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ORIGINAL RESEARCH ARTICLE

Occurrence of the exotic leafcutter bee *Megachile (Eutricharaea) concinna* (Hymenoptera: Megachilidae) in southern South America. An accidental introduction?

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Summary

Here we report for the first time the presence of the exotic leafcutter bee *Megachile (Eutricharaea) concinna* in South America, based on specimens collected in the northeast part of Buenos Aires province, Argentina. We believe that *M. concinna* accidentally entered the country probably together with the introduction of *M. rotundata* to different regions of the country for commercial purposes since the 1970's. A diagnosis, illustrations, flowers records, and nesting data are given.

Presencia de una abeja polinizadora exótica *Megachile (Eutricharaea) concinna* (Hymenoptera: Megachilidae) en Sudamérica. Una introducción accidental?

Resumen

Citamos por primera vez para Sudamérica la presencia de la abeja exótica *Megachile (Eutricharaea) concinna*. Examinamos especimenes recolectados en la región noreste de la provincia de Buenos Aires. Estimamos que *M. concinna* ingresó accidentalmente en Argentina durante la década del 70, probablemente junto con la introducción con fines comerciales de *M. rotundata* en diferentes regiones de este país. Aportamos para el reconocimiento de *M. (E.) concinna* una diagnosis, ilustraciones, registros florales y datos sobre nidificación.

Keywords: non-native species, trap nests, pollinator monitoring

Introduction

Bees of the genus *Megachile* Latreille (most of which are called "leaf-cutting bees") are among the most common bees in natural ecosystems and agricultural environments. Among the main characteristics of these bees stand out their high efficiency as pollinators, and their nests built in holes in tree trunks or in herbaceous plants with hollow stems. This habit has made the semi-domestication and large-scale multiplication of some species, mainly *Megachile (Eutricharaea) rotundata* (Fabricius, 1787), the species most used commercially in the world for pollination of alfalfa (*Medicago sativa* L.), and introduced into various countries, such as Argentina, Australia, Canada, Chile, Denmark, Sweden, New Zealand, and the USA (Raw, 2004; Michener, 2007). Some of these introductions have resulted in the invasion of natural environments and their establishment (Howlett and Donovan, 2010). *Megachile rotundata* has been introduced into Argentina, and is used commercially for pollination of alfalfa. The first introductions were made by INTA (Instituto Nacional de Tecnología Agropecuaria) in the 1970's in the experimental stations of La Banda (Santiago del Estero

province) and Hilario Ascasubi (Buenos Aires province) (Tesón *et al.*, 1976). These introductions were subsequently extended to other regions of the country including the provinces of Salta, San Juan, La Rioja, Catamarca, Mendoza, Río Negro, and Buenos Aires (De Santis, 1979; San Román *et al.,* 2002). Some productive farms imported these bees from the USA and Canada, without being able to maintain or increase the original populations (San Román *et al.,* 2002). De Santis (1979) mentioned the presence and establishment of *Megachile pacifica* (=*rotundata*) in natural areas of Lujan de Cuyo (Mendoza), probably from releases made in San Juan province, and Dalmazzo (2010) indicated the presence of this species in Las Colonias and Castellanos, Santa Fe province.

Here we provide the first record of *Megachile (Eutricharaea) cocinna* Smith in Argentina, a native species of Africa, presently widespread in the Caribbean, USA and Canada (Raw, 2004; Moure, 2008; Genaro and Franz, 2008). We also provide a diagnosis that will allow further researchers to distinguish this bee from *M. rotundata,* a list of plants visited, some nesting data, and its sex ratio.

Materials and methods

The specimens of *M. concinna* were collected at four localities in northeastern Buenos Aires, Argentina, as part of two studies on the diversity of native bees, in 2005 and 2009-2011: Parque Pereyra Iraola (Partido Berazategui) (34°50'15" S, 58°05'33" W, 12 msm), Arturo Seguí (Partido de La Plata) (34°55'41" S, 58°07'55" W, 27 msm), Los Talas (34°52'25" S, 57°50'18" W, 3 msm) and Berisso (Partido de Berisso) (34°53'12" S, 57°53'41" W, 4 msm) (Fig. 7).

In this region the natural vegetation is highly disturbed by anthropogenic action (agriculture, cattle breeding, forest cutting and forestation) and the climate is temperate humid with rainfall throughout the year. The first three sites were located within the horticultural belt at La Plata. Bees were collected with entomological nets on flowers in the field margins of horticultural crops. At the last site, the specimens were obtained using trap nests made of blocks of wood (*Pinus* sp.) 70 x 20 x 30 mm, each drilled with a single hole 60 mm in depth; of one of three apertures: 4.0, 5.0 and 6.0 mm in diameter. Each sampling boxes included 9 trap nests, three for each opening diameter totalling 45 traps which were exposed in domestic gardens. The boxes were attached horizontally to a wall of about 1–1.5 m above the ground in October 2010 and inspected weekly until March 2011. The nests were removed to the laboratory once the entrances were closed and introduced into a transparent plastic container until adult bee emergence. The sex ratio was estimated as the number of males emerged compared to females, as a percentage. External morphological structures of bees were studied using a Nikon SMZ 745T stereomicroscope and photographs were taken with a Canon Power Shot® A520 digital camera attached to the stereomicroscope. Digital images were montaged using open software CombineZM (Hadley, 2011). Abbreviations used below are T and S for terga (um) and sterna (um) respectively. Voucher specimens of *Megachile concinna* from Argentina are deposited in the entomological collection of Museo de La Plata, Argentina (MLP).

Results

Systematics

Megachile (Eutricharaea) Thomson

Diagnosis

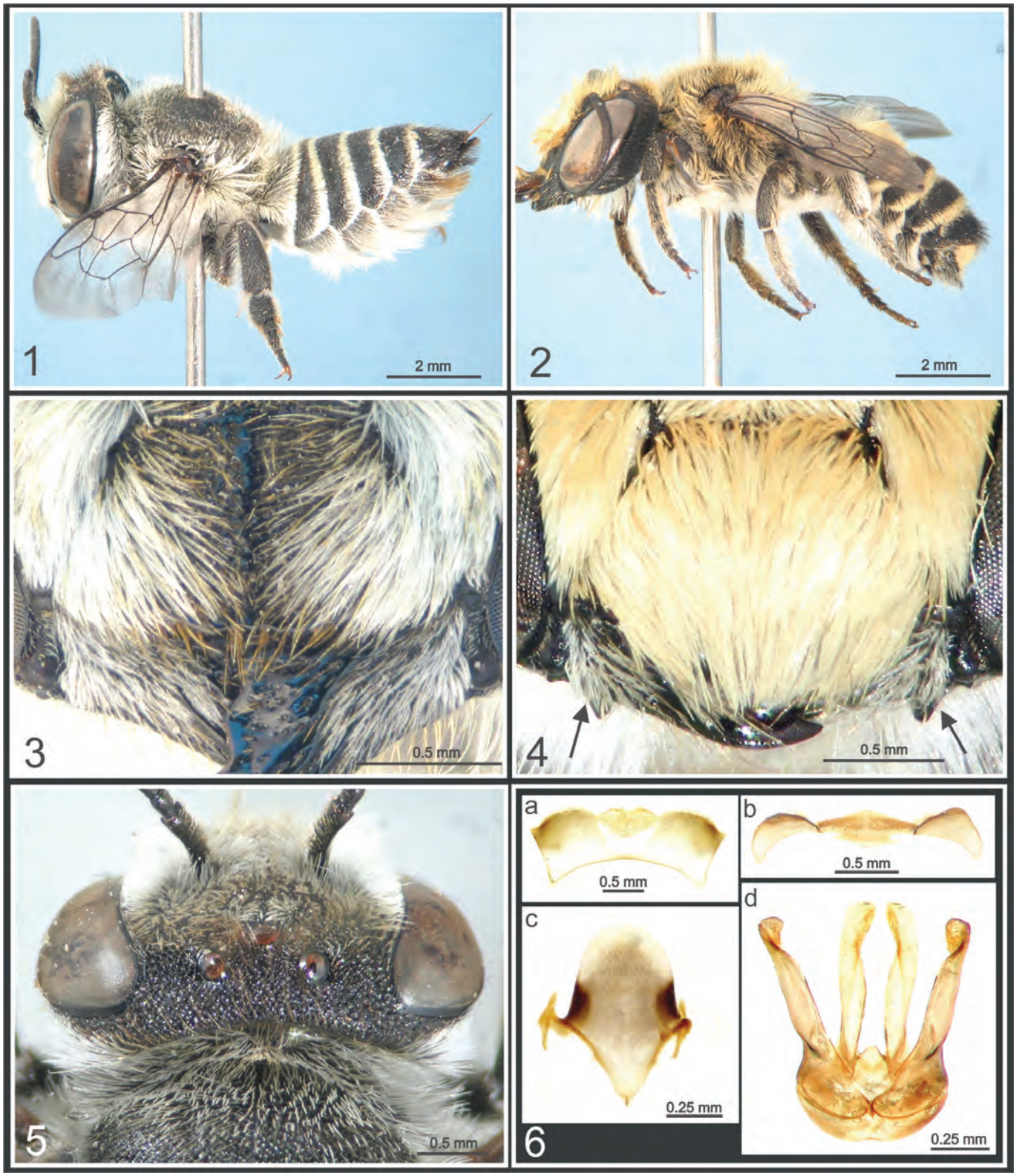
Body length 5-16 mm; integument black, female with mandible four-dentate, without or with only hidden or very small cutting edge in second interspace but with cutting edge in third interspace; glossa and labial palpi of ordinary length; metasoma megachiliform; sterna with apical white hair bands beneath scopa. Male with mandible three -dentate; front coxal spine well developed; front tarsi simple and blackish; mid tibial spurs present; T6 usually pale tomentose, carina denticulate laterally, with very little distinguishably median emargination, apical margin (not carina) without evident teeth.

Megachile (Eutricharaea) concinna Smith, 1879 (Figs 1-6).
Megachile concinna Smith, 1879: 79.
Megachile modesta Smith, 1879: 63, nomen praeoccupatum (nec *Megachile modesta* Smith, 1862).
Megachile variscopa Pérez, 1895: 24.
Megachile modestissima Dalla Torre, 1896: 439, nomen novum pro *Megachile modesta* Smith, 1879 (nec Smith, 1862).
Megachile microxantha Cockerell, 1937: 205; Gonzalez *et al.,* 2010: 65.
Megachile atratula Rebmann, 1968: 38; Gonzalez *et al.,* 2010: 65.
Megachile privigna Rebmann, 1968: 40; Gonzalez *et al.,* 2010: 65.

Diagnosis

M. concinna is most similar to *M. rotundata* (the only species of subgenus *Eutricharaea* present in Argentina), from which can be separated in the following characters: the general white pubescence, a median line unpunctured on clypeus and proportion ocellooccipital distance in the female, and the pilosity of front coxae, front tibial fringe and T2, the presence of genae projection, shape of front coxal spine, carina of T6 and S5-8 and genitalia in the male.

This species was cited for Old World: Chad, Ghana and Senegal; in America: Argentina, Barbados, Cuba, Dominica, Dominican Republic, Guana Island, Haiti, Jamaica, Mexico, Puerto Rico, Santo Domingo and the USA (Raw, 2004; Moure, 2008; Genaro and Franz, 2008; this study).



Figs 1-6. *Megachile (Eutricharaea) concinna*: 1.; 2. female and male, lateral views, respectively; 3. clypeus of female, frontal view; 4. genal tubercles of male, frontal view; 5. head of female, dorsal view; 6. male: a) fifth sternum; b) sixth sternum; c) eighth sternum; d) genitalia in dorsal view.

The collected specimens of *M. concinna* display in the female (Fig. 1) integument black, except tegulae and wing veins brown, tibial spurs yellow; head, mesosoma and legs with white pubescence, except vertex, scutum and scutellum with pale brown hairs; T1 entirely covered with white pubescence, T2-5 covered with short black hairs, T1-5 and S2-5 with complete white apical fasciae; scopa white or pale yellowish on S2-4, principally ferruginous on S5 and covered with black scopal hairs on S6. Mandible four-dentate, with cutting edge

between 3rd and 4th teeth; clypeus with apical margin straight, surface closely punctate, median line impunctate (Fig. 3); interocellar distance longer than ocelloccipital distance (proportion 1.35-1.7:1) (Fig. 5). Body length 8.49 mm (7-9.3 mm). In male (Fig. 2) integument as in female, except front tarsi brown; face with dense yellow or yellowish-white pubescence, genal area with white pubescence; mesosoma dorsally with yellowish pubescence, ventrally white as on legs; front tibial fringe longer than basitarsus; T1 entirely covered with yellowish pubescence, T2 with pale hairs and with copious suberect dark hairs laterally, T3-5 with short dark brown pubescence, more abundant on T5, T6 densely pale tomentose throughout; sterna clothed with white pubescence. T2-4 with complete yellowish apical fasciae, S1-4 with white apical fasciae. Mandibles three-dentate, with inferior acute process; genae with small tubercle just bellow base of mandible (Fig. 4); front coxal spine subtriangular, rather short, anterior surface of coxae densely white pubescent; front tarsi simple, unmodified; mid tibial spur well developed; T2 without foveae; T6 with carina slightly emarginated and external margin generally irregular; S5-8 and genitalia as in Fig. 6. Body length 7.55 mm (5.5-9 mm).

Biological observations

Floral records in Argentina

On the field margins we collected ten specimens foraging in flowers of the following native species: *Conyza bonariensis* (L.) Conquist (Asteraceae), *Phyla canescens* (Kunth) Greene (Verbenaceae), *Vigna luteola* (Jacq.) Benth. (Fabaceae), and *Verbena montevidensis* Spreng (Verbenaceae). Non-native plants: *Lotus glaber* Mill. (Fabaceae) and *Mentha* sp. (Lamiaceae).

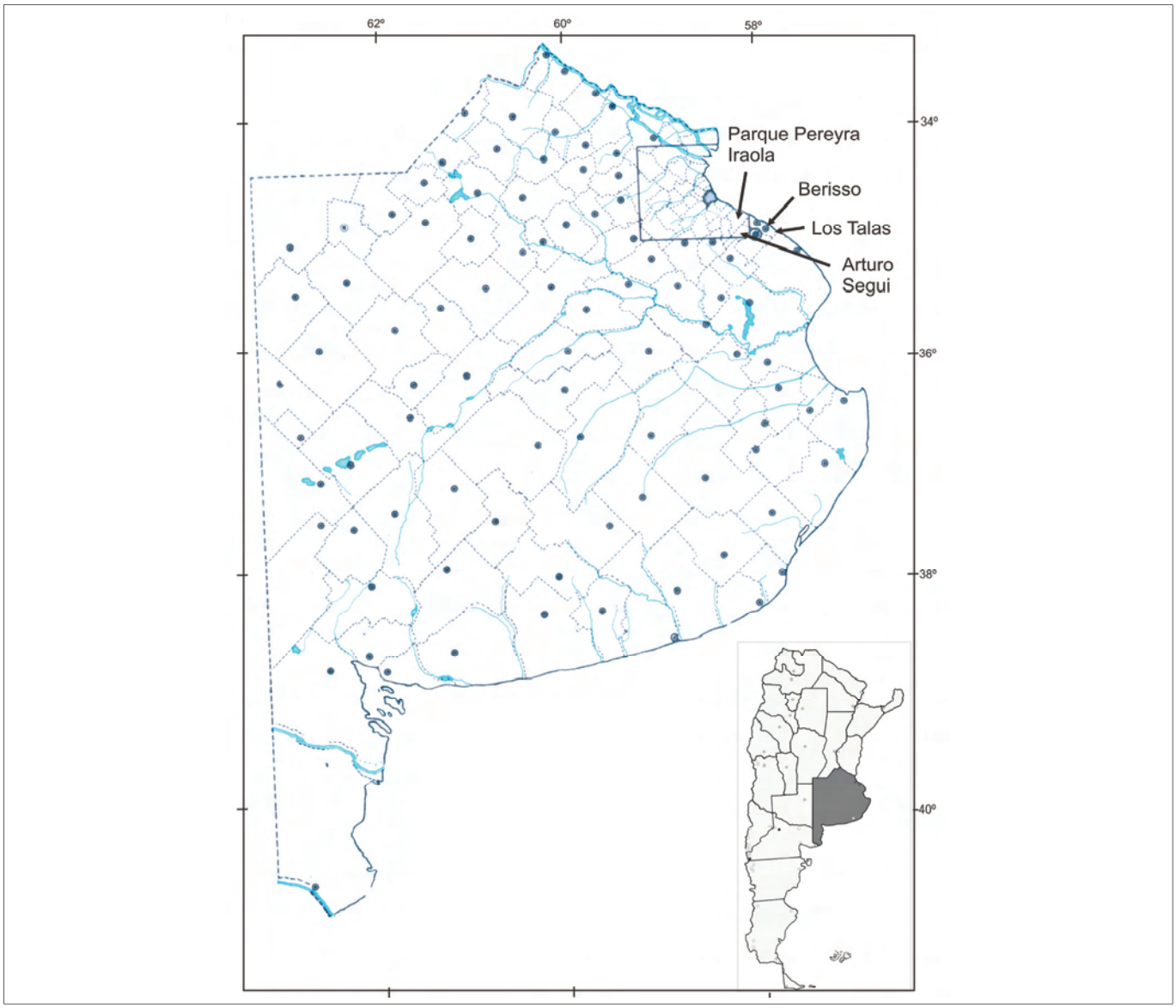


Fig. 7. Map showing the study area and localities sampled in north eastern Buenos Aires province.

Trap nests

A total of 17 out of the 45 trap-nests that were exposed in domestic gardens were occupied by *M. concinna* from which 57 specimens emerged on different days (see material studied). Although *M. concinna* nested in all diameters (4, 5 and 6 mm), it showed a marked preference for cavities of 6 and 5 mm with 88.2 % (47.02% of 6 mm and 41.18% of 5 mm) compared with only 11.8% of 4 mm. The total number of nests was 17 with a ratio of cells per nest of 3.8 (2-6) which did not differ significantly from that indicated by Raw (2004), but differs from that recorded by Krombein (1967). The sex ratio was 70.2% males to 29.8% female.

Material studied

(20 ♀♀ and 47 ♂♂) Argentina Buenos Aires. *Berazategui:* 1 ♂, Parque Pereyra Iraola, 11-xii-2005 (34°50' S, 58°05' W), M. Lucia. Coll. (MLP); 2 ♂♂ Parque Pereyra Iraola, 22-iii-2011 (34°50'15" S, 58°05'33" W), L. Alvarez. Coll. (MLP); *Berisso*: 3 ♀♀, Los Talas, 4-iii-2010 (34°52'25" S, 57°50'18" W), L. Alvarez-M. Lucia. Coll. (MLP); 1 ♂, Los Talas, 17-xii-2009, L. Alvarez. Coll. (MLP); 1 ♂, Berisso, 6-iii-2009, L. Alvarez. Coll. (MLP); 4 ♂♂, Berisso, 1-i-2011 (34°53'12" S, 57°53'41" W), L. Alvarez- M. Lucia. Coll. (MLP), 1 ♀ 7 ♂♂, Berisso, 2-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 4 ♂♂, Berisso, 4-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♀♀ 10 ♂♂, Berisso, 5-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♂♂, Berisso, 6-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♀♀ 3 ♂♂, Berisso, 7-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♂♂, Berisso, 9-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 1 ♀ 2 ♂♂, Berisso, 9-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♀♀ 1 ♂, Berisso, 12-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♀♀ 2 ♂♂, Berisso, 17-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 3 ♂♂, Berisso, 18-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 2 ♀♀, Berisso, 21-i-2011, L. Alvarez- M. Lucia. Coll. (MLP), 5 ♀♀, Berisso, 1-ii-2011, L. Alvarez- M. Lucia. Coll. (MLP); *La Plata*:1 ♂, Arturo Segui (Rta. 36), 28-ii-2011, (34°55'41" S, 58°07'55" W), L. Alvarez. Coll. (MLP); 1 ♂, Arturo Segui (Rta. 36), 29-xii-2010, L. Alvarez. Coll. (MLP).

Discussion

Megachile concinna has often been confused with *M. rotundata* and inadvertently both species were used for pollination of alfalfa and transported to different regions in the USA (Parker, 1978). We believe that *M. concinna* accidentally entered Argentina, probably together with the introduction of *M. rotundata* to different regions of the country for commercial purposes since the 1970's. The entry of this species in Argentina therefore probably occurred a long time ago, and its distribution is much broader than reported here.

M. concinna is a polylectic species, associated with 33 plant genera (Raw, 2004). Our preliminary data indicate that this species visits four families of plants in Argentina (Fabaceae, Asteraceae, Verbenaceae and Lamiaceae) from witch four species are native and two species are exotic. *M. concinna* adds to the eight established exotic species of bees in Argentina reported by Roig Alsina (2006) and Torretta *et al*. (2006). We recommend monitoring this introduced species in order to understand its dispersal, settlement, competition with native species, and the impact on native ecosystems. These data will provide baseline information for planning future conservation strategies.

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References

COCKERELL, T D A (1937) *African bees of the genera Ceratina, Halictus, and Megachile.* British Museum Press; London, UK. 254 pp.

DALLA TORRE, C G (1896) *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. Volumen X: Apidae (Anthophila).* Engelmann; Lipsiae, Germany. 643 pp.

DALMAZZO, M (2010) Diversidad y aspectos biológicos de abejas silvestres de un ambiente urbano y otro natural de la región central de Santa Fe, Argentina. *Revista de la Sociedad Entomológica Argentina* 69(1-2): 33-44.

DE SANTIS, L (1979) Nota sobre dos especies de megaquilas polinizadoras de la alfalfa. *Ciencia y abejas* 5: 44-49.

GENARO, J A; FRANZ, N M (2008) The bees of Greater Puerto Rico (Hymenoptera: Apoidea: Anthophila). *Insecta Mundi* 40: 1-24.

GONZALEZ, V H; ENGEL, M S; HINOJOSA-DÍAZ, I (2010) A new species of *Megachile* from Pakistan, with taxonomic notes on the subgenus *Eutricharaea* (Hymenoptera: Megachilidae). *Journal of the Kansas Entomological Society* 83(1): 58–67.

HADLEY, A (2011) CombineZM - Free image stacking software for depth of field correction. Available through http://www.hadleyweb.pwp.blueyonder.co.uk/CZM/combinezm.htm [Accessed 21 September 2011].

HOWLETT, B G; DONOVAN, B J (2010) A review of New Zealand's deliberately introduced bee fauna: current status and potential impacts. *New Zealand Entomologist* 33(1): 92-101.

KROMBEIN, K V (1967) *Trap-nesting wasps and bees: life histories, nests, and associates.* Smithsonian Press; Washington, USA. 570 pp.

MOURE, J S; MELO, G A R; DALMOLIN, A (2008) *Megachilini* Latreille, 1802. In Moure, J S; Urban, D; Melo, G A R (Orgs). *Catalogue of bees (Hymenoptera, Apoidea) in the Neotropical Region* - online version. Available through http://www.moure.cria.org.br/catalogue [Accessed 28 August 2011].

MICHENER, C D (2007) *The bees of the world (2nd Ed.).* Johns Hopkins University Press; Baltimore, USA. 992 pp.

PARKER, F D (1978) An illustrated key to alfalfa leafcutter bees *Eutricharaea* (Hymenoptera: Megachilidae). *The Pan-Pacific Entomologist* 54(1): 61-64.

PÉREZ, J (1895) *Espèces Nouvelles de Mellife `res de Barberie (Diagnoses Préliminaires)*. G. Gounouilhou Press; Bordeaux, France. 65 pp.

RAW, A (2004) Leafcutter and mason bees: a biological catalogue of the genus *Megachile* of the Neotropics. Available through http://www.webbee.org.b [Accessed 28 August 2011].

REBMANN, O (1968) Beitrag zur Kenntnis der Gattung Megachile Latr. (Hym., Apidae): Subgenus Eutricharaea und seine bisher bekanntgewordenen Arten. *Deutsche Entomologische Zeitschrift* 15 (1-3): 21–48.

ROIG-ALSINA, A (2006) *Hylaeus punctatus* (Brullé) (Colletidae), a Palaearctic bee long established in South America. *Journal of Hymenoptera Research* 15: 286-289.

SAN ROMÁN, E; CAZZANIGA, N J; SANTAMARÍA, E C (2002) Abejas cortadoras de una sola generación: un emprendimiento para paliar la falta de polinizadores de alfalfa en el sudoeste bonaerense. In *Vaquero, M C (Ed.), Territorio, economía y recursos naturales del Sudoeste Bonaerense.* EDIUNS, Bahía Blanca; Argentina. pp 217-232.

SMITH, F (1862) Descriptions of new species of Australian Hymenoptera, and of a species of *Formica* from New Zealand. *Transactions of the Entomological Society of London* Series 3(1): 53-62.

SMITH, F (1879) *Descriptions of new species of Hymenoptera in the collection of the British Museum.* British Museum Press; London, UK 240 pp.

TESÓN, A; DAGOBERTO, E; LIZARRALDE, M; LOIACONO, M (1976) Himenópteros polinizadores de la zona de Belloc (Buenos Aires, Republica Argentina). *Ciencia y Abejas* 2: 33-40.

TORRETTA, J P; MEDAN, D; ABRAHAMOVICH, A H (2006) First record of the invasive bumble bee *Bombus terrestris* (L.) (Hymenoptera, Apidae) in Argentina. *Transactions of the American Entomological Society* 132(3- 4): 285-289.