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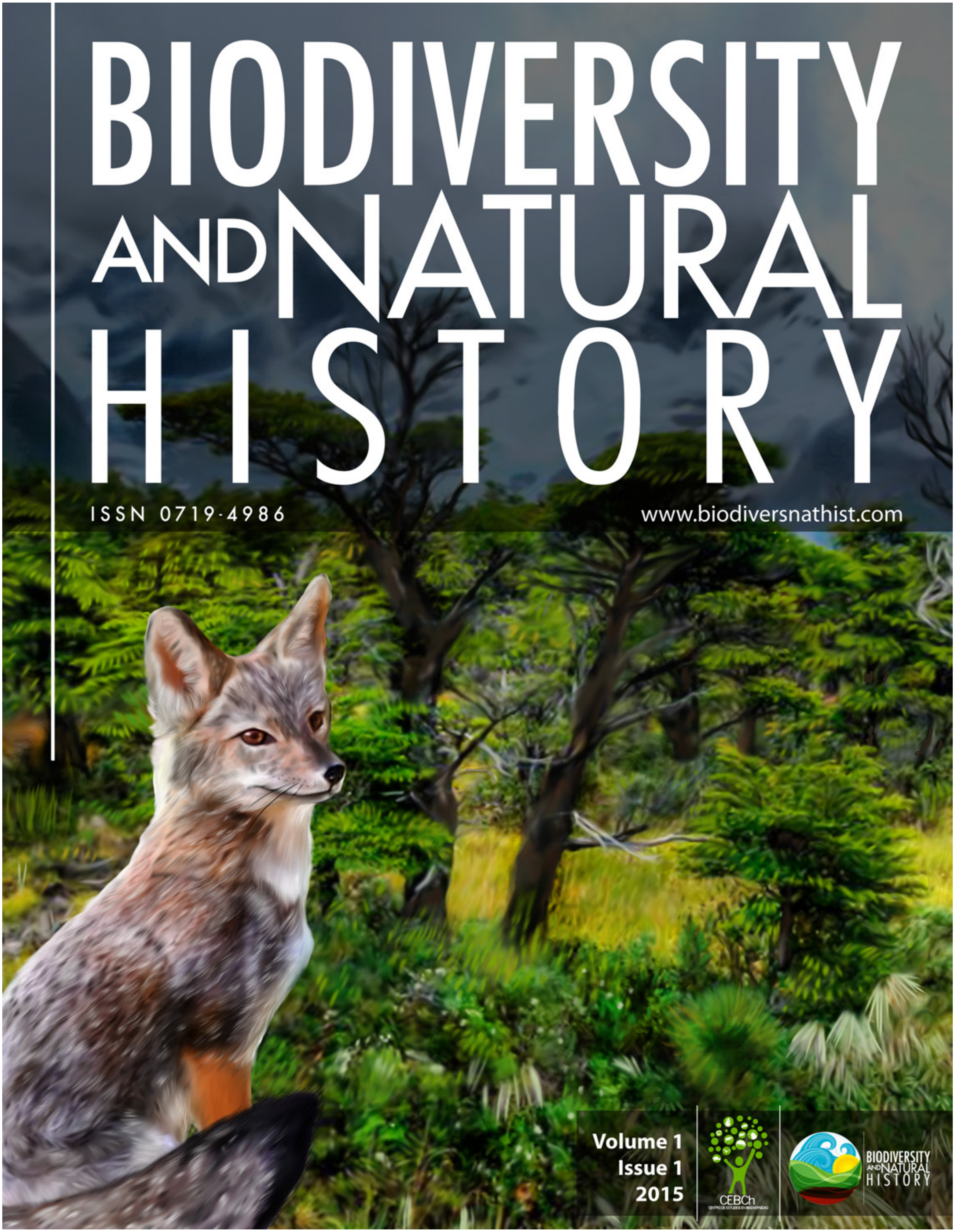

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BIODIVERSITY AND NATURAL HISTORY

Editorial

Biodiversity and Natural History (2015) 1: 0

Dear readers of and contributors to Biodiversity and Natural History

Estimados lectores y colaboradores de Biodiversity and Natural History

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Welcome to the first issue of *Biodiversity and Natural History*, a peer-reviewed, open-access and electronic journal published by the Centro de Estudios en Biodiversidad de Chile (Center for Studies in Biodiversity). The journal was created in 2009 under the name of Boletín de Biodiversidad de Chile with the aim of being a contribution to the dissemination of Chilean biodiversity and natural history. True to its original purpose, the journal only published Chilean manuscripts in the early years. However, as time went by, the journal also started to receive and publish manuscripts coming from elsewhere in the planet. Accordingly, the journal gradually became an international channel for the scientific promotion and dissemination of biodiversity and natural history and thus, the name of the journal, as well as its original scope and goals were no longer representative.

Because of this, in late 2014 the Editorial Board decided to change the original name of the journal to *Biodiversity and Natural History* and extend its scope and goals. Currently, the journal aims to be a contribution to the dissemination of biodiversity and natural history on all kinds of taxa, environments and spatio-temporal scales. The addition of an explicit spatio-temporal component in the scope was important as it clarifies that the journal publishes research from anywhere in the world (either conducted at local, regional or global level), as well as research on any geological era. An important process that also came along with the change of name of the journal was the inclusion of new international editors, a task that will continue over time. Indeed, at present, one third of the researchers who make up the Editorial Board of *Biodiversity and Natural History* are affiliated with research institutions located in countries other than Chile, such as USA, Mexico, UK, Switzerland and Ukraine.

As in the preceding title, *Biodiversity and Natural History* supports the concept that access to knowledge is a basic human right and not a good that must be commercialized. For this reason, the journal allows free access, download and distribution of its contents, in addition to offering totally free publishing. Likewise, the journal welcomes manuscripts conducted either by researchers affiliated to academic or research institutions as well as independent researchers. We also encourage undergraduate students to submit their manuscripts. An innovation that is being implemented in the journal is the immediate publication of the manuscripts after acceptance, maximizing the visibility of manuscripts. This way of publishing will be implemented from the second issue and will be definitely adopted from the third issue.

The front cover of the current issue of the journal depicts a *Lycalopex culpaeus* (Molina, 1782), a canid commonly known as “Andean fox” or “zorro culpeo”, with a *Nothofagus-dominated forest* in the background. The Andean fox is a beautiful and charismatic animal that can be found almost throughout the South American continent. For some cultures the fox represents renewal and protection. In this sense, the image of the fox is consistent with the current stage of the journal: we are living a transition from the old to the new title. In addition, the image of the fox could be interpreted as a guardian that protects the ideals as well as the short- and long-term goals of the journal.

We encourage you to visit our new website (www.biodiversnathist.com) and submit your research to *Biodiversity and Natural History* and from already thank you very much to the authors who have contributed to the growth of this journal. Finally, we hope that these changes will stimulate more authors to consider the publication in this journal.

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BIODIVERSITY AND NATURAL HISTORY

Short Communication

Biodiversity and Natural History (2015) 1: 1-5

Nueva localidad para *Alsodes tumultuosus* Veloso, Iturra & Galleguillos, 1979 (Amphibia, Alsodidae) en la Cordillera de los Andes, Region de O'Higgins, Chile

New location of *Alsodes tumultuosus* Veloso, Iturra & Galleguillos, 1979 (Amphibia, Alsodidae) in the Andes Mountains of the O'Higgins Region, Chile

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Resumen

Alsodes tumultuosus Veloso, Iturra & Galleguillos, 1979 es un anfibio endémico de Chile, descrito y hasta hace poco conocido únicamente en su localidad tipo, los arroyos cordilleranos del Sector La Parva, en la región Metropolitana. En este artículo se detalla el hallazgo de una nueva localidad para esta especie, en la región de O'Higgins, aproximadamente a 100 kilómetros al sur de La Parva. Este hallazgo, sugiere la ampliación del rango de distribución de esta especie al cordón cordillerano Andino de la región de O'Higgins, y señala la necesidad de efectuar mayores prospecciones e investigación de la especie, que permitan definir claramente su estado de conservación en Chile.

Palabras clave: anfibio**,** *Alsodes tumultuosus*, nueva localidad, Río Blanco, Chile Central.

Abstract

Alsodes tumultuosus Veloso, Iturra & Galleguillos, 1979 is an amphibian species endemic to Chile, described and known just from its type locality: the mountain streams in La Parva zone, Metropolitan region, central Chile. In this manuscript I report a new location for this species (the Andes Mountains of the O'Higgins Region, Chile), thus extending its current geographical range in about 100 kilometers southward. This finding suggests that we need to invest more efforts to clearly establish its conservation status in Chile.

Keywords: Amphibian, *Alsodes tumultuosus*, new location, Río Blanco, Central Chile.

INTRODUCCIÓN

Los herpetozoos presentes en Chile presentan patrones de endemismo asociados a procesos climáticos y geomorfológicos. Estos afectan su especiación y distribución por diversos factores, entre ellos las glaciaciones pleistocénicas (Fuentes & Jaksic, 1979; Formas, 1979). Así, el ecosistema mediterráneo de Chile central alberga cerca del 50% de los vertebrados del país, con un alto nivel de endemismo, por lo que se le ha catalogado como un "hotspot" de biodiversidad a escala mundial (Simonetti, 1999; Myers, 2000).

Alsodes tumultuosus Veloso, Iturra & Galleguillos, 1979 es un anuro de la familia Alsodidae, de tamaño mediano (ca. 66 mm), piel lisa alrededor de la cloaca y muslos, ojos grandes y prominentes orientados lateralmente, piel dorsal lisa, de coloración gris oliva, con manchas conspicuas de color negro y superficie ventral blanca. Los machos poseen antebrazos muy desarrollados y placas pectorales espinosas cornificadas en la época reproductiva (Veloso *et al*., 1979).

En cuanto a su distribución geográfica, se describe como conocida solo para su localidad tipo, La Parva (33°21' S; 70°20' W), Cordillera de los Andes, Santiago de Chile, región Metropolitana, entre los 2.600-3.000 msnm (Formas, 1995).

Sus preferencias de hábitat incluyen refugios bajo piedras y bolones, cercanos a arroyos cordilleranos sobre 2.500 msnm; la vegetación circundante está compuesta por pastizales y matorrales de los Andes (Veloso & Núñez, datos no publicados), hoy definidos como matorral bajo de altitud (Luebert & Pliscoff, 2006). Díaz & Valencia (1985) señalan que las larvas de esta especie se encuentran con mayor frecuencia en grietas de rocas bajo el agua.

El área descrita como localidad tipo para este anfibio está fuertemente intervenida por proyectos inmobiliarios asociados al turismo y los deportes invernales, siendo la infraestructura asociada a estas actividades, la amenaza principal para su conservación a futuro (Veloso & Núñez, 2003).

En cuanto al estado de conservación de *A. tumultuosus*, Glade (1988), Formas (1995), Núñez *et al*. (1997) y el Servicio Agrícola Ganadero (SAG, 1998) lo catalogan como una "Especie en Peligro". Díaz-Páez & Ortiz (2003), la consideran como "Vulnerable" y el IUCN (2004), como "En Peligro Crítico". Según el Reglamento de Clasificación de Especies (RCE, 2014) del Ministerio del Medio Ambiente, esta especie está "En Peligro".

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En anteriores prospecciones de fauna realizadas durante los años 2011 y 2012 por el Servicio Agrícola y Ganadero (SAG) de la región de O'Higgins, se detectó la presencia de esta especie en arroyos precordilleranos del Área Protegida Alto Huemul, Sierras de Bellavista (Georreferenciación aproximada: 346858 m E / 6138510 m S. 19 H Datum WGS 84), Comuna de San Fernando, Cordillera de Los Andes de la región de O'Higgins. Este hallazgo, no fue publicado en una revista científica pero quedó registrado en medios de prensa de la fecha tales como: (1) el diario "El Mercurio" 30 de julio de 2012, sección Vida, Ciencia y Tecnología (página 12 Cuerpo A); y (2) el diario "El Rancagüino", 19 de noviembre del 2012.

En este artículo describimos una nueva localidad para este anfibio y actualizamos el mapa de distribución para este anuro endémico de la Cordillera de los Andes de Chile Central. Este nuevo registro extiende en más de 100 km el rango de distribución geográfico conocido para esta especie.

MATERIALES Y MÉTODOS

Sitio de estudio y contexto de la prospección

Desde el 18 al 20 de noviembre del 2014 (tres días), se estableció un campamento en la confluencia de los ríos Paredones y Río Blanco, los cuales forman el Río Pangal, a 1.519 msnm (georreferenciación: 377962 m E / 6210907 m S, 19 H Datum WGS 84). Este campamento fue montado para hacer un catastro de la fauna silvestre en los cajones de los ríos Blanco y Pangal, asi como en terrenos pertenecientes a la División "El Teniente" de CODELCO, comuna de Machalí, Cordillera de Los Andes, Región de O'Higgins, Chile. Esta prospección fue organizada y ejecutada por la Unidad de Vida Silvestre del SAG de la Región de O'Higgins. El equipo de personas del SAG que realizó las actividades de terreno estuvo compuesto por Mauricio Valdés Cornejo, Luis Latorre Rivera y el autor de este artículo.

Diseño de muestreo y registro de fauna silvestre

Se establecieron diversas rutas y se estudiaron varios transectos en ellas para evaluar la fauna silvestre presente en el sitio de estudio. Las rutas y transectos utilizados para evaluar la fauna silvestre del sector fueron determinados antes de ir a terreno utilizando la información geográfica disponible en Google Earth. Cada transecto fue recorrido aleatoriamente y en su totalidad por las tres personas que componían el equipo, manteniendo una distancia de 10 m entre sí. Cada persona registró la fauna presente mediante métodos directos (avistamientos) e indirectos (audio referencial). Cuando fue posible, la fauna observada también fue fotografiada. Algunos transectos fueron recorridos de noche, mientras que otros fueron recorridos durante el día. De toda la fauna avistada, solo se capturaron los anfibios para registrar sus datos biométricos. Posteriormente los animales fueron liberados en el mismo lugar de captura. El tiempo total de prospección (esfuerzo de muestreo invertido), tanto de transectos diurnos como nocturnos, para los tres días, fue de 27 horas.

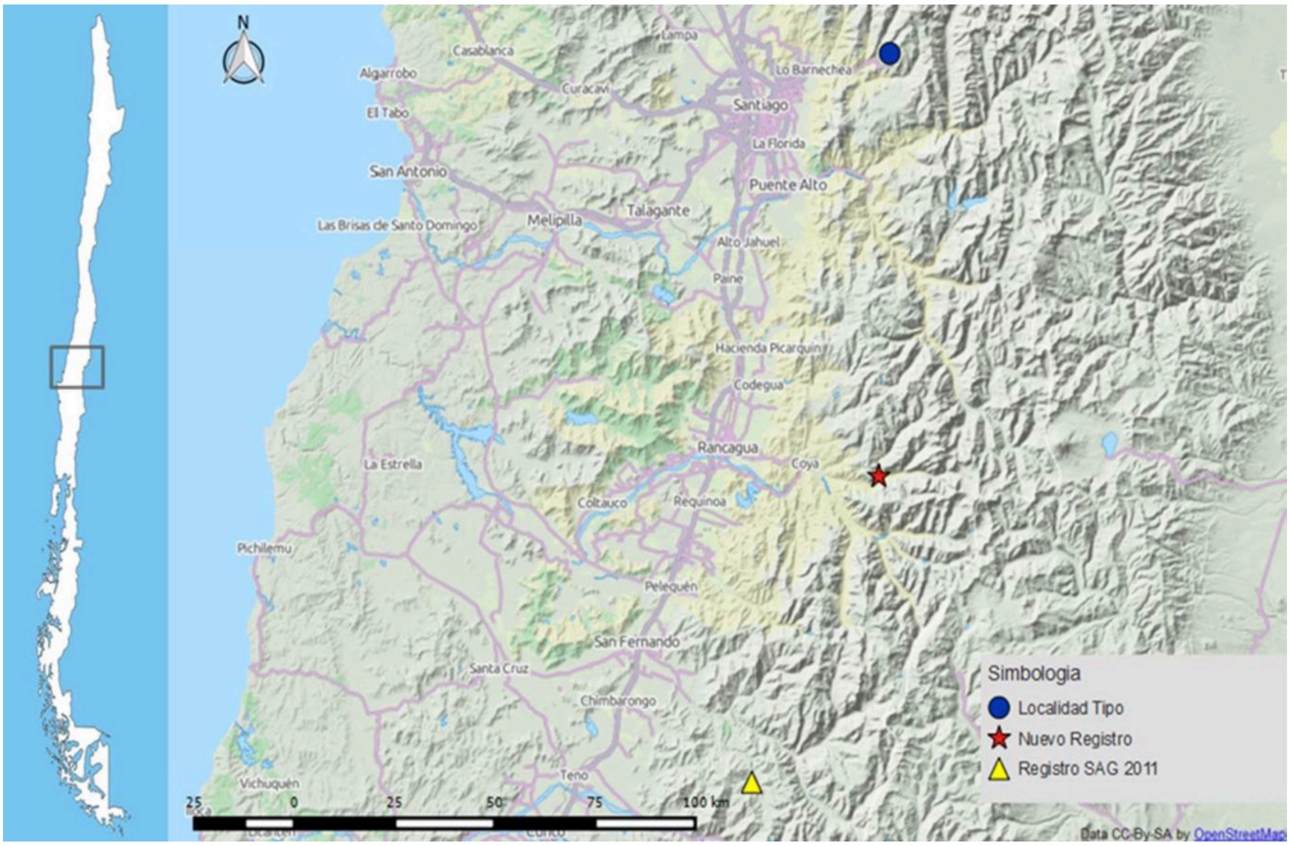

Fig. 1: Mapa con el nuevo registro de *Alsodes tumultuosus* para la región de O'Higgins, su relación con la localidad tipo y anterior registro para la especie en la región de O'Higgins por el SAG, año 2011.

Fig. 1: Records for *Alsodes tumultuosus* in Chile. Type locality (blue circle), previous record reported by the SAG-Chile in 2011 (yellow triangle), new record reported in this study (red star).

Fig. 2: A) Ejemplar adulto de *Alsodes tumultuosus* vista anterior-dorsal. B) Ejemplar adulto vista posterior-dorsal. C) Ejemplar adulto vista ventral.

Fig. 2: Different views for the same female adult of *Alsodes tumultuosus* reported in the present study. A) Anterodorsal view. B) Posterodorsal view. C) Ventral view.

RESULTADOS

Se identificaron y fotografiaron cinco especies de anfibios durante la actividad de prospección. En orden de abundancia relativa: *Rhinella spinulosa* (Wiegmann, 1834), *R. arunco* (Molina, 1782), *Pleurodema thaul* (Lesson, 1826), *Alsodes montanus* (Lataste, 1902) y *A. tumultuosus.* El hallazgo de *A. tumultuosus* es el más significativo, ya que se realizó a más de 100 kilómetros de distancia de su localidad tipo, La Parva, región Metropolitana. Este hallazgo y el realizado por el SAG (2011), representan los registros más meridionales que se conocen para esta especie y los primeros para la región de O'Higgins (Fig. 1).

Concretamente, *A. tumultuosus* fue registrado durante la prospección nocturna del segundo día, aguas arriba de un arroyo cordillerano afluente del Río Blanco (georreferenciación: 377727 m E / 6211083 m S, 19 H Datum WGS 84; elevación: 1620 msnm; Fig. 1). Este curso de agua se recorrió desde su confluencia en el Río Blanco hasta ca. 80 metros río arriba, llegando a un lugar en donde se formaba una poza (ca. 4 m de diámetro y 30 cm de profundidad) alimentada por una caída de agua de aproximadamente 20 m de altura. En este lugar, en un área rocosa constantemente salpicada por la caída de agua, se encontró un ejemplar adulto hembra (Fig. 2). El ejemplar fue identificado siguiendo las características morfológicas y ecológicas propuestas por Veloso *et al*. (1979): (a) 62 milímetros de longitud desde el hocico a la cloaca; (b) patrón de coloración dorsal gris verde-oliváceo con machas conspicuas negras o cafés, coloración ventral blanca, piel dorsal y ventral lisa (Figs. 2A y 2B); (c) ojos grandes y prominentes orientados lateralmente (Figs. 2A y 2B), escaso desarrollo de membranas interdigitales de las extremidades posteriores (Fig. 2C), sin protuberancias digitales (Fig. 2C); (d) presencia de parches pectorales sin cornificaciones permiten clasificarlo como un ejemplar hembra (Fig. 2C); (f) hábitat y conducta asociada a cursos de agua prístinos y cordilleranos de mediano caudal, con pequeñas caídas de agua o micro-cascadas tras las cuales suele ocultarse (Fig. 3A). La determinación de esta especie fue confirmada por el Sr. Andrés Charrier (Biólogo PUC) en base a material fotográfico, remitido por el autor.

En diferentes puntos de la misma poza (Fig. 3A), se avistaron al menos seis ejemplares de larvas de anfibio que, por sus características de tamaño, coloración y cercanía al ejemplar adulto hembra, podrían pertenecer a la misma especie (Fig. 3B).

Fig. 3: A) Hábitat donde fue encontrado *Alsodes tumultuosus*. B) Larva de *Alsodes tumultuosus*.

Fig. 3: A) Habitat and B) larvae for *Alsodes tumultuosus*.

DISCUSIÓN

El hallazgo de *A. tumultuosus* en el Cajón del río Blanco, comuna de Machalí, Región de O'Higgins, junto con el hallazgo anterior notificado por el SAG el año 2011, sobre la presencia de esta especie en Sierras de Bellavista, Comuna de San Fernando, indicarían que este anfibio está presente en la zona Norte, Centro y Sur de la cordillera de Los Andes de esta región. Esto permite ampliar el rango de distribución de esta especie desde su localidad tipo en La Parva, Región Metropolitana, a todo el cordón montañoso andino de la región de O'Higgins. Lo anterior, debe corroborarse con nuevas prospecciones y catastros de esta especie en esta área.

Considerando la ampliación del rango de distribución de *A. tumultuosus*, y dependiendo de la información que entreguen posteriores prospecciones y catastros de la especie en el País, los comités científicos correspondientes deberán reevaluar y posiblemente reclasificar el estado de conservación de *A. tumultuosus*. Esta especie actualmente está clasificada como "En Peligro Crítico" por la IUCN (2004), y como "En Peligro" según el RCE (2014) del Ministerio del Medio Ambiente. Sin embargo, esta clasificación se basó solo en la información disponible que ubicaba a dicha especie distribuida solo en la región Metropolitana y restringida a su localidad tipo, la cual se encuentra fuertemente fragmentada (Veloso & Núñez, 2003). Esta situación no está presente en las locaciones aquí descritas para la región de O'Higgins, en donde las amenazas para su conservación, están dadas principalmente por la implementación de proyectos hidroeléctricos o centrales de paso en las microcuencas de cursos de agua cordilleranas.

Agradecimientos

El autor agradece especialmente las facilidades otorgadas por el SAG, Chile para la realización de este trabajo. Asimismo, agradece el aporte de información de Andrés Pérez y del equipo SAG que participó de las prospecciones en los años 2011 y 2012 en Sierras de Bellavista, San Fernando, región de O'Higgins, Chile.

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BIODIVERSITY AND NATURAL HISTORY

Short Communication
Biodiversity and Natural History (2015) 1: 6-8

Depredación del murciélago de cola libre *Tadarida brasiliensis* (I. Geoffroy Saint Hilaire, 1824) por el cernícalo *Falco sparverius* Linnaeus, 1758, en un sector urbano de Santiago, Región Metropolitana, Chile

Predation of the free-tailed bat *Tadarida brasiliensis* (I. Geoffroy Saint Hilaire, 1824) by the American kestrel *Falco sparverius* Linnaeus, 1758, in an urban sector of Santiago city, Metropolitan region, Chile

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Resumen

El cernícalo americano (*Falco sparverius*) es un ave rapaz distribuido en todo el continente americano. A lo largo de toda su distribución geográfica, el cernícalo se alimenta de una gran variedad de animales, incluyendo a los murciélagos. En Chile, sin embargo, no existe información que reporte a los murciélagos como parte de la dieta de esta especie. Esta nota reporta el primer registro conocido de depredación por el cernícalo americano sobre el murciélago de cola libre *Tadarida brasiliensis*.

Palabras clave: Chile, depredación*, Falco sparverius*, murciélagos, primer registro, *Tadarida brasiliensis.*

Abstract

The American kestrel (*Falco sparverius*) is a raptor widely distributed in America. Throughout its geographic distribution, the American kestrel feeds on a variety of animal taxa, including bats. In Chile, however, there are no reports of American kestrel feeding on bats. This note reports the first known record of predation by the American kestrel on the free-tailed bat *Tadarida brasiliensis*.

Key words: bats, Chile, *Falco sparverius*, first record, predation, *Tadarida brasiliensis*.

El cernícalo *Falco sparverius* Linnaeus, 1758 es un ave rapaz diurna, perteneciente a la familia Falconidae (Orden Falconiforme). Esta ave tiene una distribución geográfica muy amplia y ha sido registrada a lo largo de todo el continente americano (Ferguson-Lees & Christie, 2001). En Chile, *F. sparverius* exhibe una extensa distribución latitudinal y altitudinal. Concretamente, este rapaz está presente desde la Región de Atacama hasta la Región de Magallanes (Tierra del Fuego) y desde la costa hasta los 4.000 msnm; donde suele habitar campos agrícolas, praderas, zonas montañosas y urbanas (Jaramillo *et al.*, 2005). Los miembros de esta especie se alimentan principalmente de insectos, aunque se ha documentado que también pueden alimentarse de varios taxa de vertebrados como anfibios, reptiles, pequeñas aves y pequeños mamíferos, incluyendo en este último grupo a los murciélagos (Black, 1976; Beltzer, 1990; Ferguson-Lees & Christie, 2001; Sarasola *et al.*, 2003; Aguiar *et al.*, 2012; Lenoble *et al.*, 2014). En Chile, sin embargo, los murciélagos no han sido reportados como parte de la dieta de esta especie (Yáñez *et al.*, 1980; Simonetti *et al.*, 1982; Mella, 2002; Figueroa & Corales, 2004). Esta nota documenta el primer registro de depredación de murciélagos por *F. sparverius* en Chile. Específicamente, la nota reporta la depredación de esta ave sobre el murciélago de cola libre *Tadarida brasiliensis* I. Geoffroy Saint Hilaire, 1824, en un sector urbano de Santiago, Región Metropolitana, Chile.

Datos de la observación

El día 8 de septiembre de 2014 (invierno) a las 17:52 hrs, en la calle Alfredo Rioseco de la comuna de Providencia (33°26'34.16" S; 70°37'42.25" W), Santiago, Región Metropolitana, Chile (Fig. 1); se observó un macho adulto de la especie *F. sparverius* posado sobre la rama horizontal de un árbol, a una altura aproximada de ocho metros sobre el nivel del suelo, sosteniendo en su pico un murciélago de la especie *T. brasiliensis* (Fig. 2), el cual extrajo de un nido de cotorra argentina (*Myiopsitta monachus* Boddaert, 1783) emplazado en una araucaria brasileña *Araucaria angustifolia* (Bertol.) Kuntze. El murciélago fue identificado sobre la base de su cola, la cual sobresale del uropatagio, carácter diagnóstico que permite distinguirlo fácilmente de cualquier otra especie de murciélago que habite en la Región Metropolitana (Rodríguez-San Pedro *et al.*, 2014). A los pocos minutos se acercó una hembra de cernícalo, tomó el

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murciélago del pico del cernícalo macho y voló llevándolo consigo.

Fig. 1: Mapa de Chile (inserción superior izquierda) en el que se indica la ubicación de la ciudad de Santiago. La otra figura corresponde a un mapa de Santiago. Este último mapa muestra la localidad aproximada donde se produjo el registro reportado en este estudio (triángulo rojo).

Fig. 1: Map of Chile (top left corner insertion) indicating the position of Santiago city. The other figure corresponds to a map of Santiago city. The latter map shows the approximate locations where the sighting here reported occurred (red triangle).

Notas sobre la presa

T. brasiliensis es un murciélago insectívoro de tamaño mediano (longitud total: 90-109 mm; peso: 9-15 g) perteneciente a la familia Molossidae (Fig. 3). Se distribuye ampliamente desde el sur de los Estados Unidos, a través de México, Centroamérica y Sudamérica hasta el Norte de la Patagonia, exceptuando la cuenca amazónica (Simmons, 2005). En Chile, se le encuentra desde la Región de Arica y Parinacota hasta la Región de Los Lagos (Mann, 1978; Galaz & Yáñez, 2006). En la Región Metropolitana se le ha registrado de norte a sur entre las Comunas de Tiltil y Alhué y desde María Pinto hasta los 3.000 msnm en la precordillera (Rodríguez-San Pedro *et al.*, 2014). En Chile, no existen muchos datos sobre los depredadores naturales de ésta y otras especies de murciélagos. Esta nota confirma a *F. sparverius* como un depredador natural de este quiróptero. *T. brasiliensis* ha sido reportado como portador del virus de la rabia en Chile (Favi & Catalán, 1986). No obstante, la prevalencia del virus en las poblaciones silvestres de esta especie no supera el 0,44% de seropositividad, y en general la incidencia de rabia en humanos transmitidas por murciélagos es escasa (Favi *et al.*, 2011; Escobar *et al.*, 2014). En este sentido, se podría inferir que *F. sparverius* contribuye al control demográfico de esta especie de quiróptero, de interés para la salud pública, y en consecuencia debería ser considerado en estrategias de conservación.

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Agradecemos a Paulo Dávalos y Taller Siete Colores por facilitarnos la fotografía. Agradecemos también las sugerencias y comentarios del Editor en Jefe de la revista y dos revisores anónimos.

Fig. 2: Un macho adulto de cernícalo *Falco sparverius* sosteniendo en su pico a un murciélago de cola libre *Tadarida brasiliensis*, en Santiago, Región Metropolitana, Chile. Crédito fotográfico: Paulo Dávalos y Taller Siete Colores.

Fig. 2: An adult male of American kestrel (*Falco sparverius*), holding a free-tailed bat (*Tadarida brasiliensis*) in its bill, at Santiago, Metropolitan Region, Chile. Photo credits: Paulo Dávalos and Taller Siete Colores.

Fig. 3: Macho adulto de murciélago de cola libre *Tadarida brasiliensis*. Crédito fotográfico: María L.C. Castillo.

Fig. 3: An adult male of free-tailed bat (*Tadarida brasiliensis*). Photo credits: María L.C. Castillo.

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BIODIVERSITY AND NATURAL HISTORY

Short Communication

Biodiversity and Natural History (2015) 1: 9-11

On the presence of *Ilithucia nasuta* (Stål, 1859) (Hemiptera: Membracidae) in the north of Chile

Sobre la presencia de *Ilithucia nasuta* (Stål, 1859) (Hemiptera: Membracidae) en el norte de Chile

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Abstract

The known distribution of *Ilithucia nasuta* (Stål, 1859) (Hemiptera: Membracidae) is expanded with specimens from Tarapacá Region, Chile; becoming the first record for the country.

Key words: Chile, North, Tarapacá, Insect, Membracidae, Ceresini, *Ilithucia,* new record.

Resumen

Se amplía el conocimiento sobre la distribución de *Ilithucia nasuta* (Stål, 1859) (Hemiptera: Membracidae) a partir de ejemplares provenientes de la región de Tarapacá, Chile, siendo el primer registro para este país.

Palabras clave: Chile, Norte, Tarapacá, insecto, Membracidae, Ceresini, *Ilithucia*, nuevo registro.

The family Membracidae Rafinesque, 1815 consist in more than 3,200 species classified in 400 genera and 9 subfamilies; 8 of these are restricted to the New World (Deitz *et al*., 2008) Membracids are popularly known for their great diversity of pronotal extensions. It is less widely known that they are as varied in their habits as in their morphology (McKamey & Deitz, 1996).

The genus *Ilithucia* Stål, 1867 (Smiliinae: Ceresini) was treated by Sakakibara (2002). This genus comprises 18 species. *Ilithucia nasuta* (Stål, 1859) was described originally in the genus *Ceresa* Amyot and Serville, 1843, referring to their place of origin: Insula, Tahiti, this considered as a mistake by Sakakibara (2002). This species is known for Brazil (Goding, 1930; Funkhouser, 1951), Colombia (Richter, 1941; 1942; 1943; 1955; Funkhouser, 1951; Sakakibara, 2002) and Ecuador (Sakakibara, 2002). The purpose of this note is to report for the first time the presence of *I. nasuta* in Chile.

Seven females were examined with the following information: Chiapa 2950 m; Cord. Iquique; 23.24-April-1969; **Coll:** L.E. Peña; **Deposited in:** "Museo Entomológico Luis Peña", Departamento de Sanidad Vegetal, Universidad de Chile (Figs. 1-9). For the identification I followed Sakakibara (2002); the original description, Richter's (1943) redescription and Kopp & Yonke's (1979) figures.

Taxonomy:

Ilithucia nasuta (Stål, 1859)
= *Ceresa nasuta*; Stål, 1859; 283
= *Melusina nasuta*; Stål, 1867: 552
= *Centrogonia nasuta*; Stål, 1869: 24
= *Penichrophorus nasutus*; Richter, 1943: 86
= *Penichrophorus sericatus* Richter, 1943: 86
= *Centrogonia nasuta*; Funkhouser, 1951: 127
= *Penichrophorus nasuta*; Richter, 1955: 334
= *Ilithucia nasuta*; Sakakibara, 2002: 195

Ilithucia nasuta (Stål, 1859) can be confused in Chile by its superficial resemblance with *Sundarion chilense* (Spinola, 1852) (Figs. 4-6), and *Alchisme rubrocostata* (Spinola, 1852) (Figs. 7-9). *Ilithucia* can be distinguished from both genera in having the forewing with veins R and M fused, then separated at apex (as described by Deitz in 1975).

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Figs. 1-3: *Ilithucia nasuta* from Región de Tarapacá (20°17′00″ S; 69°20′00″ W). (1) lateral view, (2) dorsal view, (3) frontal view.

Figs. 1-3: *I. nasuta* de la Región de Tarapacá (20°17′00″ S; 69°20′00″ W). (1) vista lateral, (2) vista dorsal, (3) vista frontal.

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Figs. 4-9: *Sundarion chilense*. (4) lateral view, (5) dorsal view, (6) frontal view. *Alchisme rubrocostata*. (7) lateral view, (8) dorsal view, (9) frontal view.

Figs. 4-9: *S. chilense*. (4) vista lateral, (5) vista dorsal, (6) vista frontal. *A. rubrocostata*. (7) vista lateral, (8) vista dorsal, (9) vista frontal.

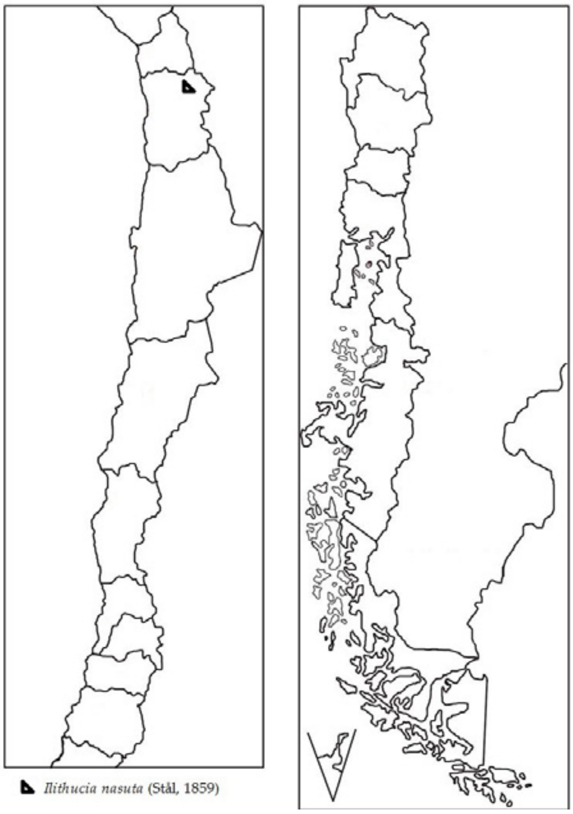

Fig. 10. Distribution of *Ilithucia nasuta* in Chile.

Fig. 10. Distribución de *I. nasuta* en Chile.

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BIODIVERSITY AND NATURAL HISTORY

Short Communication

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Taenia saginata Goeze, 1872 (Platyhelminthes: Cestoda: Taeniidae) en un indígena de Tierra del Fuego, Chile

Taenia saginata Goeze, 1872 (Platyhelminthes: Cestoda: Taeniidae) from an indigenous native from Tierra del Fuego, Chile

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Resumen

Se entrega el primer registro del céstodo *Taenia saginata* en un indígena de Tierra del Fuego (Patagonia chilena), correspondiente al año 1902. Se discute la importancia del registro y se entregan ilustraciones del ejemplar.

Palabras clave: Platyhelminthes, Cestoda, *Taenia saginata*, Patagonia, Chile.

Abstract

First record of *Taenia saginata* from an indigenous from Tierra del Fuego (Chilean Patagonia) is reported, from museum material of the year 1902. The importance of the record is discussed. Illustrations of the specimen are given.

Keywords: Platyhelminthes, Cestoda, *Taenia saginata*, Patagonia, Chile.

Taenia saginata Goeze, 1782 es un platelminto zoonótico, que vive en estado adulto en el intestino de los humanos; mientras que su hospedero intermediario son los bovinos. Este platelminto se encuentra actualmente ampliamente distribuido, siendo común en África, Europa del Este, Sureste del Asia, Sur de Asia y América Latina (Eckert, 2005).

En Chile, a pesar de que pueden encontrarse cisticercos en bovinos (Cayo *et al.*, 2013), las infecciones por tenias en humanos se presentan sólo ocasionalmente (Torres *et al.*, 2001). Si bien se ha mencionado que *T. saginata* concentra la mayor cantidad de casos en Chile respecto a otras tenias (Torres *et al.*, 2001); poco se sabe del registro histórico acerca de los primeros casos ocurridos en Chile. La presente contribución tiene por objeto entregar el primer registro de teniasis en un indígena patagónico.

Este registro fue obtenido durante labores curatoriales de la colección zoológica del Museo Maggiorino Borgatello en la ciudad de Punta Arenas. El ejemplar se encuentra fijado en formalina con una etiqueta con el número "69" (Fig. 1a), sin escolex, pero en buen estado de conservación (Fig. 1b), midiendo en total aproximadamente 9 m de longitud. Para su identificación se requirió realizar análisis morfométricos y disección; incluyendo análisis interno de las proglótidas maduras. En estas estructuras registramos la presencia de 18 ramificaciones laterales uterinas. *Taenia saginata* posee entre 12 y 30 ramificaciones; mientras que en *T. solium* el rango es de 7 a 13 (CDC, 2015). La etiqueta del frasco que contiene el ejemplar indica que fue obtenido de un indígena de Tierra del Fuego en 1902; lo que correspondería al primer registro oficial para un indígena de estas latitudes. Cabe mencionar que los escasos trabajos existentes en el país para este grupo son más bien modernos incluyendo datos de situaciones actuales (e.g. Cayo *et al.,* 2013; Torres *et al.,* 2001).

Mucho se ha escrito sobre como las patologías y parásitos de los colonos europeos devastaron a los nativos americanos, a su vez son muchas las expediciones que han visitado el extremo austral de Patagonia (Pérez, 2000); sin embargo registros como el presentado aquí son difíciles de encontrar, por lo que constituyen no solo una pieza de valor científico, sino que también histórico.

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Fig. 1: (a) Ejemplar *Taenia saginata* en el recipiente contenedor; (b) Sección del ejemplar de *T. saginata*.

Fig. 1: (a) *Taenia saginata* specimen on it container; (b) Section of the *T. saginata* specimen.

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BIODIVERSITY AND NATURAL HISTORY

Research Article

Biodiversity and Natural History (2015) 1: 14-17

Contribución al conocimiento de la fauna Hemipterológica en Patagonia: *Sinopla perpunctatus* Signoret, 1864 (Heteroptera: Acanthosomatidae): Nuevos aportes a su historia natural

Contribution to the knowledge of Patagonian Hemipterological fauna: *Sinopla perpunctatus* Signoret, 1864 (Heteroptera: Acanthosomatidae): New data about its natural history

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Resumen

Para *Sinopla perpunctatus* Signoret se brinda información adicional sobre la coloración, una nueva asociación con una planta del complejo de especies *Chusquea culeou* E. Desvaux (Poaceae: Bambusoideae) y la distribución geográfica en Argentina y Chile es revisada y discutida.

Palabras clave: Heteroptera, Argentina, Chile, patrón de coloración, planta-huésped, distribución.

Abstract

Apportations to the knowledge of coloration patterns of *Sinopla perpunctatus* Signoret are given, illustrated and discussed. A new association with a plant from the complex *Chusquea culeou* E. Desvaux (Poaceae: Bambusoideae), is mentioned and discussed. A review of the distribution known for this species in Argentina and Chile is included.

Key words: Heteroptera, Argentina, Chile, coloration pattern, host-plant, distribution.

INTRODUCCIÓN

Los Acantosomátidos son una familia de Pentatomoideos fitófagos que fue considerada por mucho tiempo como una subfamilia o tribu de Pentatomidae (Schuh & Slater, 1995). Los Acantosomátidos comúnmente llamados “shield bugs” están constituidos por 200 especies en 56 géneros (Carvajal, 2014a). Kumar (1974) realizó la última revisión mundial para este grupo. La fauna en Argentina se encuentra representada por 13 géneros y 18 especies (Grazia *et al*., en prensa; Carvajal 2014b), y la chilena por 14 géneros y 16 especies (Carvajal *et al*., 2014; Faúndez *et al*., 2014). Los Acanthosomatidae están conformados por 3 subfamilias: Acanthosomatinae, Blaudusinae y Ditomotarsinae (Kumar, 1974). El género *Sinopla* Signoret, 1864 pertenece a la subfamilia Blaudusinae Kumar, 1974; Tribu Lanopini Kumar, 1974.

Sinopla perpunctatus fue descrita por primera vez por Signoret como nueva especie para Chile en 1863. La distribución se concentra mayoritariamente en la región andina (Carvajal & Faúndez, 2013).

En este artículo brindamos información morfológica, bionómica y aportes distribucionales de *S*. *perpunctatus* en el norte de Patagonia.

MATERIALES Y MÉTODOS

Las muestras se recogieron con un “Garden vacuum” modelo de jardín vacío 56/86 Stihl y barrer-net con un diámetro de 35 cm, en febrero de 2013 en la provincia de Neuquén. Todos los estados de *S. perpunctatus*, incluyendo ninfas, se encontraron en la misma planta huésped y fueron conservados en etanol al 75%. La identificación específica de las ninfas se confirmó mediante la asociación del material estudiado con los adultos. Las imágenes fueron tomadas con una cámara digital (PANASONIC DMC-S3). El material se deposita en la colección del Museo de La Plata (MLP), Argentina.

RESULTADOS

Coloración

Faúndez & Osorio (2010) estudiaron los cambios de coloración de esta especie en el extremo sur de Patagonia (Región de Magallanes, Chile). Estos autores registraron que esta especie a principio de la primavera es naranja y uniforme a lo largo de todo el cuerpo. Esta coloración

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puede tornarse verde (machos y hembras en primavera verano), y verde claro cuando está asociada al cuidado maternal (hembras en primavera), pasando de naranja a amarillo dependiendo del color de plantas. (Faúndez & Osorio, 2010).

Nuestras observaciones incluyen también estas variaciones: coloración general desde naranja a rojizo con tonalidades castañas, extremo posterior del pronoto más oscuro, desde naranja a naranja parduzco (Fig. 1A). Algunos ejemplares presentan los segmentos conexivales con una mancha negra que distalmente ocupa un cuarto de la longitud del conexivo, el resto del conexivo varía desde rojizo hasta anaranjado (en su mayoría la coloración es naranja al igual que el resto del cuerpo). Ventralmente naranja o naranja claro con tonalidades amarillentas. Este material presentó distinta coloración con respecto el sustrato donde se hallaban. Las observaciones aquí registradas, adicionalmente, confirman la prevalencia de la madre junto con las ninfas lo que indicaría que en esta localidad más septentrional también se produce el cuidado maternal. Es probable que parte de estos nuevos colores indicados formen parte del proceso gradual de cambio hasta un anaranjado plano. Por otro lado, estos datos apoyan la hipótesis de Faúndez & Osorio (2010), de que esta especie en latitudes más septentrionales probablemente presenta los cambios de coloración en distintas fechas.

Planta-huésped

Pietrantuono *et al*., (2014) mencionan las preferencias de planta-huésped de *S. perpunctata* en *Nothofagus antarctica* (G. Forster) (Ørsted) y *Nothofagus obliqua* (Mirb*)* Ørsted como primordiales huéspedes, mientras que su preferencia es de *Nothofagus nervosa* (Phil.) Dim. et Mil en un segundo lugar; estos autores omitieron el trabajo de Faúndez (2007a); quien indica que esta especie está ampliamente asociada a *Nothofagus*, pero que en ocasiones presenta preferencia por algunas especies, como por ejemplo *N. antarctica*. En tanto Carvajal & Faúndez (2013) mencionan que además esta especie puede utilizar plantas aledañas a los *Nothofagus* como lugares de reposo. En los dos viajes de campaña (enero de los años 2013 y 2014) realizados por los autores se hallaron ninfas (Fig. 1B) y adultos sobre la caña llamada vulgarmente "caña de colihue" (Fig. 2) (Poaceae: Bambusoideae: complejo *Chusquea culeou;* en sus alrededores se encontraban árboles de *Nothofagus dombeyi* Mirbel (Ørsted)) (Nothofagaceae).

Comentario: Se cita por primera vez la asociación de *S. perpunctatus* con una especie del complejo de *Chusquea culeou*, lo que refuerza el comportamiento indicado por Carvajal & Faúndez (2013).

Distribución

La distribución conocida es del sur de Argentina y Chile. En Argentina fue registrada para las provincias de Chubut, Río Negro, Santa Cruz, y Tierra del Fuego (Pennington, 1920); Kormilev (1958) cita Santa Cruz: Lago Argentino. Martinez *et al*., (2003) para Neuquén: y Bosq (1937): San Martín de los Andes (40°8'44" S, 71°20'30" W). En Chile se distribuye desde Las Trancas (36°54' S, 71°29' W), Región del Bío Bío hasta la Isla Bertrand (55°14' S, 67°56' W), Región de Magallanes (Faúndez 2007b). Posteriormente fue citada para la Región del Maule: (35°30'S, 71°10'W), siendo la localidad de Vilches Alto la más septentrional conocida hasta el momento (Osorio 2009). Si bien estas provincias abarcan diferentes tipos de ambientes, *S. perpuntactus* se encuentra fuertemente asociada con *Nothofagus* (Osorio 2009; Faúndez 2007a, b; Carvajal & Faúndez 2013; Pietrantuono *et al*., 2014). Es por esto que consideramos que la distribución de esta especie está comprendida en la Región Andina, Subregión Patagónica (Provincia de Patagonia Subandina) y Subregión Subantártica (Provincias de Bosque Magallánico y Maule) (Morrone 2006).

Material examinado: Argentina: Neuquén: 8♂ 6♀ 4 ninfas, Lanin Parque Nacional Lanín, Las Coloradas (39°45,340' S; 71°23,085' W), 24/02/2013, Coscarón M., Diez F., Pall J.L. y Quirán M. E. coll.

Los días de recolección fueron soleados tanto al mediodía como a la tarde con una temperatura de 23 °C, a la altura de 951 m. No fueron atraídos por la trampa de luz.

Observaciones: Estas citas distribucionales representan nuevos registros para la provincia de Neuquén (Argentina). Más colectas aumentarán notoriamente la lista de sus localidades conocidas.

Agradecimientos

Esta investigación fue financiada por el Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Agencia Nacional de Promoción Científica y Tecnológica de Argentina y la Universidad Nacional de La Pampa (UNLPam), Facultad de Ciencias Exactas y Naturales.

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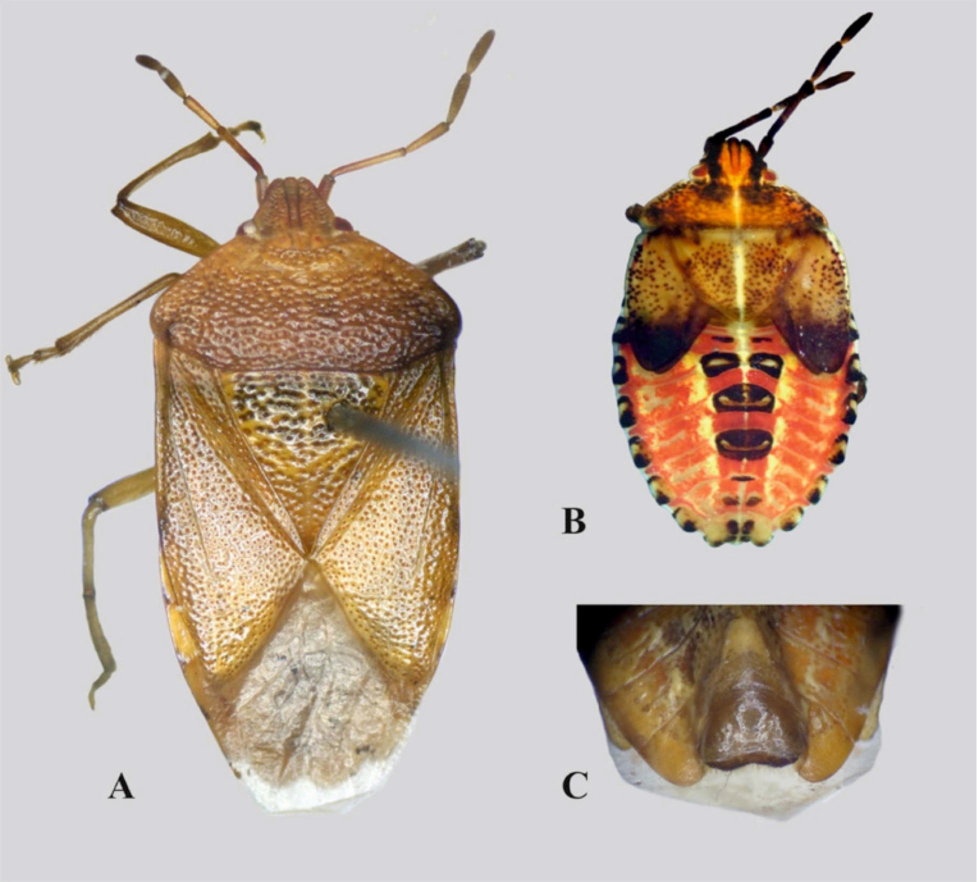

Fig. 1: *S. perpunctatus*. (A) adulto hembra, vista dorsal. (B) quinto estadío ninfal, vista dorsal. (C) genitalia masculina, vista dorsal.

Fig. 1: *S. perpunctatus*. (A) female adult, dorsal view. (B) fifth nymphal stage, dorsal view. (C) male genitalia, dorsal view.

Fig. 2: *Chusquea culeou*, sitio de captura.

Fig. 2: *Chusquea culeou*, site of capture.

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BIODIVERSITY AND NATURAL HISTORY

Research Article

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Revalidation of *Ditomotarsus hyadesi* Signoret, 1885 stat. rest. (Hemiptera: Heteroptera: Acanthosomatidae) with notes on its Natural History

Revalidación de *Ditomotarsus hyadesi* Signoret, 1885 stat. rest. (Hemiptera: Heteroptera: Acanthosomatidae), con notas acerca de su historia natural

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Abstract

Ditomotarsus hyadesi Signoret, 1885 is revalidated. An historical analysis of the references belonging to this species is provided. *Ditomotarsus gayi virens* Jensen-Haarup, 1931 is proposed as new junior synonym of *Ditomotarsus hyadesi*. New data is provided on the biology of *D. hyadesi*. First observations on oviposition process are delivered and discussed. New data on sexual behavior is recorded and discussed. Ontogenic coloration changes for this species are for first time recorded, becoming the first in the Ditomotarsinae. The distribution and life history of the species are summarized.

Keywords: Acanthosomatidae, Heteroptera, *Ditomotarsus hyadesi* Signoret, 1885, revalidation, biology.

Resumen

Ditomotarsus hyadesi Signoret, 1885 es revalidada y se provee un análisis histórico de las referencias bibliográficas correspondientes a esta especie. Se entrega nueva información acerca de la biología de *D. hyadesi*. Se entregan y discuten las primeras observaciones acerca de la oviposición en esta especie; además de nuevos datos acerca de su comportamiento sexual. Se registran también por primera vez para esta especie cambios de coloración ontogénicos, los que serían también los primeros registrados en la subfamilia Ditomotarsinae. Finalmente se analiza y discute la distribución e historia natural de la especie.

Palabras clave: Heteroptera, Acanthosomatidae, *Ditomotarsus hyadesi* Signoret, 1885, revalidación, biología**.**

INTRODUCTION

Acanthosomatidae is a Pentatomoid (Hemiptera: Heteroptera) family commonly named "shield bugs" that include around 230 species in 57 genera (Faúndez, 2014; Faúndez *et al*., 2014). Acanthosomatid species can be differentiated from other Pentatomoids by having only two tarsal segments and by the presence of Pendergrast's organs in females of most of its genera. In South America, the biology and/or immature stages of the Acanthosomatidae are poorly known (Faúndez, 2009; Carvajal & Faúndez, 2013). From a total of 30 species in this area, only three, *Sinopla perpunctatus* Signoret, 1864, *Phorbanta variabilis* Stal, 1852 and *Cylindrocnema plana* Mayr, 1864 have several immature stages described (Schlatter, 1976; Martinez *et al*., 2004, Carvajal, 2014); and just one species, *S. perpunctatus* was studied in detail (i.e. biology and reproductive behavior) (Faúndez & Osorio, 2010).

Ditomotarsus Spinola, 1852 is a monotypic Acanthosomatid genus widely dispersed in Southern South America (Chile and Argentina). *Ditomotarsus punctiventris* Spinola, 1852, has a large and complex nomenclatorial and taxonomic story, probably due to labelling mistakes in the work in which it was described (see Faúndez & Carvajal, 2010; Faúndez, 2007a). The purpose of this work is to revalidate one species of *Ditomotarsus* and add new data about its biology.

MATERIALS AND METHODS

From 2008 to 2011, specimens of *D. hyadesi* were collected in Punta Arenas city, Magallanes Region (53°55' S; 70°53' W), Chile, in Botanic Garden Carl Skottsberg, Instituto de la Patagonia.

The collected specimens were maintained in wooden boxes and glass bottles, there their development was followed. The boxes measured (15x20x10 cm), with glass in the upper surface, glass bottles and in plastic transparent boxes were tubular with a capacity of 500 ml. The breedings were maintained at environment temperature and photoperiod. Several plant species (including the whole plant; but mainly the fruits) from the families Nothofagaceae (*Nothofagus antarctica*), Rosaceae (*Malus domestica*), Salicaceae (*Salix* sp.), Poaceae, Saxifragaceae (*Ribes magellanicum*, *Ribes rubrum*, *Ribes grossulariae*),

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Poligonaceae (*Rumex acetosa*), and Asteraceae (*Chiliotrichum diffusum*) were introduced inside the boxes for the insects feeding. Breedings were cleaned once a week using a humid paper towel.

Fifteen specimens were followed from egg to adult, 7 females and 6 males were used to make observations on the sexual habits, same females were observed for oviposition process, 3 females and 1 male were used in mating and oviposition experiment, and 200 were deposited in the author's collections in different stages of development. About 150 specimens have been observed in the field and returned lately.

The process was followed from mating time, during obtaining the eggs, nymphs and adults, to the hibernation, and posterior return in the spring.

In morphology for developmental stages, we follow Costa *et al*., (2003). For the ovipositon process and breeding we follow Cobben (1968) and Kudo (2006).

RESULTS

Taxonomy:

Ditomotarsus hyadesi Signoret, 1885 stat. rest.

= *Ditomotarsus gayi virens* Jensen-Haarup, 1931 n.syn.

Ditomotarsus hyadesi: Signoret ,1885 - (Description)

Ditomotarsus hyadesi: Lethierry & Severin, 1893 - (Checklist)

Ditomotarsus gayi: Breddin, 1897 - (Description and distribution records)

Ditomotarsus hyadesi: Reed, 1898 - (Description)

Ditomotarsus hyadesi: Enderlein, 1912 - (Distribution)

Ditomotarsus gayi: China, 1963 - (Host and distribution records)

Ditomotarsus punctiventris: Faúndez, 2007a - (Distribution)

Ditomotarsus punctiventris: Faúndez, 2007b - (Biology and hosts)

Ditomotarsus punctiventris: Faúndez *et al*., 2009 - (Sexual habits)

Ditomotarsus punctiventris: Faúndez & Carvajal, 2011 - (Teratology)

This species was described from Magallanes Region in Chile by Signoret. This taxon was placed as tentatively junior synonym of *Ditomotarsus punctiventris* Spinola, 1852 by Breedin (1897). Authors followed this synonymy without examine the species in detail.

Actually with the study of material including the syntypes of *D. punctiventris* and *D. hyadesi* shows that both taxa are not conspecific. The major differences are in the posterior end of pygophore of males. This structure has a small and very truncate process in the middle in *D. hyadesi* (Fig. 4); whereas it is more wide and rounded in *D. punctiventris* (Fig. 5). The male parameres have a distal lobe wide and truncated in *D. punctiventris* (Fig. 2) whereas the distal lobe is more slender, and rectangular in *D. hyadesi* (Fig. 3). The female genitalia it is not useful for separating both species. Additionally *D. punctiventris* is not present in Magallanes Region of Chile and Tierra del Fuego (Chile and Argentina; whereas *D. hyadesi* is restricted to those

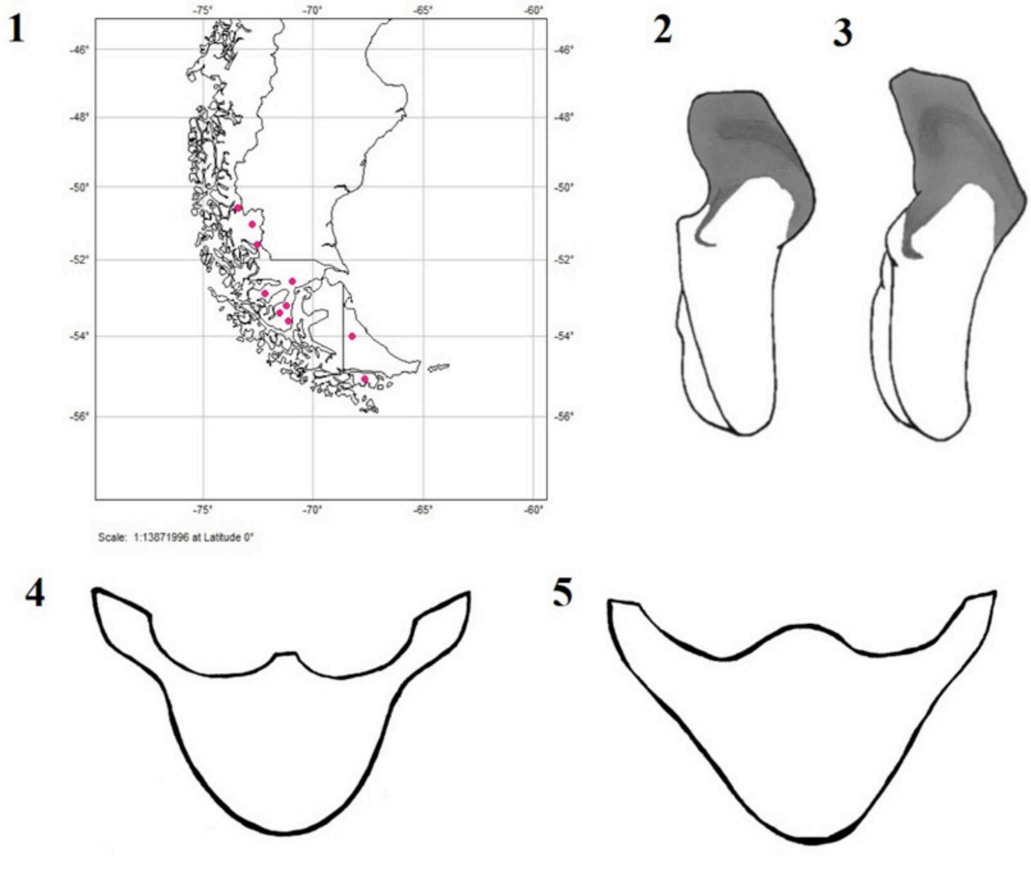


Fig. 1: *Ditomotarsus hydesi* Signoret, 1885 distribution; Figs. 2, 5: *Ditomotarsus punctiventris* Spinola, 1852: 2. Paramere 5. pygophore ventral view; Figs. 3, 4: *D. hyadesi*: 3. paramere, 4.pygophore ventral view.

Fig. 1: *Ditomotarsus hyde*si Signoret, 1885, distribución; Figs. 2, 5: *Ditomotarsus punctiventris* Spinola, 1852: 2. Parámero 5. pigóforo en vista ventral; Figs. 3, 4: *D. hyadesi*: 3. parámero, 4. pigóforo en vista ventral.

localities (Fig. 1). Therefore we propose the revalidation of *D. hyadesi*.

The subspecies *Ditomotarsus gayi virens* Jensen-Haarup, 1930 is currently listed as junior synonym of *D. punctiventris*; however this taxon correspond to the green morph of *D. hyadesi*. Thus *D. gayi virens* is removed from the synonymy of *D. punctiventris* and placed as a junior synonym of *D. hyadesi*.

Observations on the Biology of *D. hyadesi*:

Mating: In nature, females were observed choosing the place and time for the copulation process. When an aggregation of specimens was present, females were usually not receptive to the intend of males for mating; however, when they were receptive they did not tend to choose one male, instead, they mate more than one male in short periods of time because males tend to aggregate close to the female and fight for her mate. There was one case in which a female mate one male which died while copulating with the female (the couple was catch in coupling) and stayed connected to it for about 4 days. The female was still alive and dragged the male all around the plastic box for the all 4 days; after this period, the female left the male and lived for about a two weeks and then died. The time of each copulation varied from about 15 minutes to 2 or 3 hours. While male and female are copulating, males stand below females and the pygophore rotates 180 degrees as shown in Faúndez (2007b); the patches of hair present on the pygophore match and connect with the pilosity of the Pendergrast's organs of the females, which walk around dragging the male to walk backwards.

During copulation process in laboratory, females were observed choosing the time and place for mating the only male they had contact with. Females tend to choose the higher part of the breeding boxes for copulating, where usually there was a piece of wood and the amount of light was higher (Fig. 10). Once they were copulating for a while, they tend to move to the bottom section of their box to feed preferently on apples. The time of each copulation was different from what we observed in nature varying from about 6 minutes in intermittent mates to about 4 hours (see Table 1). Intermittent mating was not able to be recorded, but consist in very short time copulations that vary from 2 to 10 minutes with an interval of about 3 minutes between each mate, in total about 15. Finally, shortly after mating, males tend to die in about 2 to 5 days, and females proceed with oviposition of the eggs.

Eggs and oviposition: Females laid eggs soon after mating, in the lower surface of the piece of wood inside the boxes, in a piece of paper or even in the plastic surface of the breeding boxes (Fig. 11), or in a leaf of any plant from the families that mentioned above in nature (there is no preference for plants), but usually in the lower surface or in a hidden place difficult to find. When females were at the point of ovipositing in the surface they choose, they started by moving their hind legs against its lower abdomen, close to the Penderdrast's organs. After a minute or 2 of massaging the abdomen the oviduct opened and the eggs started to emerge from the female. Once the egg it was attached to the surface, the female started accommodating it with its hind leg by giving little touches to it and adding a substance from its Pendergrast's organ with its hind leg too (Fig. 11). The lapsus between the appearances of each egg varied from 5 to 14 minutes, and the total time of the oviposition recorded was of about 1 and a half hour. According to our observations one female can lay approximately 3 batches of eggs, in each batch the number of eggs can vary from 5 to 14 eggs (see Table 2). Females laid their batches of eggs in different places, even when they were in a breeding box; there was not any pattern concerning the shape of the batches, we observed linear, grouped, or rounded ways in which the female laid the eggs (Figs. 12, 15). About a week from the date in which the eggs were laid, they begin to mature, and were close to the date of hatch; in this period the eggs turned darker and less wide.

TABLE 1

Mating Times: M= male; F= female; N/A= Not Available.

Tiempos de apareamiento: M= macho; F= hembra; N/A= sin información.

Mates	Couple number	Duration (hours:minutes)
M1xF1	1	2:57
	2	N/A
	3	1:16
	4	1:35
	5	N/A
	6	N/A
	7	0:19
	8	N/A
	9	2:30
	10	N/A
	11	1:50
	12	2:20
	13	0:45
	14	4:10
	15	2:40
	16	1:00
M2xF2	1	4:15
M3xF3	1	N/A
	2	N/A
	3	1:32
	4	1:40
	5	1:35
	6	1:00
	7	N/A
	8	2:02
	9	N/A
	10	1:45
	11	N/A
	12	N/A
	13	N/A
	14	2:24
M3xF4	1	2:00
	2	N/A
	3	1:13
	4	2:17
	5	N/A
	6	N/A
M4xF4	1	N/A
	2	N/A
	3	1:29
	4	N/A
	5	N/A
M5xF5	1	2:38
M6xF6	1	N/A
M6xF7	N/A	

TABLE 2

Oviposition process data and egg characteristics.

Información para el proceso de ovoposición y características del huevo.

Female and oviposture numbers	Eggs number	Measure and/or shape of the clutch	Weight of the clutch	Time from oviposition to hatch	Colour
Female 1					
Batch 1	6	All together	0.06 mg	Unviable eggs	Green
Female 2 - No Eggs					
Female 3					
Batch 1	6	0.6 mm. - in line	0.1 mg	8 days	Green
Batch 2	5	In line		8 days	Green
Batch 3	14	4. 5 x 4 mm	0.4 mg	9 days	Green
Female 4					
Batch 1	14	Without form		7 days	Gold
Batch 2	14	All together		7 days	Gold
Batch 3	11	All together		8 days	Gold
Female 5					
Batch 1	14	All together		7 days	Light blue-green
Female 6					
Batch 1	14	All together		Unviable eggs	Reddish gold
Female 7					
Batch 1	14	Without form		7 days	Gold

Eggs of *D. hyadesi* could have different colours. In our breeding, for example, we observed green, light blue, gold and reddish eggs (Figs. 12, 15); while in the nature we found same colours besides pink, brown, orange or bluish eggs (Figs. 6-9). One female can only lay eggs of one color during her lifetime; eggs themselves do not change color. Collecting the eggs it was a difficult work because they jump with the contact of the paint brush. Maternal or paternal care was not observed in any stage of the life cycle.

The Experiments:

In an intend of explaining the coloration change in the eggs of *D. hyadesi*, the following experiments were designed:

1- At a temperature of 20C, 2 females of *D. hyadesi* were raised in separate wooden boxes covered by glass, we will call each female FA and FB. The females were feed with *Nothofagus antarctica* (Mirb) Oerst leaves and fruits, and at an environment photoperiod. After the females were collected, they were put in quarantine for 36 hours before the experiment started.

Once the females were ready, one male, called MA, was introduce in each of the boxes and let it there until mating was successful, obtaining the following eggs coloration:

MAxFA = gold eggs MAxFB= light blue eggs

2- At the same environmental conditions mentioned above, a third female, called FC, was raised and mate with 2 males called MB and MC, obtaining the following eggs coloration:

MBxFC = green eggs

MCxFC= green eggs

Nymphs: (see Table 3)

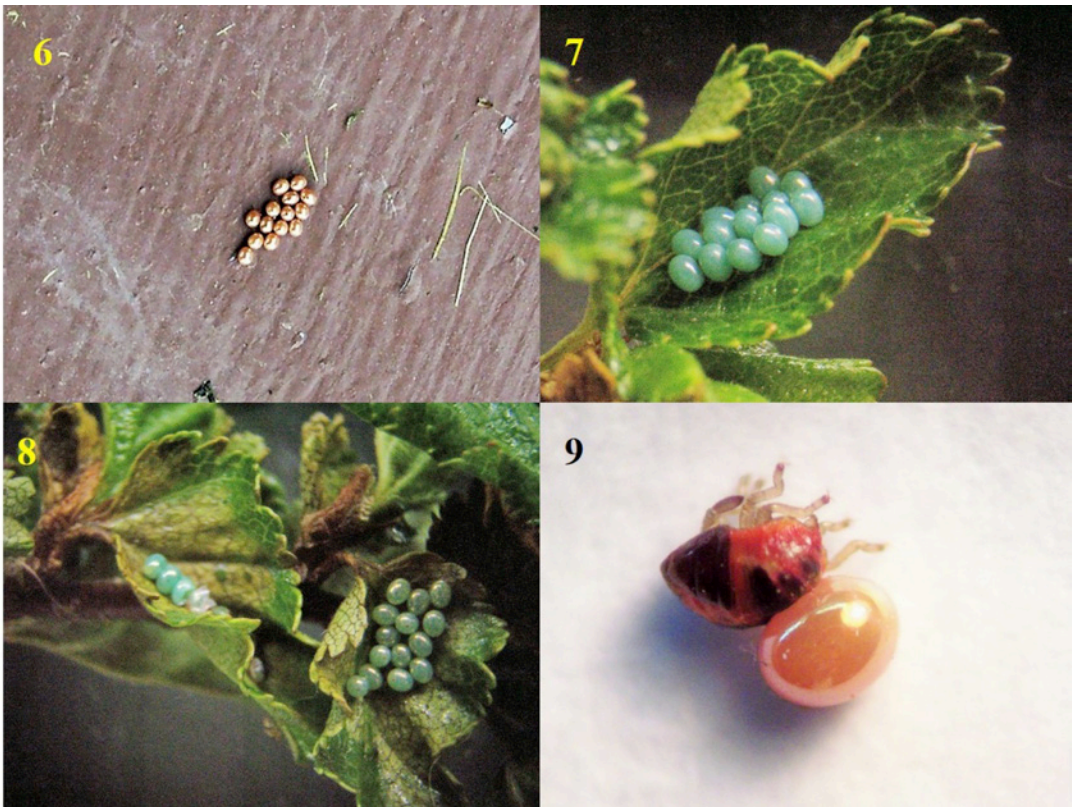
Usually after a week from the appearance of the eggs, which were darker and less wide than in the beginning, nymphs started to hatch. Nymphs emerged from the eggs leaving the exterior of the chorion, which was transparent (Figs. 9, 17). The just emerged nymphs, with a total length of less than a millimetre, were whitish during the first two hours and then light pink to finally turn dark orange after about 10 to 20 hours more. The level of activity of the immatures during the first couple hours it was low; they did not move more than 2 centimetres away in that period of time and no more than 10 centimetres during the first day. In the second day nymphs tended to be more active, walking around their breeding boxes and starting to eat, although nymphs from the same batch of eggs seemed to keep themselves together or very close during the first days (Fig. 16). Different kind of plants were available as food for the immature (Fig.13); however, they presented a preference for feeding on apples or any similar juicy fruit (Fig. 14). Nymphs feeding time could vary from about 10 minutes to 2 hours. Moulting from first instar to second instar nymphs occurred soon from their hatch date, the individuals started by positioning in a high place of the breeding box, turned darker and stayed in the same position for about 5 hours, after that period of time we were able to observe the formation of the exuvia and the darkening of it; finally after about 18 hours the new nymph emerged again. The time

TABLE 3

First Instar nymphs life time.

Ninfas de primer instar.

Female and Oviposture Numbers	Time from hatch to first molt
Female 1 - Unavailable Eggs	
Batch 1	
Female 2 - No Eggs	
Female 3	
Batch 1	6 days
Batch 2	6 days
Batch 3	5 days
Female 4	
Batch 1	5 days
Batch 2	3 days
Batch 3	3 days
Female 5	
Batch 1	4 days approx.
Female 6	
Batch 1	
Female 7	
Batch 1	7 days



Figs. 6-9: *Ditomotarsus hydesi* Signoret, 1885; Fig. 6: Gold eggs on a rain channel on the grass; Figs. 7-8: Blue greenish eggs on *Nothofagus antarctica* leaf; Fig. 9: Nymph emerging from its egg.

Figs. 6-9: *Ditomotarsus hydesi* Signoret, 1885; Fig. 6: Huevos dorados en una canaleta metálica sobre el pasto; Figs. 7-8: Huevos verde azulado en *Nothofagus antarctica* leaf; Fig. 9: Ninfa emergiendo desde un huevo.

between each moult was increasing progressively as more instars passed by.

Adult observations: During fall the first adults emerge. These adults had brown dorsal coloration, and no mating was observed. Once the winter arrived, they tend to hide in the soil and have a diapause process. Once spring was back, the specimens that came back from the soil had still brown coloration; however, they change its colour to bright green gradually in about one month. The coloration change was observed first in the scutellum, then the pronotum and finally in the hemelytra, the ventral coloration was always reddish (Plate IV).

Adults feed on several plants, in the field in which we collected them they used to be on Nothofagaceae, Saxifragracea, Asteracea and Polygonacea; however any plant that we put in our breeding boxes was successful as food source for the specimens.

DISCUSSION

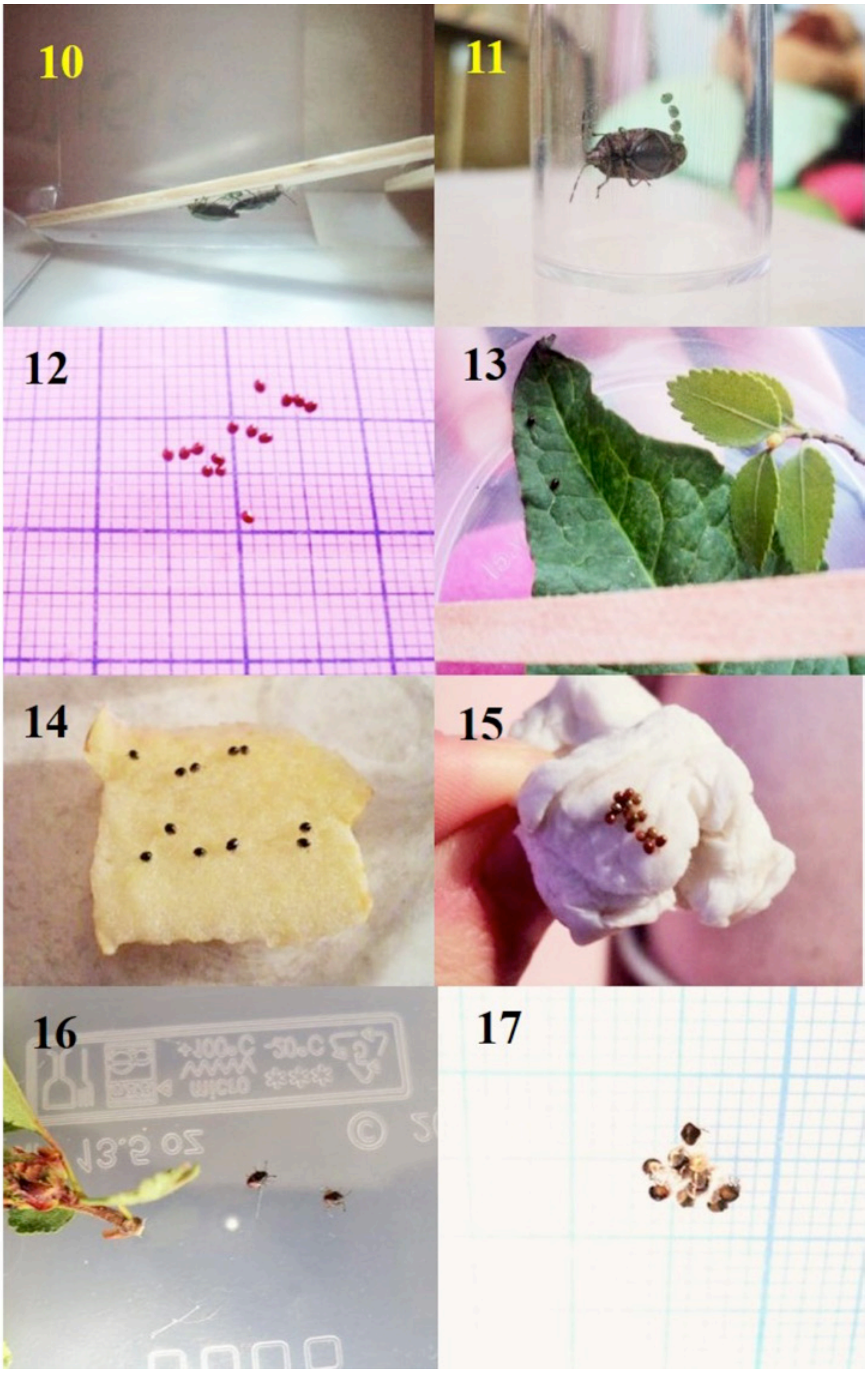
The life cycle of *D. hyadesi* can be summarized by the following events (see plates IV and V for detailed information): during the spring adults mate, males die soon after mating and females lay eggs; in the spring and summer eggs hatch and nymphs develop; in the fall first adults emerge with brown coloration; nymphs and first emerged adults of the season have a diapause process; finally all the specimens finish they diapause process in the spring and nymphs from the anterior season emerge as brown adults that turn to green coloration in about a month and the cycle starts again.

Mating of acanthosomatids has been scarcely recorded, especially for the Ditomotarsinae. In South America the known data about mating in Acanthosomatidae has been reported by Faúndez & Osorio (2010), corresponding to *Sinopla perpunctatus* Signoret, 1864 (Blaudusinae) and Faúndez (2007) and Faúndez *et al*. (2009) corresponding to data on the sexual habits of *D. hyadesi.* The new data presented here expand our knowledge of the mating process on *D. hyadesi*, expanding its possible copulation time up to 4 hours. The amount of couples observed helped us to understand the dynamics of mating on this species. It seems like females are mechanically impossibilited to get out a male when it is in copulation position (e.g. above female). However, we believe that females are selective in the way that this sex is which decide how many longer the couple is. Therefore females control with what male they will produce the offspring.

In contrast of most acanthosomatids for which parental care is known (see Faúndez & Osorio 2010), *D. hyadesi* does not present this behaviour. Instead of laying a large batch of 40 to 60 eggs and take care of it, females of *D. hyadesi* lay small batches of about 14 eggs in 3 different times and places; these places are usually underneath leaves of different plant or in the ground. The egg smearing behaviour in Acanthosomatidae observed when females laid their eggs and covered them by a setose substance that they took from their Pendergrast's organs has been explained by Tsai *et al*. (2014). According to our experiment, the variation in the coloration of the eggs could not be explained by environmental factors or the mates of the females.

Coloration changes, in adults and eggs could be due to a kind of camouflage like in other acanthosomatids (Faúndez & Osorio, 2010). The variant colours of eggs help to camouflage them in different places of ovipositon (as we observed, this species oviposits in many different places like wood, leaves, grasses). On the other hand, adults are green when leaves of trees are green, and are brown when trees leaves are darker, and next to falling down in autumn. Coloration changes in this family have been described for *S. perpunctatus*, in which also it is used for camouflage, and are controlled possibly by photoperiod and temperature (Faúndez & Osorio, 2010).

The general phytophagy of this species has been reported by Faúndez (2007b). This in addition to the big aggregations observed, show the potential economic risk in



Figs. 10-17: *Ditomotarsus hydesi* Signoret, 1885 from breeding boxes; Fig. 10: Mating; Fig. 11: Female ovipositing its egg batch in half moon shape; Fig. 12: Golden egg batch; Fig.13: 1st instar nymphs on *Rumex acetosa*; Fig. 14: First instar nymphs on a piece of apple; Fig. 15: Brownish egg batch; Fig. 16: 2nd instar nymphs on breeding box; Fig. 17: Nymphs emerging from the egg.

Figs. 10-17: *Ditomotarsus hydesi* Signoret, 1885 en cajas de crianza. Fig. 10: Cópula; Fig. 11: Hembra ovipositando en forma de media luna. Fig. 12: Masa de huevos dorados; Fig. 13: ninfa de primer instar en *Rumex acetosa*; Fig. 14: Ninfas de primer instar en un trozo de manzana; Fig. 15: Masa de huevos color pardo; Fig. 16. Ninfas de segundo instar en caja de crianza; Fig. 17: Ninfas emergiendo del huevo.

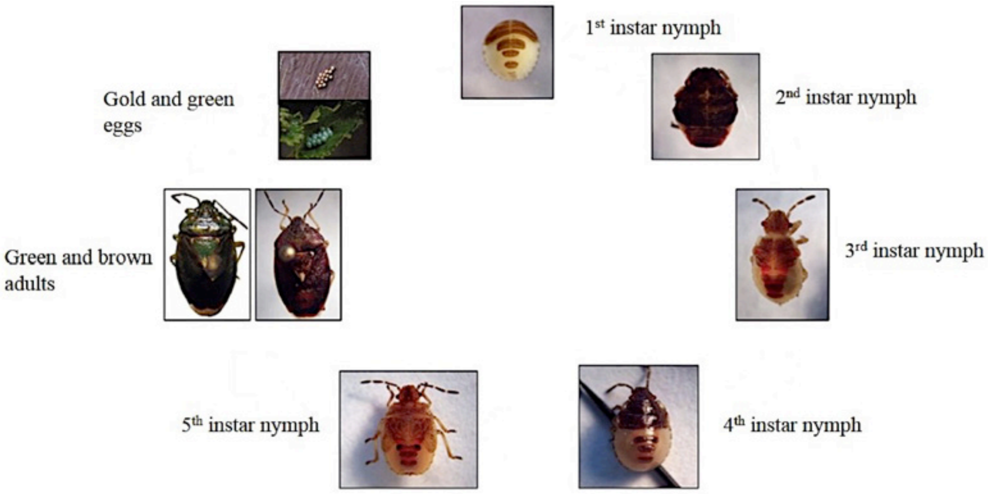


Fig. 18: *Ditomotarsus hydesi* Signoret, 1885 life cycle illustration.

Fig. 18: Diagrama del ciclo de vida de *Ditomotarsus hydesi* Signoret, 1885.

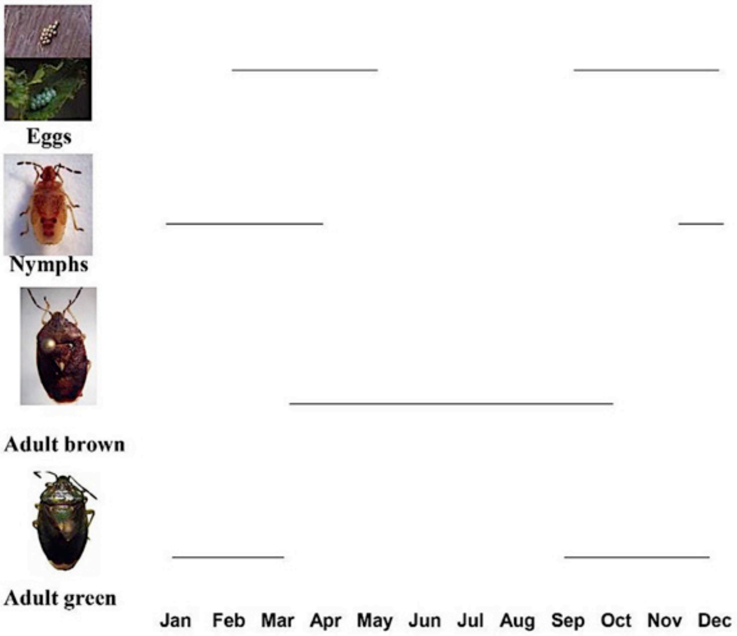


Fig.19: *Ditomotarsus hydesi* Signoret, 1885, life histoy scheme.

Fig.19: Esquema de la historia de vida de *Ditomotarsus hydesi* Signoret, 1885.

regards *D. hyadesi*. In Magallanes, this species attack fruits of exportation shrubs (e.g. Magellan Barberry and Red Currant), and forestry interest species (*Nothofagus* spp.) Therefore the knowledge of oviposition and morphology of eggs and nymphs is very important for their detection before the insects cause economic damage.

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This work is dedicated to the memory of Carl W. Schaefer

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Research Article

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Bioecological traits, abundance patterns and distribution extension of the soldierless Neotropical termite *Compositermes vindai* Scheffrahn, 2013 (Isoptera: Termitidae: Apicotermitinae)

Patrones de abundancia, bioecología y distribución de la termita neotropical sin soldados *Compositermes vindai* Scheffrahn, 2013 (Isoptera, Termitidae, Apicotermitinae)

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Abstract

The soldierless Neotropical Apicotermitinae is considered among the less known termite groups and its ecological relevance warrants studies about the biology and diversity of their species. We investigated the presence, distribution and relative abundance of the recently described species *Compositermes vindai* Scheffrahn, 2013 in natural and anthropized ecosystems of northeastern Argentina. Their nests and populations, as well as their presence inside other Termitidae mounds were examined. A standardized sampling protocol for termites was applied at five sites, with 100 x 2 m transects. Worker morphometric data from the surveyed localities are also reported. *C. vindai* was found in protected environments with little disturbance as well as in other altered ecosystems. The abundance patterns of *C. vindai* in the sampled areas varied from rare to intermediate and seemed not to be significantly affected by the environmental changes of the sites due to their land uses. The microhabitats occupied were mainly superficial soil and other Termitidae mounds (*Cornitermes cumulans* Kollar, 1832; *Syntermes obtusus* Holmgren, 1911 and *Cortaritermes fulviceps* Silvestri, 1901). *C. vindai* subterranean and diffuse nests showed a core surrounding by scattered chambers and tunnels extending into the surrounding soil. The small size colonies comprised workers, brachypterous nymphs and white immature larvae. Winged imagoes or primary reproductives were not found. These new records also extend the distribution of *C. vindai* across the biomes and ecoregions of the Neotropical ecozone and constitute the first reports of *C. vindai* from Argentina.

Key words: *Anoplotermes* group, South America, humivorous termites.

Resumen

Las termitas Neotropicales sin soldados de la subfamilia Apicotermitinae, son consideradas uno de los grupos de isópteros menos conocidos, por lo que resulta importante analizar sus rasgos biológicos y diversidad. Se investigó la presencia, distribución y abundancia relativa de la especie recientemente descripta *Compositermes vindai* Scheffrahn, 2013 en ecosistemas naturales y antropizados del noreste de Argentina. Se examinaron sus nidos y poblaciones, así como su presencia en los montículos de otras termitas. Se aplicó un protocolo estandarizado de muestreo para isópteros en cinco sitios, con transectas de 100 x 2 m. También se registraron datos morfométricos de obreras. *C. vindai* fue detectada en ambientes protegidos poco perturbados, así como en otros ecosistemas alterados. Los patrones de abundancia de *C. vindai* en estas áreas variaron de rara a intermedia y la especie pareció no ser afectada de manera significativa por los cambios ambientales derivados de diferentes usos de la tierra. Los microhábitats ocupados fueron principalmente suelo superficial y montículos de otras Termitidae (*Cornitermes cumulans* Kollar, 1832; *Syntermes obtusus* Holmgren, 1911 y *Cortaritermes fulviceps* Silvestri, 1901). Los nidos subterráneos y difusos de *C. vindai* mostraron un núcleo rodeado por cámaras dispersas y túneles que se extendían en el suelo circundante. Las pequeñas colonias estuvieron compuestas por obreras, ninfas braquípteras e inmaduros. No se hallaron individuos alados ni reproductores primarios. Estos nuevos registros extienden la distribución de *C. vindai* a otros biomas y ecorregiones de la ecozona Neotropical y constituyen los primeros hallazgos de *C. vindai* para Argentina.

Palabras clave: grupo *Anoplotermes*, Sudamérica, termitas humívoras.

INTRODUCTION

The recently described genus *Compositermes* Scheffrahn, 2013 belongs to the *Anoplotermes* group of the subfamily

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Apicotermitinae. This genus includes seven soldierless Neotropical termite genera, mostly humivorous except for *Ruptitermes* Mathews (Scheffrahn, 2013). The group remains poorly known in the region (Mathews, 1977; Fontes, 1986, 1992; Kambhampati & Eggleton, 2000) although in recent decades several studies started to show its true diversity, abundance and ecological significance (Constantino, 1998; Torales *et al*., 1997, 2005, 2008; Davies, 2002; Roisin & Leponce, 2004; Roisin *et al*., 2006; Scheffrahn *et al*., 2006; Acioli, 2007; Carrijo *et al*., 2009; Bourguignon *et al*., 2009, 2010, 2011 a, b, 2013; Lopes & Ruvolo- Takasusuki, 2010; Šobotník *et al*., 2010; Oliveira *et al*., 2013; Scheffrahn, 2013).

One of the main aspects that helped to elucidate the diversity of soldierless Apicotermitinae was the recognition of the value of worker gut characters, for genera and species definition; mainly when winged imagoes are unknown (Grasse & Noirot, 1954; Sands, 1972, 1998; Fontes, 1992; Godoy & Torales, 1999; Donovan, 2002; Bourguignon *et al*., 2010, 2013). This is the case of *Compositermes,* where the characters allowing its recognition refer mainly to organs of the worker digestive tract, such as the enlarged enteric valve seating with a crown of sclerotized structures and the enteric valve cushions (Scheffrahn, 2013).

Little is known about the bioecological aspects of subterranean Neotropical Apicotermitinae. Among these the distribution and abundance in natural and altered ecosystems, the size and composition of the colonies, their nesting habits and their relationships with other termites are the most scarcely studied. Although it is estimated that most of the Neotropical Apicotermitinae build subterranean nests, these structures have been reported or described only in a few studies (Mathews, 1977; Fontes, 1986). In addition, some of these species are frequently located inside the mounds of other Termitidae as secondary occupants or inquilines; but many of these relationships and their particular characteristics are barely known (Redford, 1984; Domingos & Gontijo, 1996; Costa *et al*., 2009, Florencio *et al*., 2013).

This contribution analyzes the presence, relative abundance and distribution of *C. vindai* in various subtropical habitats of northeastern Argentina. The microhabitats occupied by this species and the characteristics of their nests and populations, as well as the interspecific associations with other mound-building Termitidae were investigated. Worker morphometric data from the surveyed localities are also given.

MATERIAL AND METHODS

Study sites and termite sampling

Surveys were conducted in natural and anthropized ecosystems of northeastern Argentina (Corrientes province) (Table 1). The standardized protocol for termites proposed by Jones & Eggleton (2000) was applied at each site, consisting of 100 m long and 2 m wide transects, divided into 20 contiguous sections (each 5 x 2 m). The termites were collected at each section during 1 h/person in different microhabitats (fallen trunks and branches, mounds, arboreal nests, under cow dung, etc.). Twelve samples of surface soil (about 12 x 12 cm, to 10 cm depth) were excavated in each section. Five transects in total were run at the selected sites (Table 1).

The total number of termite encounters within the transects were counted and the abundance of *C. vindai* was estimated in the surveyed areas, defining their occurrence, dominance and abundance patterns according to the categories established by Florencio & Diehl (2006). To determine the occurrence pattern, the species are categorized as rare (R, present in 1-10 % of sections), sporadic (S, present in 11-40% of sections), common (C, present in 41-70% of sections), frequent (F, present in 71-99% of sections) and constant (CS, present in 100% of sections). The following formula was applied:

$$OP = \frac{\text{Number of sections were the species was found}}{\text{Total number of evaluated sections}} \times 100$$

For the dominance pattern, the species are classified as rare (R, 1-10% of encounters), accessory (A, 11-49% of encounters), dominant (D, 50-100% of encounters) according to the following formula:

$$DP = \frac{\text{Number of encounters of each species}}{\text{Total number of encounters}} \times 100$$

The combination of both patterns is used as an indicator of the abundance of each species, according to the following categories: common (C, species with CS and D patterns), intermediate (I, species with R, S, C or F and A; and species with S, C, F or CS and R) and rare (R, species with R in occurrence and dominance patterns).

TABLE 1

Sampling sites in the Corrientes province (Argentina). References: MNP: Mburucuya National Park, HC: Humid Chaco, SCMS (CM): Southern Cone Mesopotamian Savannas (Campos and Malezales).

Sitios relevados en la provincia de Corrientes (Argentina). Referencias: Parque Nacional Mburucuyá, HC: Chaco Húmedo, SCMS (CM): Savanas Mesopotámicas del Cono Sur (Campos y Malezales).

Locality (Department)	Georeferences	Ecoregion	Plant community	Transects	Date
Ita Paso (San Miguel)	27°43'00'' S 57°13'39'' W	HC	*A. lateralis* savanna (grazed)	T1	June 2005
Gobernador Virasoro (Santo Tomé)	28°04'01" S 56°03'26" W	SCMS (CM)	*A. compressus* and *Paspalum* sp. savanna (grazed)	T2	May 2013
MNP (Mburucuyá)	28°00'22" S 58°02'31" W	HC	*Ocotea acutifolia* hygrophilous forest islet	T3	July 2010
MNP (Mburucuyá)	28°01'24" S 58°03'07" W	HC	Savanna with *B. yatay* palm trees	T4, T5	March 2012

The subterranean nests detected at each site were measured and photographed. The characteristics of the chambers and galleries were recorded. Total populations inside the nests were collected, assorted by castes and counted. Nest measurements included height (H), width (W), and thickness (T). Their volume (V) was then estimated assuming that nests have an ellipsoidal shape using the formula:

$$V = \frac{\pi HWT}{6}$$

Identification and morphometrics

C. vindai samples collected from the surveys were fixed in FAA (formalin + alcohol + acetic acid). Other samples deposited at the Isoptera collection (FACENAC) of the Universidad Nacional del Nordeste (UNNE) were also studied. They came from six localities of the Corrientes province, Argentina (Table 2). Detailed analyses of the specimens were carried out under stereomicroscope and optical microscope, including external and gut morphology and morphometrics. The taxonomic identifications were made by comparisons with the original description of the species and references from relevant literature (Fontes, 1985, 1992; Constantino, 1999; Scheffrahn, 2013). Fifteen workers from five samples were examined and measured with an ocular micrometer attached to an Olympus SZH stereomicroscope. Six morphometric characters defined by Roonwal (1970) and Fontes (1992) were considered: total body length (TBL), maximum head width (MHW), maximum pronotum width (MPW), hind tibia length (HTL), fore tibia length (FTL), fore tibia maximum width (FTMW). The fore tibia length/width ratio (CTF/WR) was calculated. The number of antennae articles was also recorded. The distribution of *C. vindai* is discussed according to the scheme of Terrestrial Ecoregions of the World (Olson *et al.*, 2001).

RESULTS AND DISCUSSION

The presence of *C. vindai* was detected in several subtropical woody and herbaceous plants communities, with diverse alteration degrees by human action in northeastern Argentina, from the surveys reported in this study and the samples deposited at the FACENAC termite collection (Tables 1 and 2). Thus, *C. vindai* was found in protected environments with little disturbance such as islets of native hygrophilous forests (T3) and savannas with *Butia yatay* (Mart.) Becc. palms in reserve areas (T4 and T5), but the species was also present in other deeply altered ecosystems like *Pinus elliotii* Engelm. plantations and *Axonopus compressus* (Sw.) P. Beauv. (T2) and *Andropogon lateralis* Nees grasslands (T1) submitted to high grazing intensity. These are also the first records of *C. vindai* from Argentina.

The number of *C. vindai* encounters and the positive sections by transect at the sampled areas are showed in Table 3. Considering the five transects 13.71% of the

TABLE 2

FACENAC collection data of *C. vindai* in the Corrientes province (Argentina). References: HC: Humid Chaco, SCMS (CM): Southern Cone Mesopotamian Savannas (Campos and Malezales), SCMS (I): Southern Cone Mesopotamian Savannas (Ibera).

Datos de *C. vindai* en la provincia de Corrientes (Argentina) provenientes de la colección FACENAC . Referencias: HC: Chaco Húmedo, SCMS (CM): Savanas Mesopotámicas del Cono Sur (Campos y Malezales), SCMS (I): Savanas Mesopotámicas del Cono Sur (Iberá).

Collection number (date)	Locality (Department)	Georeferences	Ecoregion	Plant community	Microhabitat
0043 (2-VI-81)	Santa Ana (San Cosme)	27°27'16"S 58°39'12"W	HC	*Paspalum notatum* grassland	*C. fulviceps* nest
0322 (18-V-90)	El Carmen (Concepción)	28°08'02"S 57°55'53"W	SCMS (I)	*A. lateralis* savanna	*C. fulviceps* nest
0656 (18-III-93)	Villa Olivari (Ituzaingo)	27°35'56"S 53°52'25"W	SCMS (I)	*P. elliotii* plantation	Under fallen *P. elliotii* logs
0774 (5-V-94)	Campo Nalda (Mburucuyá)	28°08'25"S 58°25'53"W	HC	*A. lateralis* savanna	*C. cumulans* nest
0805 (4-VII-94)	San Carlos (Ituzaingo)	27°44'16"S 55°54'18"W	SCMS (CM)	*Elyonurus muticus* grasslands	*S. obtusus* nest
0986 (15-V-97)	MNP (Mburucuyá)	28°01'18"S 58°02'44"W	HC	*A. lateralis* savanna	Abandoned *C. cumulans* nest
1128 (21-X-93)	Campo Nalda (Mburucuyá)	28°08'25"S 58°25'53"W	HC	*A. lateralis* savanna	Under cow dung
1136 (24-XI-93)	Campo Nalda (Mburucuyá)	28°08'25"S 58°25'53"W	HC	*A. lateralis* savanna	Superficial soil
1270 (7-IV-94)	Campo Nalda (Mburucuya)	28°08'25"S 58°25'53"W	HC	*A. lateralis* savanna	*C. cumulans* nest

termite encounters corresponded to *C. vindai*. The occurrence, dominance and abundance patterns of *C. vindai* at the surveyed sites were variable although, overall *C. vindai* abundance was intermediate. Two places (T1 and T3) showed an intermediate abundance of the species while it was categorized as rare in the remaining locations. The abundance patterns observed at the sampled spots seem to indicate that *C. vindai*, together with other species of the *Anoplotermes* group, are widely distributed members of the termite assemblages in the region. Those patterns did not show clear relationships with the habitat disturbance degree of the sites due to their land uses. Therefore, intermediate abundance patterns were recorded from two points with different characteristics (T1 and T3). One of them (Ita Paso savanna, T1) was subjected to a marked intensity of cattle grazing. At that site, the natural herbaceous vegetation was largely consumed and the soil suffered continuous trampling and dung deposition. These activities produce environmental changes in the quantity and quality of biomass, biodiversity, nutrient cycling and soil structure, which can affect termite assemblages (Kurtz *et al*., 2010; Vasconcellos *et al*., 2010). Intermediate abundance was also recorded from the hygrophilous forest located within a protected area with little human influence (T3). Moreover, *C. vindai* was categorized as rare at the second grazing pasture (Gobernador Virasoro, T2) with similar characteristics to Ita Paso and at the scarcely disturbed *B. yatay* palm savannas (T4 and T5). The observed abundance patterns of *C. vindai* did not showed a clear influence of land use intensification in the analyzed sites and might suggest that the species would not be significantly affected by such environmental changes at those sites. In this regard, several studies in subtropical, semi -arid or arid ecosystems suggest that subterranean soil-feeding termites might show less sensitivity to anthropogenic disturbances in these environments, than the observed in tropical forests for this functional group (Bandeira, 1989; De Souza & Brown, 1994; Eggleton *et al*., 1995, 1996, 1997; Bignell & Eggleton, 2000; Bandeira & Vasconcellos, 2002; Bandeira *et al*., 2003; Davies *et al*., 2003; Jones *et al*., 2003; Florencio & Diehl, 2006; Donovan *et al*., 2007; Carrijo *et al*., 2009; Vasconcellos *et al*., 2010; Cunha & Orlando, 2011). However, it is noteworthy that this paper analyzed the relative abundance of a single species and not of all those of each feeding group, as in the aforementioned studies.

Fig. 1: Central core of *C. vindai* subterranean nest with workers, nymph and larvae inside the chambers.

Fig. 1: Núcleo central del nido subterráneo de *C. vindai* con obreras y larvas dentro de las cámaras.

Fig. 2: Cell of *C. vindai* nest partially coated by dark faecal material of workers.

Fig. 2: Celda del nido de *C. vindai*, parcialmente cubierta con material fecal de obreras.

C. vindai was detected at different microhabitats during the surveys. The most frequently occupied microhabitat was superficial soil between 0 and 10 cm depth, where individuals were located inside subterranean cells and chambers. In the grasslands, these galleries and subterranean cells were usually placed around the bases and roots of *A. lateralis* and *A. compressus* clumps. We also found *C. vindai* as inquiline inside *Cornitermes cumulans* (Kollar, 1832) epigeal nests (Table 2). The *C. vindai* colonies

TABLE 3

Total number of termite encounters during the surveys and encounters, positive sections and occurrence, dominance and abundance patterns of *C. vindai*.

Número total de encuentros de termitas durante los relevamientos y número de encuentros, secciones positivas y patrones de ocurrencia, dominancia y abundancia de *C. vindai*.

Transects	Termite encounters	*C. vindai* encounters	*C. vindai* positive sections	Occurrence patterns	Dominance patterns	Abundance patterns
1	54	11	11	Common	Accesory	Intermediate
T2	26	2	2	Rare	Rare	Rare
T3	26	8	8	Sporadic	Accesory	Intermediate
T4	39	2	2	Rare	Rare	Rare
T5	30	1	1	Rare	Rare	Rare
TOTAL	175	24 (13.71%)	24	Sporadic	Accesory	Intermediate

were located in some sectors of the *C. cumulans* nests, frequently at hypogeal or lateral areas of the mounds. In some cases, these nests had been abandoned by the builders and were occupied by *C. vindai* alone or with other Termitidae species. In Paraguay, *C. vindai* was also detected inside *Cornitermes* spp. nests (Scheffrahn, 2013). *C. vindai* was also discovered inside *Syntermes obtusus* Holmgren, 1911 and *Cortaritermes fulviceps* (Silvestri, 1901) nests (Table 2). On the other hand, *C. vindai* was not found inside *Termes saltans* (Wasmann) nests, another mound-building Termitidae located at the surveyed sites. Occasionally, *C. vindai* specimens were collected under fallen and partially degraded logs and branches, as well as below cattle dung (Table 2).

Three *C. vindai* hypogeal nests were detected at hygrophilous forest (two nests) and *B. yatay* palm savannas (one nest) of the Mburucuyá National Park (Argentina). The subterranean nests were of the diffuse type and consisted of networks of galleries and chambers whose center was located below the soil surface, at depths from 5 to 20 cm. Its internal structure showed a core or central region where the soil particles of the walls were consolidated and constituted a distinct zone from the surrounding soil, but friable. Inside these nearly ellipsoidal or ovoid central cores, several chambers and galleries accommodated groups of the colony members (Fig. 1). The inner surface of the cells was partially coated with a thin dark colored layer of workers faecal material that cemented the soil particles and plastered the cell walls (Figure 2). This material is composed of humic substances, digestive secretions and a large population of bacteria and has a defensive value because gives greater hardness to the nest structures (Noirot & Darlington, 2000). Those characteristics were similar to previous general descriptions of other subterranean Apicotermitinae nests that constitute also a defense mechanism as these termites react escaping while being attacked (Mathews, 1977; Noirot & Darlington, 2000; Acioli, 2007). The central blocks volumes of the nests varied between 0.183 and 0.330 l, but they constituted only part of the nest structures, connected to other less resistant outer cells and galleries that extend in the surrounding soil. With respect to the volume of Neotropical Apicotermitinae nests, we only found data for *Anoplotermes banksi* Emerson which builds arboreal nests (Martius & Ribeiro, 1996; Apolinario, 2000; Soki & Josens, 2010; Bourguignon *et al*., 2011 a; Pequeno *et al*., 2013). The volumes of the central cores of *C. vindai* nesting structures were lower than the mean value registered for the new *A. banksi* nests found annually in French Guiana, but close to the median of those volumes (Bourguignon *et al*., 2011a). According to the volumes calculated for *A. banksi* by Pequeno *et al*. (2013), eleven of the fifteen nests considered by these authors were similar to the *C. vindai* nests recorded in this study, with values lower than 0.2 l. However, since the precise limits of the subterranean nests are generally difficult to determine, it seemed likely that these central structures represent only a fragment of each nest (Lepage & Darlington, 2000). Despite the small number of reported nests, we consider the provided data as valuable because correspond to the first description of the *Compositermes* nests and the firsts records of Apicotermitinae nests from Argentina.

With regard to *C. vindai* populations, the total number of individuals housed in the central blocks of the subterranean nests (colony size) varied between 275 and 407 individuals (workers, brachypterous nymphs and white immature larvae). The workers were the most abundant individuals of these colonies, composing on average 75.13% of the recorded population. The nymphs and larvae were found at much lower percentages, with mean values of 5.32% and 19.55%, respectively. The larvae were always placed in neighboring cells of the central sector of each nest (Fig. 2). No alates, primary or replacement reproductives were found inside the nests. The estimations of colony size for soil-feeding termites are scarce and the previously known data relate mainly to species that build nests on trees or mounds like *A. banksi* in South America or those of the *Cubitermes* group in Africa (Martius & Ribeiro, 1996; Soki *et al*., 1996; Brauman *et al*., 2000). Among the subterranean species of the *Anoplotermes* group, the colonies of *Ruptitermes* are very small and consist of only a few tens of individuals, located either in the soil or as inquilines of other termite mounds (Acioli, 2007). According to our findings, *C. vindai* colonies were smaller if compared with *A. banski* populations that exceed 2,500 individuals per nest (Martius & Ribeiro, 1996) and were more similar in size to *Ruptitermes* colonies. Among soil-feeding species, only a few form large colonies with tens or hundreds of thousands individuals (Eggleton *et al*., 1995, 1997). In addition, the mounds of some soil-feeding termites apparently housed only about 10% of the colony members so population estimates may have deviations due to individuals that left the nest at the time of sampling or escape during the process (Eggleton *et al*., 1996). As a result, there are discrepancies in the estimated values even for the best studied species (Lepage & Darlington, 2000). Although the registered samples correspond to seven months and three seasons of the year, no winged imagoes were found. In order to find the still unknown *C. vindai* alates it is necessary to intensify the search mainly during the spring months (September to December) which are the swarming season for several Termitidae at this region (Coronel *et al*., 2001; Torales & Coronel, 2004; Torales *et al*., 1999, 2006; Annoni *et al*., 2013).

C. vindai workers (Figs. 3 and 4) were identified according to several distinctive characters that allow to differenciate this monospecific genus from other Neotropical Apicotermitinae. The most remarkable traits were the mandibles (Fig. 3c), the gut coiling (Fig. 4a), the dilated enteric valve seating (Fig. 4b) and the sclerotized paddles located at the enteric valve seating- third proctodeal segment junction (Fig. 4c). The morphometric characters measured in *C. vindai* workers are showed in Table 4. The total body length (TBL) although indicative, showed a wide

TABLE 4

Measurements of *C. vindai* workers (in mm) from Corrientes province (Argentina). n = 15.

Medidas de obreras de *C. vindai* (en mm) de la provincia de Corrientes (Argentina). n = 15.

	Mean	SD	Range	Samples
Total body length	4.25	0.47	3.70-5.10	5
Maximum head width	0.89	0.07	0.83-1.02	5
Maximum pronotum width	0.62	0.05	0.54-0.71	5
Hind tibia length	0.73	0.09	0.66-0.95	5
Fore tibia length	0.61	0.04	0.57-0.71	5
Fore tibia maximum width	0.15	0.03	0.13-0.20	5
Fore tibia length/width ratio	4.19	0.46	3.17-4.86	5
Antennae articles	14	-	-	5

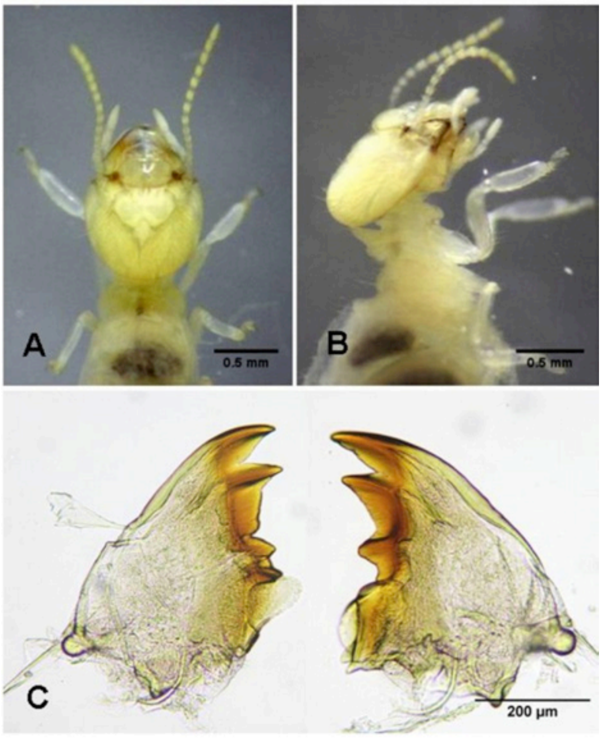

Fig. 3: *C. vindai* worker. (A) Dorsal view of head and pronotum. (B) Lateral view of head, pronotum and fore leg. (C) Mandibles.

Fig. 3: Obrera de *C. vindai*. (A) Vista dorsal de cabeza y pronoto. (B) Vista lateral de cabeza, pronoto y pata anterior. (C) Mandíbulas.

range of variation due to the contraction or expansion degree of the abdomen. The other five characters (MHW, MPW, HTL, FTL and FTMW) were similar to those previously determined for *C. vindai*, although the maximum values were higher. The fore tibia length/width ratio (FTL/WR) which indicates the dilatation degree of this segment also corresponded to the values recorded by Scheffrahn (2013).

With respect to the distribution of *C. vindai*, the previous records corresponded to two biomes of the Neotropical ecozone (Olson *et al*., 2001): Tropical and Subtropical Moist Broadleaf Forests (TSMF) and Tropical and Subtropical Grasslands, Savannas and Shrublands (TSGSS). In the TSMF biome, *C. vindai* was recorded in four ecoregions located in different countries: Parana - Paraiba inside forests (NT0150) in Paraguay, Guianian moist forests (NT0125) in French Guiana, Talamancan and Isthmian Pacific forests (NT0167) in Panama and Islands of Trinidad and Tobago in the Caribbean (NT0171). In the TSGSS biome, the earlier *C. vindai* reports were included in the Humid Chaco ecoregion (NT0708) in Paraguay (Bourguignon *et al*., 2013; Scheffrahn, 2013). The present study extends the distribution area of the species within this ecoregion, in northeastern Argentina. It is also reported for the first time, the presence of the species in the Flooded Grasslands and Savannas biome (FGS), particularly in the Southern Cone Mesopotamian Savannas ecoregion (NT0909). This ecoregion, also known as the Argentine Mesopotamian savannas or Mesopotamian grasslands (Daniele & Natenzon, 1994) is a flooded grassland ecoregion that comprises a mosaic of seasonally wet habitats, including grasslands, marshes, woodlands and gallery forests. It is located exclusively at the Corrientes, Misiones and Entre Rios provinces in northeastern Argentina. The region is considered as highly threatened due to destruction and degradation of natural habitats by cattle ranching and agriculture. Many specialist suggest the division of this ecoregion, due to environmental and vegetation differences in: Campos and Malezales region located at the northeast portion of Corrientes province and the Ibera (Ibera wetlands) at the central zone of the province, one of the most important South American wetlands (Burkart *et al*., 1999; Olson *et al*., 2001; Brown *et al*., 2006). *C. vindai* was found in both zones of this ecoregion.

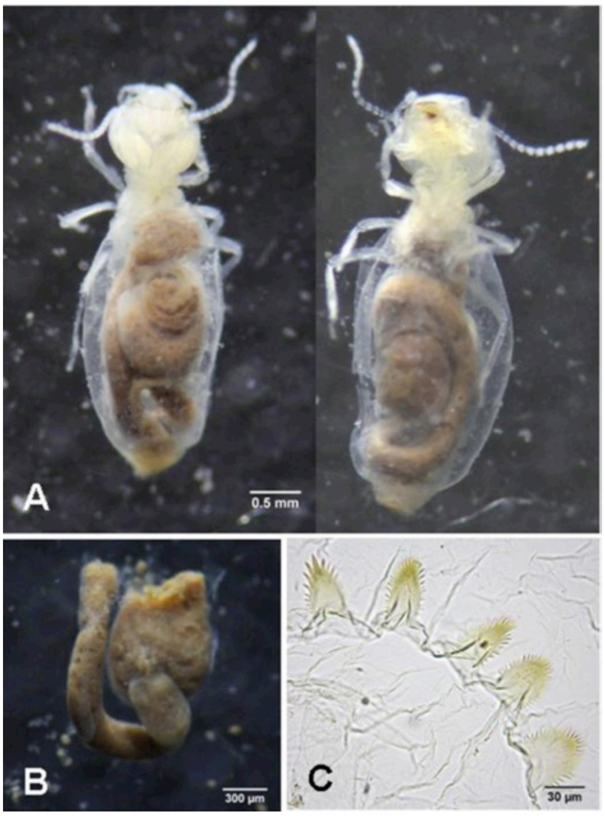

Fig. 4: *C. vindai* worker gut. (A) Gut coiling in dorsal (left) and ventral (right) views. (B) Enteric valve seating. (C) Ornamentation located at the enteric valve seating- third proctodeal segment junction.

Fig. 4: Tubo digestivo de obrera de *C. vindai*. (A) Configuración intestinal en vista dorsal (izquierda) y ventral (derecha). (B) Asentamiento de la válvula entérica. (C) Ornamentación localizada en la unión válvula entérica-tercer segmento proctodeal.

The present records extends the distribution area of the species (Fig. 5) to higher S latitude than reported by Scheffrahn (2013) for the Eastern Paraguay and also confirm the ability of *C. vindai* to survive the lower winter temperatures of this region, at least for short time intervals. Although the Corrientes province climate is subtropical without dry season with an average temperature of 13-15 °C, sometimes during the winter (July) absolute minimum temperatures of -1 °C to -5.5 °C are registered, as well as infrequent frosts derived from incoming polar air masses (Carnevali, 1994). Though there has not been *C. vindai* registers from other argentine provinces so far, future surveys could allow new findings that would extend further the southern limits of its wide distribution.

In sum, the present results indicate that *C. vindai* is a widely distributed subterranean termite found in diverse subtropical ecosystems at two ecoregions of northeastern Argentina. The relative abundance of *C. vindai* was

Fig. 5: Distribution of *C. vindai* in Corrientes province (Argentina) including survey sites (*) and previous records from FACENAC collection (•). References: 1- Mburucuya National Park, 2- Ita Paso, 3- Gobernador Virasoro, 4- Santa Ana, 5- El Carmen, 6- Villa Olivari, 7- Campo Nalda, 8- San Carlos.

Fig. 5: Distribución de *C. vindai* en la provincia de Corrientes (Argentina) incluyendo los sitios relevados (*) y registros previos de la colección FACENAC (•). Referencias: 1- Parque Nacional Mburucuyá, 2- Itá Paso, 3- Gobernador Virasoro, 4- Santa Ana, 5- El Carmen, 6- Villa Olivari, 7- Campo Nalda, 8- San Carlos.

intermediate and it seemed not evidently affected by land use intensification at the sampled sites. The small colonies of this species were located mainly at superficial soil, inside other Termitidae mounds and at their own hypogeal nests.

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