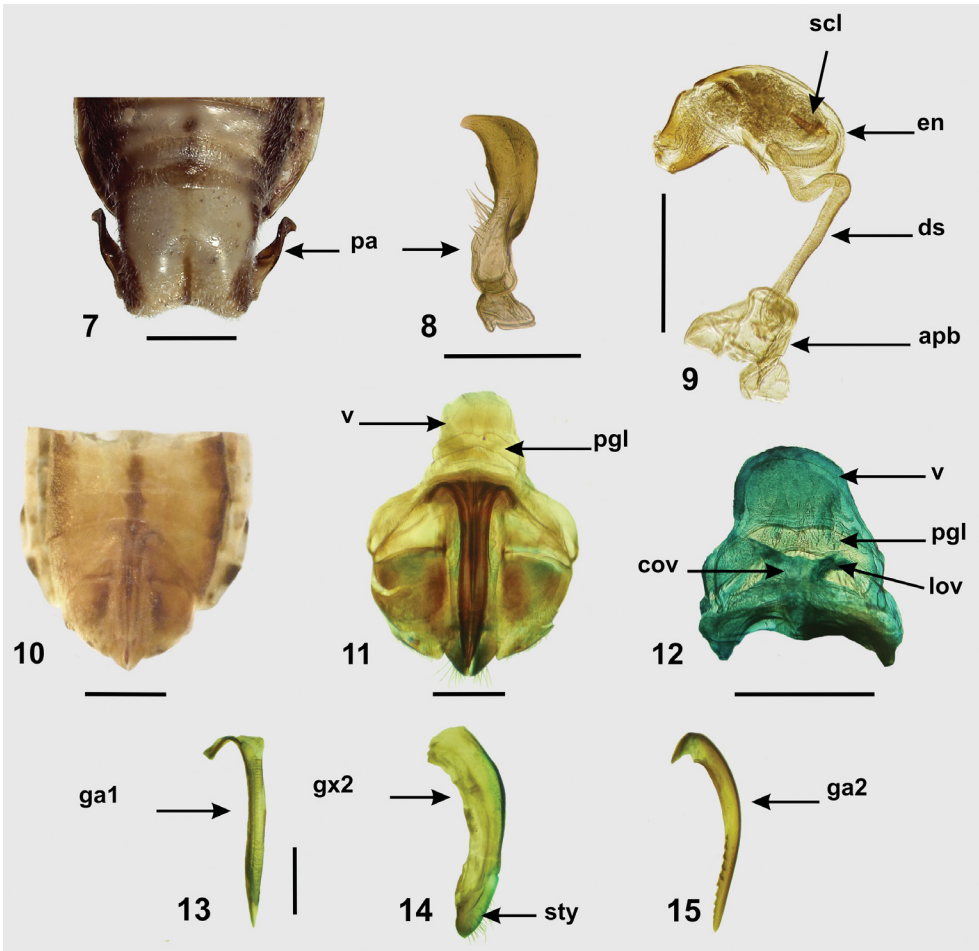
Nabis ashworthi Fáundez & Carvajal, 2014: 64 (original description).

Material examined: ARGENTINA: Neuquén: Lanín National Park, Las Coloradas [*Nothofagus* sp. (Nothofagaceae) forest], 39°41.166′S, 70°59.405′W, 8.i.2014, Coscarón M. C., Diez F. & Espindola M. lgt., Cornelis M. det. 2015, 4 ♀♀, 4 immature stages III, 5 immature stages VI, 5 immature stages V; Lanín National Park, *Araucaria araucana* (Molina) K. Koch (Araucariaceae) forest (growing on the shore of Rucachoroi lake), 39°14.242′S, 71°10.877′W, 8.i.2014, Coscarón M. C., Diez F. & Espindola M. lgt., Cornelis M. det. 2015, 7 ♂♂ 1 ♀ (coll. Museo de La Plata, Argentina).

Redescription of adults. ***Male*** (n = 5) (Figs 1, 3, 7–9; Table 1). *Brachypterous form*. General colour sordid light brown (in some specimens brown), except the following parts being brown: middle stripe extending from apex of clypeus to pronotum, lateral angles of scutellum, dorsal surface of abdomen, lateral band extending from preocular region to tip of abdomen. Body covered with short, light, adherent setae.



Figs 1–6. *Nabis ashworthi* Faúndez & Carvajal, 2014. 1–3 – adults (1–2 – dorsal view, 3 – lateral view); 4–6 – nymphal stages, dorsal view (4 – fifth instar; 5 – fourth instar; 6 – third instar). Scale bars = 1 mm. Abbreviations: dep – circular depression of scutellum, wp – wing pad.



Figs 7–15. *Nabis ashworthi* Faúndez & Carvajal, 2014. 7–9 – male genitalia: 7 – genital capsule; 8 – paramere; 9 – aedeagus. 10–15 – female genitalia: 10–11– ventral view; 12 – vagina in dorsal view; 13 – first gonapophysis; 14 – gonocoxite 2; 15 – second gonapophysis. Scale bars: 0.5 mm. Abbreviations: apb – articulatory apparatus, cov – common ovidutc, ds – ductus seminis, en – endosoma, ga1 and ga2 – gonapophysis 1 and 2, gx2 – gonocoxite 2, lov – lateral oviducts, pa – paramere, pgl – parietal gland, scl – sclerite of aedeagus, sty – styloid, v – vagina.

Head slightly longer than wide; postocular region rounded and short, equal in length to the distance between ocelli; eyes large, prominent, surpassing dorsal surface of head in lateral view; ocelli reduced; rostrum slender, surpassing fore coxae; antennal segments linear and thin, except segment I slightly curved laterally and thickened, segment II longest, III and IV equal in length; segment III, IV, apex of II and basal region of segment I, dark brown.

Pronotum narrow, slightly wider than long, lobes in lateral view not arched upwards; collar length shorter than eye width, with two fine lateral dark lines; anterior lobe with irregular dark patterns, granulose; posterior lobe scarcely longer than collar, with three fine lateral dark lines, posterior lobe and collar with punctate surface. Scutellum wider than long, with

straight lateral margins, and circular granulose dark depression at each anterolateral angle (Fig. 1). Hemelytra reduced, reaching basal margin of third abdominal segment, hind margin rounded, veins distinctly elevated, anterior surface shallowly punctate, hemelytron surface with brown dots; membrane very small, without veins, occupying inner surface of hind margin of hemelytron. Fore femora thickened, middle femora not incrassate; fossula spongiosa of fore and middle tibiae reaching distal end of first tarsal segment; all appendages dotted with fuscous dark spots, fore and middle femora with transverse bands on lateral external margin; tibiae distally brown; legs with long scattered semierect setae.

Abdomen with medial dorsal surface often shiny; connexival segment dorsally pale, with a region on distal margin dark brown, which gradually increases in size towards the last connexival segments (in some specimens, segments VI and VII totally dark). Dorsal and ventral surface of abdomen with abundant whitish setae; connexival segments ventrally with the same colour pattern as dorsally, or with dark midline running longitudinally.

Genitalia (Figs 7–9). In ventral view, genital capsule parallel-sided (Fig. 7); disc of paramere moderately wide, hypophysis broad and rounded, without reversible plate, base of paramere nearly as wide as the disc, with erect white setae on internal distal region (Fig. 8); aedeagus with one small sclerite with basal lamina (Fig. 9).

Female (n = 5) (Figs 2, 10–15, Table 1). Brachypterous, similar to male, except slightly longer, and more widened towards the middle of the abdomen.

Genitalia (Figs 10–15): Genital segments moderately protruded regarding abdominal segment VII (Fig. 10). Vagina symmetrical; parietal gland symmetrical, large and half-moon shaped arched on superior margin, situated basally on the ventral side of the vagina; common oviduct short and wide (Figs 11–12).

Description of immature stages (Figs 4–6). ***Instar V*** (n = 5) (Fig. 4). Body oval-shaped, total length: 3.61–4.32 (mean = 4.09). General colour light brown, with a thin reddish median line extending from apex of head to tip of abdomen (some specimens with two lateral dark brown bands); in lateral view, brown band extending from preocular region to tip of abdomen. Body covered with abundant whitish pilosity. Head length 0.79–0.88 (mean = 0.86), width 0.67–0.75 (mean = 0.71), eyes width 0.16–0.21 (mean = 0.17), interocular width 0.33–0.37 (mean = 0.35), postocular region length 0.16–0.25 (mean = 0.19). Labium surpassing mesocoxae, ratio of segment lengths about 1.00 : 2.66 : 3.00 : 1.57. Antennae light brown, antennal segments III and IV dark brown, ratio of segment lengths about 1.00 : 1.52 : 1.54 : 1.40. Pronotum with straight posterior margin; length 0.71–0.79 (mean = 0.74), width 0.84–0.92 (mean = 0.88). Wing pad as seen in Fig. 4, reaching the superior region or half of fourth abdominal segment, length 1.00–1.09 (mean = 1.05). Legs light brown, with brown spots, tarsi distally brown, fore femora: length 1.26–1.38 (mean = 1.31), width 0.33–0.37 (mean = 0.34); middle femora: length 1.13–1.21 (mean = 1.19), width 0.25–0.29 (mean = 0.26); hind femora: length 1.55–1.63 (mean = 1.59), width 0.12–0.12 (mean = 0.12); fore tibiae: length 1.09–1.21 (mean = 1.15); middle tibiae: length 1.05–1.13 (mean = 1.09); hind tibiae: length 1.84–1.93 (mean = 1.88). Abdomen: length 2.39–2.85 (mean = 2.68), width 1.26–1.47 (mean = 1.35); ventral surface with a middle brown band; connexivum dorsally pale, ventrally with longitudinal reddish stripe.

Instar IV (n = 5) (Fig. 5). Body oval-shaped, total length: 2.43–3.24 (mean = 2.80). General colour similar to that of instar V; covered with abundant whitish pilosity. Head length 0.69–0.81 (mean = 0.75), width 0.54–0.63 (mean = 0.58), eyes width 0.15–0.18 (mean =

0.16), interocular width 0.24–0.33 (mean = 0.29), postocular region length 0.12–0.18 (mean = 0.15). Labium reaching mesocoxae, ratio of segment lengths about 1.00 : 2.80 : 3.13 : 2.06. Ratio of antennal segment lengths about 1.00 : 1.85 : 1.88 : 2.02. Pronotum with straight posterior margin; length 0.48–0.54 (mean = 0.51), width 0.66–0.81 (mean = 0.72). Wing pad with two longitudinal brown lines, reaching between base of first abdominal segment and apical region of second abdominal segment, length 0.51–0.60 (mean = 0.56). Legs light brown, femora and tibiae with brown spots, tarsi distally brown, fore femora: length 0.96–1.17 (mean = 1.03), width 0.24–0.27 (mean = 0.25); middle femora: length 0.75–0.99 (mean = 0.91), width 0.15–0.27 (mean = 0.21); hind femora: length 1.29–1.59 (mean = 1.44), width 0.12–0.15 (mean = 0.13); fore tibiae: length 0.90–0.99 (mean = 0.94); middle tibiae: length 0.81–0.99 (mean = 0.92); hind tibiae: length 1.50–1.68 (mean = 1.56), legs with long erect

Table 1. Measurements (in mm) of adults of *Nabis ashworthi* Faúndez & Carvajal, 2014.

Characters	♂♂ (n = 5)			♀♀ (n = 5)		
	min.	mean	max.	min.	mean	max.
Total length	4.68	4.80	5.09	4.97	5.56	6.17
Head length	0.92	0.93	0.96	0.98	1.03	1.1
Head width	0.82	0.86	0.89	0.89	0.92	0.94
Postocular region length	0.11	0.12	0.13	0.11	0.13	0.16
Eye width (dorsal view)	0.25	0.31	0.47	0.41	0.43	0.46
Eye height (lateral view)	0.36	0.39	0.45	0.25	0.26	0.27
Interocular space (dorsal view)	0.32	0.34	0.36	0.36	0.38	0.39
Interocelar space	0.11	0.12	0.13	0.09	0.10	0.11
Labial segment I length	0.25	0.26	0.27	0.27	0.29	0.32
Labial segment II length	0.73	0.78	0.80	0.82	0.86	0.89
Labial segment III length	0.73	0.74	0.75	0.82	0.86	0.92
Labial segment IV length	0.36	0.38	0.39	0.41	0.44	0.46
Antennal segment I length	0.82	0.85	0.87	0.85	0.88	0.92
Antennal segment II length	1.26	1.34	1.38	1.33	1.37	1.42
Antennal segment III length	0.96	1.01	1.05	1.03	1.04	1.08
Antennal segment IV length	0.94	1.00	1.05	0.96	0.98	1.01
Pronotum width	1.03	1.10	1.17	1.24	1.28	1.33
Pronotum length	0.85	0.98	1.05	1.05	1.10	1.15
Collar of pronotum length	0.16	0.17	0.18	0.18	0.19	0.20
Collar of pronotum width	0.64	0.65	0.66	0.69	0.73	0.75
Anterior lobe of pronotum lenght	0.48	0.57	0.64	0.50	0.59	0.64
Anterior lobe of pronotum width	0.92	0.95	1.01	0.98	1.06	1.10
Posterior lobe of pronotum length	0.20	0.23	0.25	0.27	0.29	0.32
Scutellum length	0.41	0.44	0.46	0.41	0.47	0.57
Scutellum width	0.50	0.53	0.57	0.52	0.60	0.69
Hemelytron length	1.12	1.26	1.35	1.03	1.42	1.67
Fore femur length	1.81	1.85	1.9	1.90	1.99	2.04
Fore femur width	0.41	0.42	0.43	0.43	0.48	0.50
Middle femur length	1.61	1.67	1.77	1.72	1.82	1.90
Middle femur width	0.25	0.29	0.32	0.32	0.33	0.34
Hind femur length	2.21	2.35	2.46	2.55	2.59	2.70
Hind femur width	0.18	0.21	0.27	0.24	0.25	0.27
Fore tibia length	1.49	1.57	1.65	1.54	1.66	1.79
Middle tibia length	1.58	1.64	1.67	1.61	1.72	1.84
Hind tibia length	2.79	2.85	2.91	2.94	2.98	3.09
Fore fossula spongiosa length	0.16	0.16	0.16	0.13	0.17	0.18
Middle fossula spongiosa length	0.16	0.17	0.18	0.11	0.13	0.16
Abdominal length	2.39	2.51	2.76	2.61	2.90	3.23
Abdominal width	1.28	1.38	1.49	1.65	1.78	1.90
Genital capsule length (ventral view)	0.78	0.84	0.94	–	–	–

scattered setae. Abdomen length 1.38–2.01 (mean = 1.75), width 0.84–1.20 (mean = 0.99); connexivum dorsally pale, ventrally with longitudinal reddish stripe.

Instar III (n = 4) (Fig. 6). Body oval-shaped, total length: 2.02–3.47 (mean = 2.17). General colour similar to that of instar IV, covered with abundant whitish pilosity and long erect scattered setae. Head length 0.57–0.62 (mean = 0.59), width 0.41–0.50 (mean = 0.46), eyes width 0.11–0.13 (mean = 0.12), interocular width 0.18–0.25 (mean = 0.23), postocular region length 0.08–0.09 (mean = 0.08). Labium reaching mesocoxae, ratio of segment lengths about 1.00 : 3.20 : 3.40 : 2.00. Ratio of antennal segment lengths about 1.00 : 1.39 : 1.75 : 1.96. Pronotum length 0.32–0.41 (mean = 0.37), width 0.52–0.57 (mean = 0.54). Wing pad reaching apical region of first abdominal segment, length 0.32–0.34 (mean = 0.32). Legs light brown, in some specimens femora and tibiae with brown spots, fore femora: length 0.75–0.82 (mean = 0.72), width 0.20–0.23 (mean = 0.21); middle femora: length 0.75–0.80 (mean = 0.78), width 0.11–0.16 (mean = 0.14); hind femora: length 0.85–0.92 (mean = 0.87), width 0.09–0.13 (mean = 0.10); fore tibiae: length 0.59–0.71 (mean = 0.66); middle tibiae: length 0.64–0.73 (mean = 0.69); hind tibiae: length 1.05–1.15 (mean = 1.08). Abdomen length 1.03–1.49 (mean = 1.28), width 0.66–0.80 (mean = 0.74); connexivum dorsally pale.

Habitat (Figs 16–19). In this work, all specimens of *Nabis ashworthi* came from biogeographic Maule Province (Fig. 16). Morrone (2000), in tracking the distribution of *Chaetanthera serrata* Ruiz & Pavón (Asteraceae), noted that it is located in South Central Chile, between

Figs 16–19. Habitats of *Nabis ashworthi* Faúndez & Carvajal, 2014: Argentina. Neuquén, Lanín National Park, 16–17 – *Araucaria araucana* forest, 18–19 – *Nothofagus* forest.

37 and 39 south latitude (see also Morrone 2015). In Maule Region, the climate is temperate and humid, the mean annual temperature being 9.5°C and the annual rainfall is 700 or 800 mm on the east side of the Andes mountain range and, at most 5000 mm on the west side (Cabrera & Willink 1980). According to Cabrera (1976), the undergrowth of *Araucaria araucana* forest (Figs 16–17) is represented by a herbaceous stratum composed of *Lathyrus magellanicus* Lamarck (Fabaceae), *Adenocaulon chilense* Less (Asteraceae), *Acaena pinnatifida* Ruiz & Pavón (Rosaceae), and *Cortaderia pilosa* (d'Urv.) Hack (Poaceae). In contrast, the undergrowth of *Nothofagus* sp. forest (Figs 18–19) is characterized by *Chusquea culeou* Desvaux (Poaceae), *Berberis* sp. (Berberidaceae), *Alstroemeria aurantiaca* Graham (Alstroemeriaceae), and *Acanea* sp. (Rosaceae).

Faúndez & Carvajal (2014) recorded *N. ashworthi* in Santiagan Province (Fig. 20), an area localized in Southern Chile and Argentina, between 33 and 37 south latitude (Morrone 2015). The forests of this ecoregion are adapted to a Mediterranean climate (Dinerstein et al. 1995). **Distribution. Chile:** Región de la Araucanía: Traiguen; Región del Bío Bío: Las Trancas, Chillán, Lag. El Barco, Guallali; Región de los Ríos: Valdivia, Choshuenco (Faúndez & Carvajal 2014). **Argentina** (Fig. 20): Neuquén, Lanín National Park: Rucachoroi and Las Coloradas (new country record).

Together with the records provided by Faúndez & Carvajal (2014), the distribution of this species ranges between 39°47′S and 36°50′S. This area is characterized by high num-

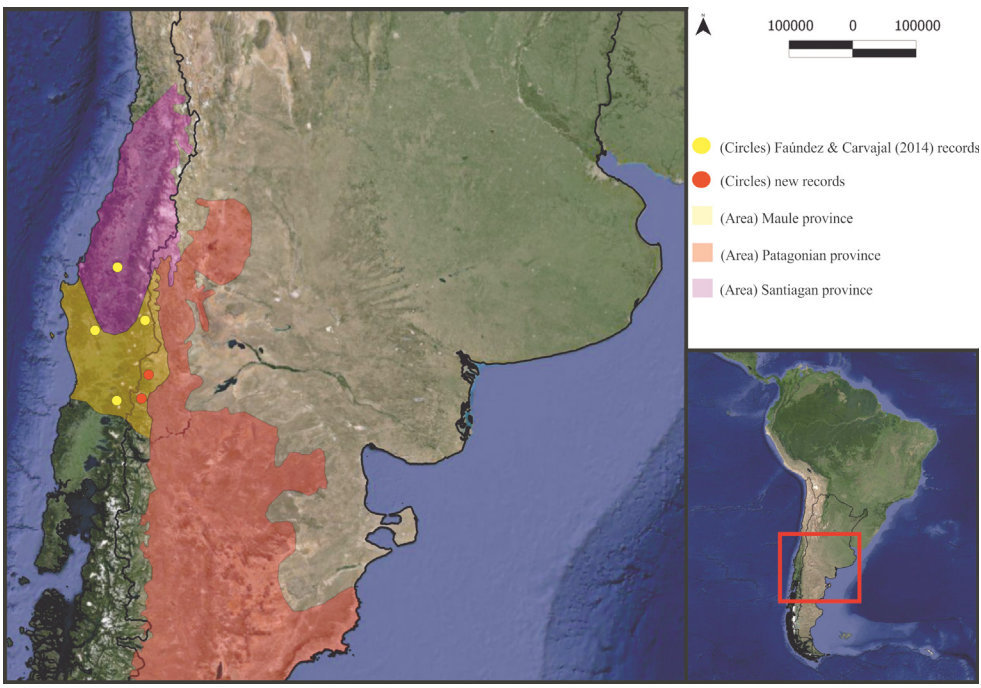


Fig. 20. Geographical distribution of *N. ashworthi* Faúndez & Carvajal, 2014. Ecoregions according to Morrone (2015).

bers of endemic species (Dinerstein et al 1995; Morrone 2000, 2015). The restricted range distribution of *N. ashworthi* may be related to its brachypterous condition, as, according to Harrison (1980), the degree of wing development influences the dispersal capabilities of species. However, in Nabidae wing polymorphism is common (Péricart 1987), and it is possible that macropterous forms of *N. ashworthi* exist (although rare), but no such specimens have yet been collected. On the other hand, prevailingly brachypterous species with rare macropterous forms can have a wide geographical distributions. This is the case, with several Holarctic species, e.g. *Himacerus apterus* (Fabricius, 1798) (see Péricart 1987) and *Nabis* (*Dolichonabis*) *americolimbatus* (Carayon, 1961) (see Larivière 1994). To find the real distribution of *N. ashworthi*, more sampling effort in different areas are necessary.

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