

Aquatic Coleoptera from El Cristal Natural Reserve (Santa Fe Province, Argentina)

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Los coleópteros acuáticos de la Reserva Natural El Cristal (Provincia de Santa Fe, Argentina)

RESUMEN. Se presenta una lista de los coleópteros acuáticos colectados en la Reserva Natural El Cristal. Se identificaron 77 especies incluidas en 35 géneros y seis familias. Diez géneros se citan por primera vez de la provincia de Santa Fe: *Copelatus* Erichson, *Anodocheilus* Babington, *Bidessodes* Régimbart, *Bidessonotus* Régimbart, *Pachydrus* Sharp, *Laccommimus* Toledo & Michat (Dytiscidae), *Mesonoterus* Sharp (Noteridae), *Pelonomus* Erichson (Dryopidae), *Chaetarthria* Stephens y *Paracymus* Thomson (Hydrophilidae). Además, 17 especies se registran por primera vez de la provincia de Santa Fe: *Thermonectus succinctus* (Aubé), *Anodocheilus maculatus* Babington, *Bidessonotus obtusatus* Régimbart, *Pachydrus globosus* (Aubé), *P. obesus* Sharp (Dytiscidae), *Hydrocanthus paraguayensis* Zimmermann, *Mesonoterus laevicollis* Sharp, *Suphis freudei* Mouchamps, *Suphisellus curtus* (Sharp), *S. grammicus* (Sharp), *S. nigrinus* (Aubé), *S. remator* (Sharp) (Noteridae), *Chaetarthria bruchi* Balfour-Browne, *Enochrus sublongus* (Fall), *Berosus paraguayanus* Knisch, *Derallus altus* (Leconte) y *Phaenonotum regimbarti* Bruch (Hydrophilidae).

PALABRAS CLAVE. Coleópteros acuáticos. Inventario. Chaco Húmedo. Biodiversidad. Región Neotropical.

ABSTRACT. A list of the aquatic Coleoptera collected in El Cristal Natural Reserve is presented. Seventy-seven species included in 35 genera and six families were recorded. Ten genera are first cited from Santa Fe Province: *Copelatus* Erichson, *Anodocheilus* Babington, *Bidessodes* Régimbart, *Bidessonotus* Régimbart, *Pachydrus* Sharp, *Laccommimus* Toledo & Michat (Dytiscidae), *Mesonoterus* Sharp (Noteridae), *Pelonomus* Erichson (Dryopidae), *Chaetarthria* Stephens and *Paracymus* Thomson (Hydrophilidae). In addition, 17 species are recorded for the first time from Santa Fe Province: *Thermonectus succinctus* (Aubé), *Anodocheilus maculatus* Babington, *Bidessonotus obtusatus* Régimbart, *Pachydrus globosus* (Aubé), *P. obesus* Sharp (Dytiscidae), *Hydrocanthus paraguayensis* Zimmermann, *Mesonoterus laevicollis* Sharp, *Suphis freudei* Mouchamps, *Suphisellus curtus* (Sharp), *S. grammicus* (Sharp), *S. nigrinus* (Aubé), *S. remator* (Sharp) (Noteridae), *Chaetarthria bruchi* Balfour-Browne, *Enochrus sublongus* (Fall), *Berosus paraguayanus* Knisch, *Derallus altus* (Leconte) and *Phaenonotum regimbarti* Bruch (Hydrophilidae).

KEYWORDS. Aquatic Coleoptera. Inventory. Humid Chaco. Biodiversity. Neotropical Region.

INTRODUCTION

The Humid Chaco, one of the 18 eco-regions of Argentina, covers 16 million ha in the eastern part of Chaco and Formosa Provinces and in the northern part of Santa Fe Province (Burkart *et al.*, 1999; Brown *et al.*, 2012). In the last decades, Santa Fe Province has experienced high levels of deforestation, including the highest deforestation rate in the country, which led to the loss of 96% of its native forests (Brown *et al.*, 2012). Hopefully, small patches of the still unperturbed forests of the province are protected, including 11 areas preserving the Humid Chaco.

Several studies dealing with the macroinvertebrates associated to aquatic macrophytes in Humid Chaco were presented in the past (Neiff & Poi de Neiff, 1978; Poi de Neiff, 1983; Poi de Neiff & Neiff, 1984). These contributions had an ecological approach and were not focused on aquatic Coleoptera. Recently, Libonatti *et al.* (2013) presented the first comprehensive inventory of aquatic Coleoptera of Humid Chaco, based on two protected areas located in Chaco Province. On the other hand, the aquatic beetle fauna of Santa Fe Province has received some attention in the past recent years (Montalto, 2008; Zilli *et al.*, 2008), however, these approaches were mainly ecological and no comprehensive inventories of aquatic Coleoptera were presented.

In the present paper, we provide the first inventory of the species of aquatic Coleoptera inhabiting El Cristal Natural Reserve, a protected area preserving a pristine remnant of the Humid Chaco eco-region of Santa Fe Province.

MATERIAL AND METHODS

Study area

El Cristal is a small wildlife natural reserve located in the northern part of Santa Fe Province, in the department of Vera, municipality of Calchaquí (30° 01' 05.2" S, 60° 06' 16.6" W) (Fig. 1). It was created in 1992 and covers 15 ha. This protected area preserves the shore of a pond called El Cristal and a representative part of the southeastern forests of the Humid Chaco eco-region (Chebez, 2005).

Sampling

Specimens were collected on 5-8 December 2010 using mercury light traps, fixed *in situ* in

96% ethyl alcohol and deposited in the collection of the Laboratory of Entomology, Buenos Aires University, Argentina.

Identification

Specimens were identified to the lowest possible taxonomic level under a Leica MZ6 stereoscopic microscope using appropriate keys and literature. For taxonomic classifications we followed Nilsson (2013) for Dytiscidae, Beutel & Roughley (2005) for Gyrinidae, Nilsson (2011) for Noteridae, Short & Fikáček (2013) for Hydrophilidae, and Lawrence & Yoshitomi (2007) for Scirtidae.

RESULTS

In total, 77 species of Coleoptera were recorded, included in 35 genera and six families (Table I). The richest family in number of species was Hydrophilidae (31 species) followed by Dytiscidae (25), Noteridae (14), Hydrochidae (5), Dryopidae (1) and Scirtidae (1). With respect to genera, however, Dytiscidae was the richest family (16 genera) followed by Hydrophilidae (11), Noteridae (5), Hydrochidae (1), Dryopidae (1) and Scirtidae (1). Ten genera are first cited for Santa

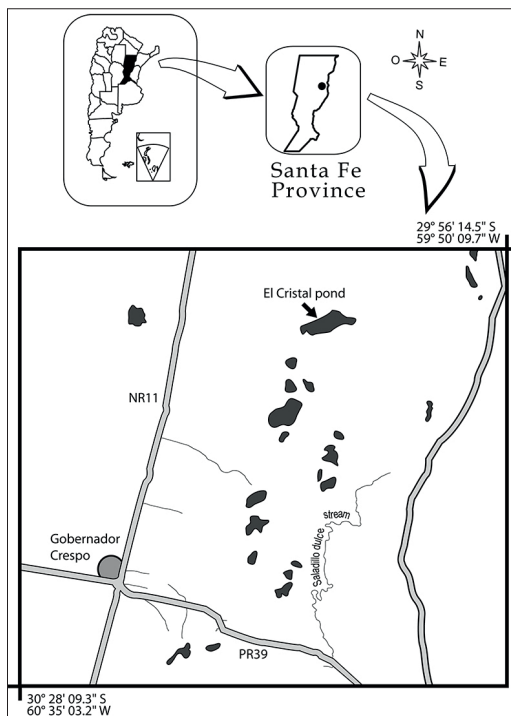


Fig. 1. Study area: El Cristal pond in Calchaquí municipality (Santa Fe Province).

Table I. Aquatic Coleoptera collected in El Cristal Natural Reserve. New records from Santa Fe Province are denoted by asterisks.

ADEPHAGA	POLYPHAGA
DYTISCIDAE	DRYOPIDAE
Copelatinae	<i>Pelonomus</i> sp.*
Copelatini	HYDROCHIDAE
<i>Copelatus</i> sp. 1*	<i>Hydrochus ducalis</i> Knisch
<i>Copelatus</i> sp. 2*	<i>Hydrochus drakei</i> Knisch
Dytiscinae	<i>Hydrochus metallipes</i> Knisch
Aciliini	<i>Hydrochus obscurus</i> Sharp
<i>Thermonectus succinctus</i> (Aubé)*	<i>Hydrochus richteri</i> Bruch
Aubehydrini	HYDROPHILIDAE
<i>Notaticus fasciatus</i> Zimmermann	Acidocerinae
Cybistrini	Acidocerini
<i>Cybister puncticollis</i> (Brullé)	<i>Helochares femoratus</i> (Brullé)
Hydroporinae	<i>Helochares oculatus</i> Sharp
Bidessini	Chaetarthriinae
<i>Anodocheilus maculatus</i> Babington*	Chaetarthriini
<i>Bidessodes</i> sp.*	<i>Chaetarthria bruchi</i> Balfour-Browne*
<i>Bidessonotus obtusatus</i> Régimbart*	Enochrinae
<i>Brachyvatus acuminatus</i> (Steinheil)	<i>Enochrus sublongus</i> (Fall)*
<i>Liodessus</i> sp. 1	<i>Enochrus vulgaris</i> (Steinheil)
<i>Liodessus</i> sp. 2	Hydrophilinae
<i>Liodessus</i> sp. 3	Berosini
Hyphydrini	<i>Berosus coelacanthus</i> Oliva
<i>Desmopachria concolor</i> Sharp	<i>Berosus decolor</i> Knisch
<i>Desmopachria</i> sp. 1	<i>Berosus erraticus</i> Mouchamps
<i>Desmopachria</i> sp. 2	<i>Berosus minimus</i> Knisch
<i>Pachydrus globosus</i> Sharp*	<i>Berosus paraguayanus</i> Knisch*
<i>Pachydrus obesus</i> (Aubé)*	<i>Berosus patruelis</i> Berg
Methilini	<i>Berosus pedregalensis</i> Jensen-Haarup
<i>Celina</i> sp. 1	<i>Berosus reticulatus</i> Knisch
<i>Celina</i> sp. 2	<i>Berosus speciosus</i> Knisch
<i>Celina</i> sp. 3	<i>Berosus</i> sp. 1
Vatellini	<i>Berosus</i> sp. 2
<i>Derovatellus lentus</i> (Wehncke)	<i>Derallus altus</i> (Leconte)*
<i>Vatellus haagi</i> Wehncke	<i>Derallus angustus</i> Sharp
Laccophilinae	<i>Derallus paranensis</i> Oliva
Laccophilini	Hydrophilini
<i>Laccomimus</i> sp.*	<i>Hydrobiomorpha irina irina</i> (Brullé)
<i>Laccophilus</i> sp. 1	<i>Hydrophilus palpalis</i> Brullé
<i>Laccophilus</i> sp. 2	<i>Hydrophilus masculinus</i> Régimbart
NOTERIDAE	<i>Tropisternus lateralis limbatus</i> (Brullé)
Noterinae	<i>Tropisternus mergus</i> (Say)
Noterini	<i>Tropisternus ovalis</i> Castelnau
<i>Hydrocanthus debilis</i> Sharp	Laccobiini

Hydrocanthus paraguayensis Zimmermann*

Mesonoterus laevicollis Sharp*

Suphis cimicoides Aubé

Suphis freudei Mouchamps*

Suphis fluviatilis Guignot

Suphisellus curtus (Sharp)*

Suphisellus cribosus (Régimbart)

Suphisellus flavopictus (Régimbart)

Suphisellus grammicus (Sharp)*

Suphisellus nigrinus (Aubé)*

Suphisellus remator (Sharp)*

Suphisellus rotundatus (Sharp)

Notomicrinae

Notomicrus reticulatus Zimmermann

Paracymus sp. 1*

Paracymus sp. 2*

Paracymus sp. 3*

Sphaeridiinae

Hydroglobus puncticollis (Bruch)

Phaenonotum argentinense Bruch

Phaenonotum regimbarti Bruch*

SCIRTIDAE

Ora semibrunnea Pic

Fe Province: *Copelatus* Erichson, *Anodocheilus* Babington, *Bidessodes* Régimbart, *Bidessonotus* Régimbart, *Pachydrus* Sharp, *Laccomimus* Toledo & Michat (Dytiscidae), *Mesonoterus* Sharp (Noteridae), *Pelonomus* Erichson (Dryopidae), *Chaetarthria* Stephens and *Paracymus* Thomson (Hydrophilidae). Also, 17 species are recorded for the first time from Santa Fe Province: *Thermonectus succinctus* (Aubé), *Anodocheilus maculatus* Babington, *Bidessonotus obtusatus* Régimbart, *Pachydrus globosus* (Aubé), *P. obesus* Sharp (Dytiscidae), *Hydrocanthus paraguayensis* Zimmermann, *Mesonoterus laevicollis* Sharp, *Suphis freudei* Mouchamps, *Suphisellus curtus* (Sharp), *S. grammicus* (Sharp), *S. nigrinus* (Aubé), *S. remator* (Sharp) (Noteridae), *Chaetarthria bruchi* Balfour-Browne, *Enochrus sublongus* (Fall), *Berosus paraguayanus* Knisch, *Derallus altus* (Leconte) and *Phaenonotum regimbarti* Bruch (Hydrophilidae).

DISCUSSION

Suborder Adephaga

Family Dytiscidae

The family is presently represented in Argentina by 119 species, distributed in 31 genera and eight subfamilies (Libonatti *et al.*, 2011). In El Cristal Natural Reserve four subfamilies, 16 genera and 25 species were found (Table I). The subfamily Copelatinae, represented by two unidentified species, is reported for the first time from Santa Fe Province. The genus *Copelatus*

had already been cited from Buenos Aires, Corrientes, Entre Ríos, Misiones, Chaco, Salta and Jujuy Provinces (Trémouilles, 1998; Torres *et al.*, 2008). Dytiscinae was represented in this study by three species, of which *Thermonectus succinctus* (Aubé) (Aciliini) is herein recorded for the first time from Santa Fe. Hydroporinae was represented by 10 genera. Four genera and four species are newly recorded from Santa Fe: *Anodocheilus maculatus* Babington, *Bidessonotus obtusatus* Régimbart, *Pachydrus globosus* (Aubé), *P. obesus* Sharp, and an unidentified species of *Bidessodes* recently found in Corrientes and Entre Ríos Provinces (Libonatti *et al.*, 2011; Torres *et al.*, 2012). We found two genera of Laccophilinae in the present study, one of which (*Laccomimus* Toledo & Michat) is first recorded from Santa Fe. It had been previously cited, as "Laccophilinae, unpublished genus", from Entre Ríos, Corrientes and Chaco Provinces by Libonatti *et al.* (2011).

Family Noteridae

The noterid fauna of Argentina is composed of about 40 species classified in two subfamilies (Noterinae and Notomicrinae) and six genera (Nilsson, 2011). In El Cristal Natural Reserve we found four genera of Noterinae and one genus of Notomicrinae (Table I). The genus *Mesonoterus* Sharp and the following seven species are reported for the first time from Santa Fe Province: *Mesonoterus laevicollis* Sharp, distributed in Bolivia, Brazil, Cuba, Guatemala, Mexico, Paraguay, and recently found in Argentina (Torres *et al.*, 2012);

Hydrocanthus paraguayensis Zimmermann, known from Buenos Aires and Corrientes; *Suphis freudei* Mouchamps, previously recorded in Buenos Aires and Chaco (Grosso, 1993); *Suphisellus curtus* (Sharp), so far only recorded from Corrientes (Torres *et al.*, 2012); *S. grammicus* (Sharp), formerly known from Buenos Aires, Entre Ríos, Misiones, Chaco and Tucumán; *S. nigrinus* (Aubé), with previous records from Buenos Aires, Corrientes, Misiones, Córdoba, Chaco and Tucumán (Torres *et al.*, 2012); and *S. remator* (Sharp), distributed in the central-northern part of the country (Regimbart, 1903; Bruch, 1915).

Suborder Polyphaga

Family Dryopidae

Four genera of this family are known to occur in Argentina: *Dryops* Olivier, *Helichus* Erichson, *Onopelmus* Spangler, and *Pelonomus* Erichson (Trémouilles *et al.*, 1995). *Pelonomus*, currently represented by three Argentinean species (*P. bergi* Grouvelle, *P. pubescens* (Blanchard) and *P. simplex* Berg) and distributed in central and northern parts of the country (Torres *et al.*, 2007), is herein cited for the first time from Santa Fe (Table I).

Family Hydrochidae

This family contains solely the cosmopolitan genus *Hydrochus*, represented by *ca.* 180 species worldwide, 17 of which are found in Argentina (Oliva *et al.*, 2002). In the present study, five species were identified, all previously known from Santa Fe.

Family Hydrophilidae

The Hydrophilidae include almost 150 species in Argentina, distributed in 20 genera and six subfamilies (Oliva *et al.*, 2002; Short & Fikáček, 2013). In our study, two species of Acidocerinae, one of Chaetarhriinae, two of Enochrinae, 23 of Hydrophilinae and three of Sphaeridiinae were identified (Table I). Chaetarhriinae is divided in two tribes: Anacaenini, with only the genus *Anacaena* Thomson (Oliva *et al.*, 2002), and Chaetarhriini with six Argentinean species in the genus *Chaetarhria*. We found *Chaetarhria bruchi* Balfour-Browne, early known from Tucumán, Córdoba and La Rioja (Oliva *et al.*, 2002), so it is the first record for the genus and species from Santa Fe. The genus *Enochrus* Thomson is the only member of the subfamily Enochrinae present

in Argentina, widely distributed throughout the country. *Enochrus sublongus* (Fall), previously known from Chaco, Formosa and Corrientes (Torres *et al.*, 2012), was collected in our samplings and is here cited for the first time from Santa Fe. The subfamily Hydrophilinae was represented in this study by three tribes: Berosini, Hydrophilini and Laccobiini. Berosini included two out of three genera known from Argentina: *Berosus* and *Derallus*. *Berosus paraguayanus* Knisch, known from Northern Argentina, and *Derallus altus* (Leconte), previously to this study only recorded from Salta, are first cited from Santa Fe. We found six species in three genera of the tribe Hydrophilini: *Hydrobiomorpha* Blackburn, *Tropisternus* Solier and *Hydrophilus* Geoffroy, all previously recorded from Santa Fe. The tribe Laccobiini is represented in Argentina by two genera: *Oocyclus* Sharp, with a single species (*O. schubarti* Orchymont) cited from Misiones, and *Paracymus* Thomson, with four species (*P. graniformis* Bruch, *P. phalacroides* Wollaston, *P. rufocinctus* Bruch and *P. sedatus* Wooldridge) distributed in the central and northern parts of the country (Short & Fikáček, 2013). The latter genus is herein cited for the first time from Santa Fe. Two tribes of the subfamily Sphaeridiinae are present in Argentina: Megasternini and Coelostomatini. *Phaenonotum regimbarti* Bruch (Coelostomatini), recorded from Buenos Aires, Chaco and Formosa by Archangelsky (1990, 1992) is herein cited for the first time from Santa Fe.

Family Scirtidae

The family comprises 22 species in Argentina, classified in one subfamily (Scirtinae) and five genera (*Contacyphon* Gozis, *Ora* Clark, *Prionocyphon* Redtenbacher, *Pseudomicrocara* Armstrong and *Scirtes* Illiger) (Klausnitzer, 2012; Libonatti & Ruta, 2013; Libonatti, 2014, 2015). We found *Ora semibrunnea* Pic in our samplings, which was recently recorded from Santa Fe (Libonatti, 2015).

CONCLUSIONS

Although limited both geographically and in sampling effort, this study proves that El Cristal Natural Reserve hosts a vast diversity of aquatic Coleoptera representative of the Humid Chaco eco-region. Several species are cited for the first time from Santa Fe Province, and some remain unidentified which highlights the potential

of the area as a source of novel information. Our results reinforce the idea advanced by TNC (2005) of considering the Humid Chaco as a priority area for conservation purposes, and may encourage specialists to further investigate the aquatic beetles and other insect groups inhabiting the region.

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LITERATURE CITED

- ARCHANGELSKY, M. 1990. El género *Phaenonotum* Sharp en la Argentina. I. Redescripción de *Phaenonotum regimbarti* Bruch, 1915 y *Ph. argentinense* Bruch, 1915 (Coleoptera, Hydrophilidae, Sphaeriidiinae). *Revista de la Sociedad Entomológica Argentina* 49: 157-164.
- ARCHANGELSKY, M. 1992. El género *Phaenonotum* Sharp en la Argentina (Coleoptera: Hydrophilidae). II. Reubicación de *Hydroglobus puncticollis* Bruch dentro del género *Phaenonotum*. *Revista de la Sociedad Entomológica Argentina* 51(1-4): 47-51.
- BROWN, A., S. PACHECO & L. CRISTÓBAL. 2012. *Bitácora. Los caminos del Chaco. Obras viales y paisajes de conservación en la región chaqueña*. Ediciones del Subtrópico, Tucumán.
- BRUCH, C. 1915. Catálogo sistemático de los coleópteros de la República Argentina. Pars II. Familias: Halipilidae, Dytiscidae, Gyrinidae, Hydrophilidae y Staphylinidae. *Revista del Museo de La Plata* 19: 174-526.
- BURKART, R., N. O. BÁRBARO, R. O. SÁNCHEZ & D. A. GÓMEZ. 1999. *Ecorregiones de la Argentina*. Administración de Parques Nacionales, Buenos Aires.
- CHEBEZ, J. C. 2005. Guía de las reservas naturales de la Argentina 3. Nordeste. Editorial Albatros, Buenos Aires.
- GROSSO, L. E. 1993. Revisión de las especies neotropicales del género *Suphis* Aubé, con la descripción de *S. ticky* n.sp. (Coleoptera- Noteridae). *Acta Zoológica Lilloana* 42(2): 225-238.
- KLAUSNITZER, B. 2012. Zur Kenntnis der Gattung *Prionocyphon* L. Redtenbacher 1858 sensu lato (Coleoptera, Scirtidae) aus Südamerika (181. Beitrag zur Kenntnis der Scirtidae). *Linzer biologische Beiträge* 44: 1177-1194.
- LAWRENCE, J. F. & H. YOSHITOMI. 2007. *Nipponocyphon*, a new Genus of Japanese Scirtidae (Coleoptera) and its Phylogenetic Significance. *Elytra* 35: 507-527.
- LIBONATTI, M. L. 2014. A revision of the genus *Ora* Clark, 1865 (Coleoptera: Scirtidae) in Argentina (part I)—descriptions of new species. *Zootaxa* 3884(1): 27-44.
- LIBONATTI, M. L. 2015. A revision of the genus *Ora* Clark, 1865 (Coleoptera: Scirtidae) in Argentina (part II)—descriptions, updated distributions and a key to species. *Zootaxa* 3985(1): 69-97.
- LIBONATTI, M. L., M. C. MICHAT, P. L. M. TORRES. 2011. Key to the subfamilies, tribes and genera of adult Dytiscidae of Argentina (Coleoptera: Adepaga). *Revista de la Sociedad Entomológica Argentina* 70(3-4): 317-336.
- LIBONATTI, M. L., M. C. MICHAT & P. L. M. TORRES. 2013. Aquatic Coleoptera from two protected areas of the Humid Chaco eco-region (Chaco Province, Argentina). *Revista de la Sociedad Entomológica Argentina* 72(3-4): 155-168.
- LIBONATTI, M. L. & R. RUTA. 2013. Review of the Argentinean species of *Pseudomicrocara* Armstrong (Coleoptera: Scirtidae). *Zootaxa* 3718(2): 137-157.
- MONTALTO, L. 2008. Dinámica espacio-temporal de asociaciones de invertebrados en un humedal marginal fluvial de la llanura aluvial del Río Paraná medio. Doctoral thesis, University of Buenos Aires, 215 pp.
- NEIFF, J. J. & A. POI DE NEIFF. 1978. Estudios sucesionales en los camalotales chaqueños y su fauna asociada. I. Etapa seral *Pistia stratiotes* – *Eichhornia crassipes*. *Physis*, sección B 37(95): 29-39.
- NILSSON, A. N. 2011. A world catalogue of the family Noteridae, or the burrowing water beetles (Coleoptera, Adepaga). Version 16.VIII.2011. Umeå: distributed electronically as a PDF file by the author, 54 pp. Available on: http://www2.emg.umu.se/projects/biginst/andersn/WCN/WCN_20110816.pdf
- NILSSON, A. N. 2013. A world catalogue of the family Dytiscidae, or the diving beetles (Coleoptera, Adepaga). Version 1.1.2013. Umeå: distributed electronically as a PDF file by the author, 304 pp. Available on: http://www2.emg.umu.se/projects/biginst/andersn/WCD_20130101.pdf
- OLIVA, A., L. A. FERNÁNDEZ & A. O. BACHMANN. 2002. Sinopsis de los Hydrophilodea acuáticos de la Argentina (Insecta, Coleoptera). *Monografías Museo Argentino de Ciencias Naturales* 2: 1-67.
- POI DE NEIFF, A. 1983. Observaciones comparativas de la mesofauna asociada a *Pistia stratiotes* L. (Araceae) en algunos ambientes acuáticos permanentes y temporarios (Chaco, Argentina). *Physis*, sección B 41(101): 95-102.
- POI DE NEIFF, A. & J. J. NEIFF. 1984. Dinámica de la vegetación acuática flotante y su fauna en charcos temporarios del sudeste del Chaco (Argentina). *Physis*, sección B, 42(103): 53-67.
- RÉGIMBART, M. 1903. Liste des Dytiscidae et Gyrinidae recueillies par le Dr. Philippe Silvestri dans l'Amérique méridionale de 1898 a 1900. *Bolletino della Societa Entomologica Italiana* 35: 46-74.
- SHORT, A. E. Z. & M. FIKÁČEK. 2013. Molecular phylogeny, evolution and classification of the Hydrophilidae (Coleoptera). *Systematic entomology* 38: 723-752.
- The Nature Conservancy (TNC), Fundación Vida Silvestre Argentina (FVSA), Fundación para el Desarrollo Sustentable del Chaco (DeSdel Chaco) & Wildlife Conservation Society Bolivia (WCS). 2005. *Evaluación Ecorregional del Gran Chaco Americano / Gran Chaco Americano Ecoregional Assessment*. Fundación Vida Silvestre Argentina, Buenos Aires.
- TORRES, P. L. M., S. A. MAZZUCONI & M. C. MICHAT. 2007. Los coleópteros y heterópteros acuáticos del Parque Nacional El Palmar (Provincia de Entre Ríos, Argentina). *Revista de la Sociedad Entomológica Argentina* 66(3-4): 127-153.
- TORRES, P. L. M., S. A. MAZZUCONI, M. C. MICHAT & A. O. BACHMANN. 2008. Los coleópteros y heterópteros acuáticos del Parque Nacional Calilegua (Provincia de Jujuy, Argentina). *Revista Sociedad Entomológica Argentina* 67(1-2): 127-144.
- TORRES, P. L. M., M. C. MICHAT, M. L. LIBONATTI, L. A. FERNÁNDEZ, A. OLIVA & A. O. BACHMANN. 2012. Aquatic Coleoptera from Mburucuyá National Park (Corrientes Province, Argentina). *Revista de la Sociedad Entomológica Argentina* 71(1-2): 57-71.
- TRÉMOUILLES, E. R., A. OLIVA & A. O. BACHMANN. 1995. Insecta, Coleoptera. In: E. C. Lopretto & G. Tell (eds.), *Ecosistemas de aguas continentales, Metodologías para su estudio*, Ediciones Sur, La Plata, pp. 1133-1197.
- ZILLI, F. L., L. MONTALTO & M. R. MARCHESE. 2008. Benthic invertebrate assemblages and functional feeding groups in the Paraná River floodplain (Argentina). *Limnologia* 38: 159-171.