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## The Aradidae of Chile (Hemiptera: Heteroptera)

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**Abstract:** Six species belonging to five subfamilies and genera of Aradidae are recorded to date from Chile. Additional faunistical data and photos of five species are presented including the first photos of the holotype of *Neuroctenus chilensis* KORMILEV, 1975. For the taxon *Carventus chilensis* KORMILEV, 1981, which cannot be placed in *Carventus* STÅL, 1865 a new genus *Chileaptera* nov.gen. is proposed and *Chileaptera chilensis* nov.comb. designated as type species.

**Key words:** Hemiptera, Heteroptera, Aradidae, faunistic records, new taxonomic assignment, new genus, Chile.

### Introduction

Chile is the seventh largest country of South America with a surface of about 276.000 square kilometres. With a length of 4.300 km it ranges also among the longest north-south extended countries of the world, reaching a maximum width of 300 km.

Because of its geographical position between 17° to 50° South and 66° to 75° West, Chile hosts several climatic types and biotopes from bare desert in the north (Atacama) to the subantarctic southern Patagonia at the tip of South American continent facing Antarctica. The high Andean mountain range along the eastern border was and is a barrier causing isolation of flora and fauna during their past development compared to neighbouring countries, which, however, are more related to Gondwana elements sharing with Australia and New Zealand e.g. forests of *Nothofagus* and *Podocarpus* as well as Isoderminae and Prosympiestinae subfamilies of flat bugs.

This is particularly valid for the known fauna of the flat bug family Aradidae. Surprisingly five of the eight world-wide recognized subfamilies are represented in Chile, however, only by one genus and species each except of Mezirinae with two genera and species.

The most recent Catalog of Aradidae for the Neotropical Region (COSCARAON & CONTRERAS 2012) lists 80 genera and 509 species, of which following five genera and six species are recorded from Chile:

Subfamily Aradinae: *Aradus angustellus* BLANCHARD, 1852

Subfamily Carventinae: *Carventus chilensis* KORMILEV, 1981

Subfamily Isoderminae: *Isodermus gayi* (SPINOLA, 1852)

Subfamily Mezirinae: *Mezira americana* (SPINOLA, 1852)

*Neuroctenus chilensis* KORMILEV, 1975

Subfamily Prosympiestinae: *Llaimacoris penai* KORMILEV, 1964

This low number of Aradidae taxa may indicate, that there are less suitable habitats for Aradidae available and – or the fauna is still insufficiently known. Therefore the following additional faunal records might be of interest.

### Material and methods

The material examined was borrowed from Field Museum, Natural History, Chicago, collected by A. Newton & M. Thayer 1996, 1997 and Solodovnikov 2002. Additional data are from the authors collection.

When citing the text on labels attached to the specimens, a slash ( / ) separates different lines and a double slash ( // ) separates different labels. Abbreviations: deltg = dorsal external laterotergite (connexivum); ptg = paratergite; vltg = ventral laterotergite.

The specimens upon this study is based are preserved in the following collections:

FMNH .....Field Museum, Natural History, Chicago, USA

CEHI.....Ernst Heiss collection, Tiroler Landesmuseum, Innsbruck, Austria

### Taxonomy

#### Family A r a d i d a e BRULLÉ, 1836

#### Subfamily A r a d i n a e BRULLÉ, 1836

#### *Aradus angustellus* (BLANCHARD, 1852) (Figs 1-4)

*Brachyrhinchus* (sic!) *angustellus* BLANCHARD, 1852: 205 (original description)

*Aradus angustellus*: SIGNORET 1863: 576 (taxonomy)

*Aradus angustellus*: KORMILEV & FROESCHNER 1987: 36 (catalog)

*Aradus angustellus*: HEISS 1993: 121 (figures head, pronotum ♂, ♀, pygophore)

*Aradus angustellus*: COSCARON & CONTRERAS 2012: 14 (catalog, bibliography)

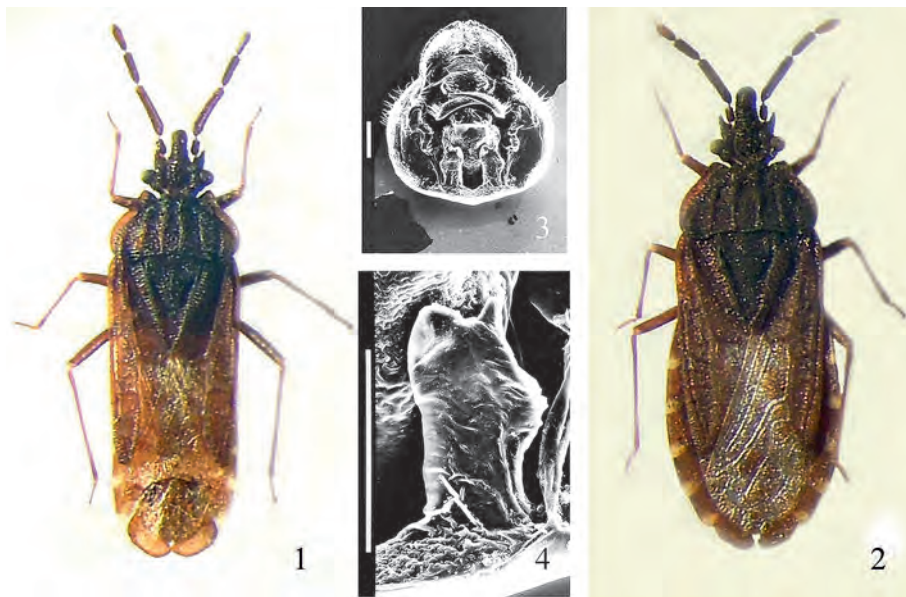
*Aradus angustellus*: CONTRERAS & COSCARON 2012: 8 (distribution, fig. F)

**M a t e r i a l e x a m i n e d** (CEHI): 1 ♀ Chile S.Amer. / El Canelo / 890 mtrs. Prov. / Santiago X.20.1951 / Luis E. Peña //; 1 ♀ El Canelo / Santiago / Chile XI. (? illegible) // Dr. Gutierrez / leg // (reverse side); 1 ♂ Chile / Coll. Signoret // (pygophore mounted separately)

1 ♂ Chile / E. Peuno / 15-II-51 / J. Herrera G. //; 1 ♂ 02 / II / 2001 / Estaquilla / Chili (region X) // S 41.43941° / W 73.69685° / Alt. 125m GPS 97 // Foret turbière sous / écorce arbre calcine / J-C Streito //

*Aradus angustellus* is characterized by the unicolored blackish antennae, shared only by the neotropical species *Aradus compressicornis* STÅL, 1873 and *Aradus gracilis* STÅL, 1873. However, the latter is distinguished by long slender antennae (shorter and cylindrical in *A. angustellus*, cf. figs 6, 7, 9, 10 HEISS 1973) and *A. compressicornis* by the spindle-shaped antennal segment II (cylindrical in *A. angustellus*) and different shape of paramers and tergite IX of the male (cf. figs 14, 15 HEISS 1973).

**Distribution:** Chile: Cordilleras de Ovale (type locality), further literature citations without localities; Argentina: (Prov. Buenos Aires, Santa Cruz, Chubut, Rio Negro, Córdoba, Patagonia); Colombia (cf. BERG 1892 as Nova Grenada = ancient name for Colombia); Peru: Cuzco.



**Figs 1-4:** *Aradus angustellus*: (1) male from Estaquilla; (2) female from El Canelo; (3) pygophore, dorsal view; (4) detail of tergite IX. (SEM photos 3, 4 from HEISS 1993, scale 0.1mm).

### Subfamily *C a r v e n t i n a e* USINGER, 1950

#### *Carventus chilensis* KORMILEV, 1981: 296 (Figs 5, 6, 7, 9)

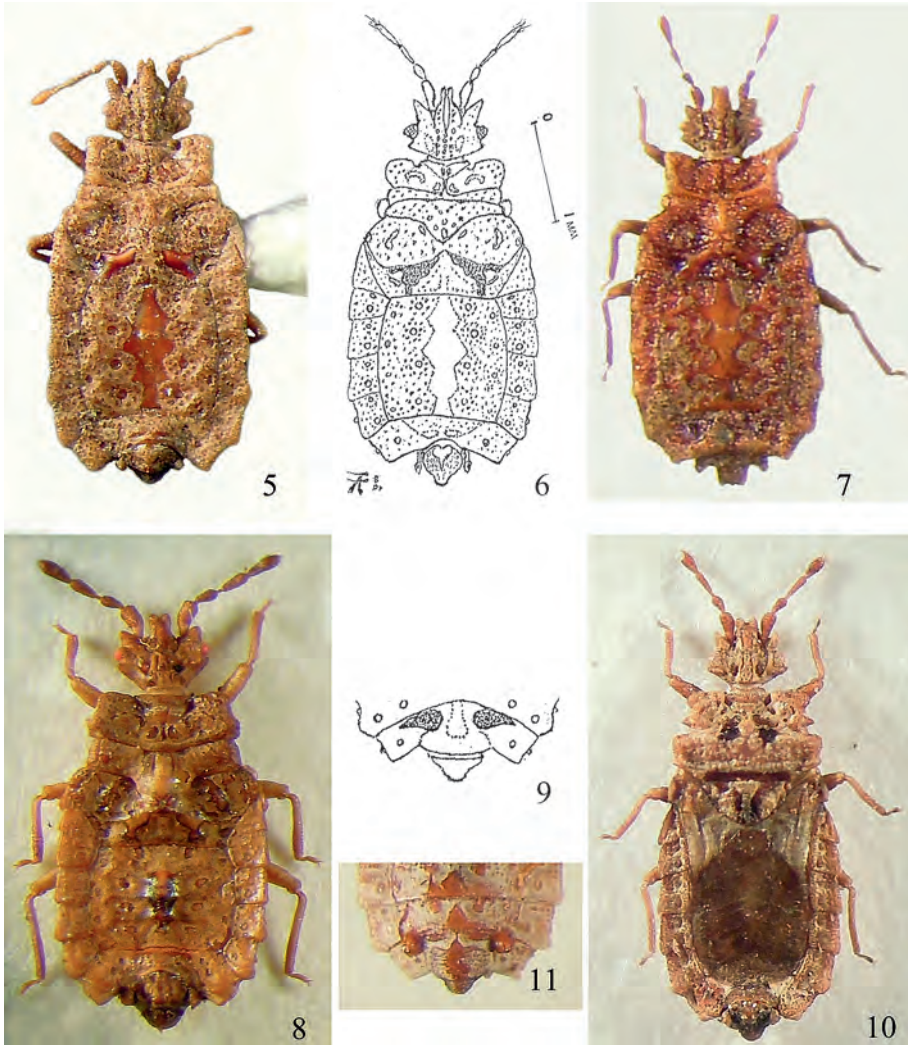
*Carventus chilensis* KORMILEV, 1981: 296 (original description, fig. habitus ♂, terminal segments ♂, ♀)

*Carventus chilensis*: KORMILEV & FROESCHNER 1987: 73 (catalog)

*Carventus chilensis*: COSCARON & CONTRERAS 2012: 238 (catalog, bibliography, distribution)

**M a t e r i a l e x a m i n e d** (CEHI): 1♂, 1♀ Chile / Res. Nac. Nonguén, litter / nr. Concepción / 1985-12-02 F.Morales // (the male was damaged after taking the habitus photo 5).

*Carventus chilensis* was described on a male from Chile, Prov. Nuble, Los Troncos 25.V.1977 and a female from Chile, Prov. Concepción, Neuquén 4.X.1972 (misspelling of Nonguén which is in Chile instead of Neuquén, a locality in Argentina). KORMILEV described it as micropterous, however, as small or vestigial wings – characterizing microptery – are lacking and fused with mesonotum, it is to be regarded as an apterous taxon.



**Figs 5-11:** (5) *Chileaptera chilensis*, male from Nonguén; (6) *Carventus chilensis* male holotype (from KORMILEV 1981, Fig. 1); (7) *Chileaptera chilensis*, female from Nonguén; (8) *Carventaptera spinifera*, male from New Zealand; (9) *Carventus chilensis*, male, ventral, elongate oval calli on vltg VII (from KORMILEV 1981, Fig. 3); (10) *Carventus australis*, male from NSW, Australia; (11) *Carventus australis*, male, ventral, round tubercles on vltg VII.

The genus *Carventus* STÅL, 1865 comprises to date 42 species, distributed in the Oriental and Australian Regions, nearly half of them were described from New Guinea (KORMILEV & FROESCHNER 1987). Three species are native to Australia (*C. australis* KORMILEV, 1958; *C. elongatus* KORMILEV, 1965, both macropterous and *C. brachypterus* KORMILEV, 1966, with reduced wing pads from Tasmania) and none is

known from New Zealand, where it seems to be replaced by the apterous *Carventaptera spinifera* USINGER & MATSUDA, 1959.

As there are surprisingly only two species recorded from Neotropical Region:

*Carventus mexicanus* BERGROTH, 1895 from Mexico

*Carventus chilensis* KORMILEV, 1981 from Chile

Their assignment to the genus *Carventus* seemed doubtful and should be confirmed.

Examination of the holotype of *Carventus mexicanus* (from the collection of the Naturhistorisches Museum, Vienna) and the abovementioned couple of *Carventus chilensis* confirmed, that *C. mexicanus* belongs and is to be transferred to the neotropical genus *Neoproxius* (USINGER & MATSUDA, 1959), which will be treated in a separate paper.

*Carventus chilensis* shows several differences to true *Carventus*, of which no apterous species is yet known. Habitus and thoracic structures resemble more those of *Carventaptera*, however *C. chilensis* is e.g. distinguished from both genera by the different position of spiracles and the elongate oval shiny callosities on male sternite VII, where only round tubercles are developed in *Carventus* and no such structure in *Carventaptera*.

**Differential diagnosis:** Character comparison of *C. chilensis* to the geographically closest species of the genus, the macropterous *Carventus australis* and the apterous *Carventaptera spinifera* shows following differences:

	<i>Carventus chilensis</i> ♂ apt., Concepción Figs 5, 6, 7, 9	<i>Carventus australis</i> ♂ macr., Australia NSW Figs 10, 11	<i>Carventaptera spinifera</i> ♂ apt., New Zealand Fig. 8
body length	3.6mm	3.75mm	4.2mm
antennae length/with head	1.24	1.43	1.26
ratio antennae III/II	1.20	1.43	1.20
postocular lobes	blunt, not produced over eyes	subangulate, produced over eyes	blunt, not produced over eyes
outline pronotum	rectangular, w/l 2.61	rectangular, w/l 1.93	trapezoidal, w/l 2.64
pronotum lateral margins	parallel, straight	medially with tooth	sinuate, converging anteriorly
mesonotum with/length	3.8	scutellum 1.88	3.33
deltg VII, posterior edge	vltg VII not reflexed	vltg VII dorsally reflexed and visible from above	vltg VII at a lower level, visible from above
width head /w pygophore	1.7	1.87	1.72
length of ptg VIII	blunt, 1/2 pygophore	rounded, 1/2 pygophore	blunt, 1/3 pygophore
spiracles	II-V ventral, VI-VII lateral, visible from above	II ventral, III-VII dorso-lateral, visible from above	II-IV ventral, V-VI lateral on reflexed vltg V-VI, VII on vltg VII at a lower level, visible from above
venter sternite VII	2 elongate oval calli	2 round shiny tubercles	no calli or tubercles

Besides biogeographical considerations and that there is no true *Carventus* species recorded from the New World, this comparison of characters supports the suspicion, that *C. chilensis* does not belong to and cannot be placed neither in *Carventus* nor in *Carventaptera*. Therefore a new genus *Chileaptera* gen.nov. is proposed and *C. chilensis* is here designated as type species, thus: *Chileaptera chilensis* comb.nov.

### Subfamily I s o d e r m i n a e STÅL, 1873

#### *Isodermus gayi* (SPINOLA, 1852) (Figs 12-15)

*Anchomichon Gayi* SPINOLA, 1852: 216 (original description)

*Achomichon Gayi*: GAY 1854: plate XI (= Hemipteros lámina 1, Fig. 14) (fig. F with broken hemelytra)

*Isodermus gayi*: STÅL 1873: 147 (taxonomy)

*Isodermus gayi*: WYGODZINSKY 1946: 266 (redescription, figures genitalia etc.)

*Isodermus gayi*: KORMILEV & FROESCHNER 1987: 94 (catalog)

*Isodermus gayi*: COSCARON & CONTRERAS 2012: 32 (catalog, bibliography)

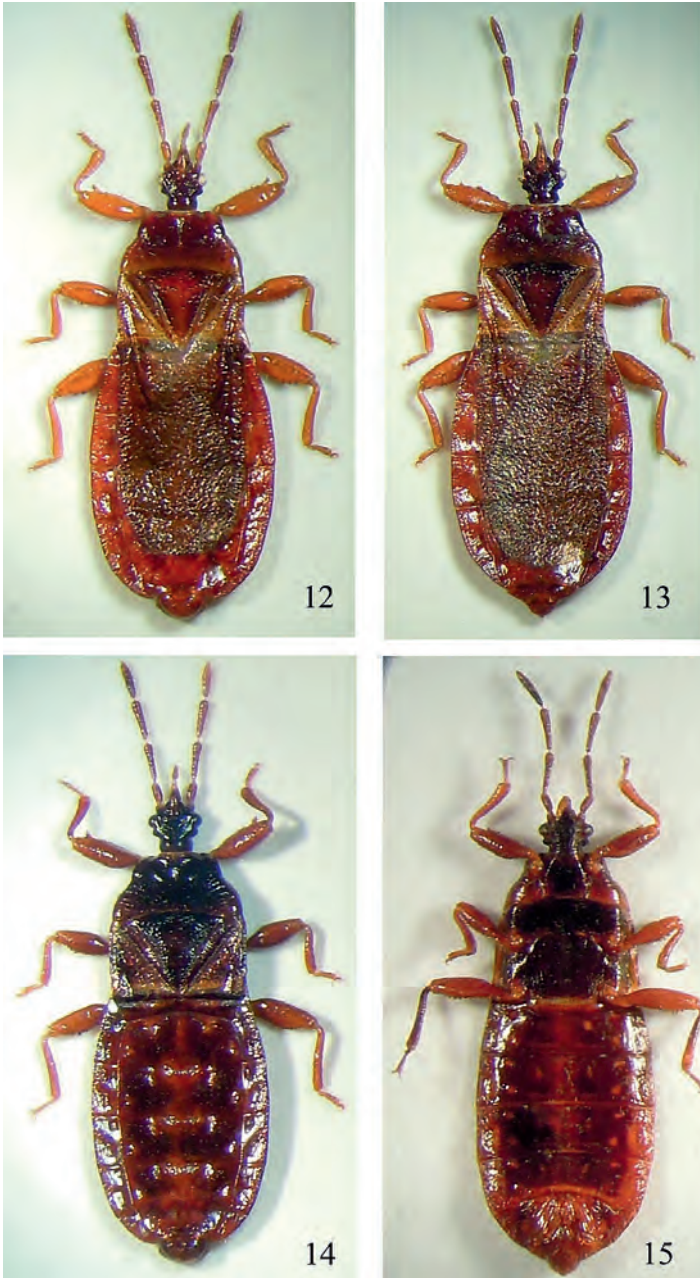
*Isodermus gayi*: CONTRERAS & COSCARON 2012: 11 (distribution, fig. habitus ♂)

SPINOLA gave in his description no locality information as well as several later literature citations, which mention only Chile (cf. COSCARON & CONTRERAS 2012).

**M a t e r i a l e x a m i n e d :** 1♂, 1♀, 8L5 (in alcohol) with label: Chile: Cautin Pr.: P.N. Villarica, Volcán Villarica, road to ski center, 1390m, 39°23.27'S, 71°57.82W, 27.xii.1996, stunted *Nothofagus pumilio* forest; under bark *Nothofagus pumilio* logs, A. Newton & M. Thayer 981, Field Museum Nat. Hist. (macropterous specimens without broken hemelytra, FMNH); 2♂♂, 1♀ with label: Chile: Malleco Pr.: P.N. Nahuelbuta, vic. Pehuenco (Centro de Visitantes), 1130m, 37°49.6'S, 73°00.47'W, 25.xii.2002, *Nothofagus* sp. (decid.) w/shrubby understory, no bamboo: under bark, Solodovnikov 1056, Field Museum Nat. Hist. (macropterous specimens without broken hemelytra, FMNH); 1♂, 1♀ 21 V 2001 / Las Trancas / Chili (region X) // S40.30391° / W 73.36397° / Alt. 320m GPS 58 // Bord de route, bois, / grumes, sous écorce / J-C Streito // (specimens with broken hemelytra, CEHI); 1♀ Feuerland / Ushuaia, Nielsen / 30 I 1931 // (unbroken hemelytra, CEHI); 3♀♀ // Chile: Magelhaes / I.Navarino / Pto. Williams / 6.8.III.1961 // Boris Malkin / Collector / Bishop Museum // (broken hemelytra, CEHI); 6♂♂, 10♀ Chile / Chuquenco / XI 1977 / E.E. Peña // (broken & unbroken hemelytra, CEHI); 4♂♂, 3♀♀ Chile W Reg. IX / Lastaria-Loncoche / 24 I 2005 Snižek lgt. // (broken & unbroken hemelytra, CEHI); 4♂♂, 4♀♀, 1L5 Chile VII r. 14-16.5 / 2005 Alto Vilches / 35°35'949 - 71°02'947 / 1400-1800m, S. Bilý lgt. // (broken & unbroken hemelytra, CEHI).

The genus *Isodermus* is regarded as a typical Gondwanian faunal element with circumantarctic distribution from Australia, New Zealand and Tasmania to southern South America. To date six species are described but *Isodermus gayi* is the only one occurring in South America.

WYGODZISKY, 1946 published a scholarly detailed study of this species including genitalic structures and refers to the sexual dimorphism in the size of spines of the fore femora.



**Figs 12-15:** *Isodermus gayi* (12) male with complete membrane; (13) female with complete membrane; (14) male with membrane broken at level of scutellum; (15) female, ventral side.

There is a tendency to break off the membrane of the hemelytra at a line of weakness at level of apex of scutellum. The reason is unknown and broken hemelytra can be observed in both sexes usually macropterous.

**D i s t r i b u t i o n :** Chile (literature citations without localities), Los Muermos forest, Puntarenas; Argentina (several localities cf. COSCARON & CONTRERAS 2012a).

### Subfamily *P r o s y m p i e s t i n a e* USINGER & MATSUDA, 1959

#### Tribe *Llaimacorini* KORMILEV & FROESCHNER, 1987

#### *Llaimacoris penai* KORMILEV, 1964 (Figs 16-19)

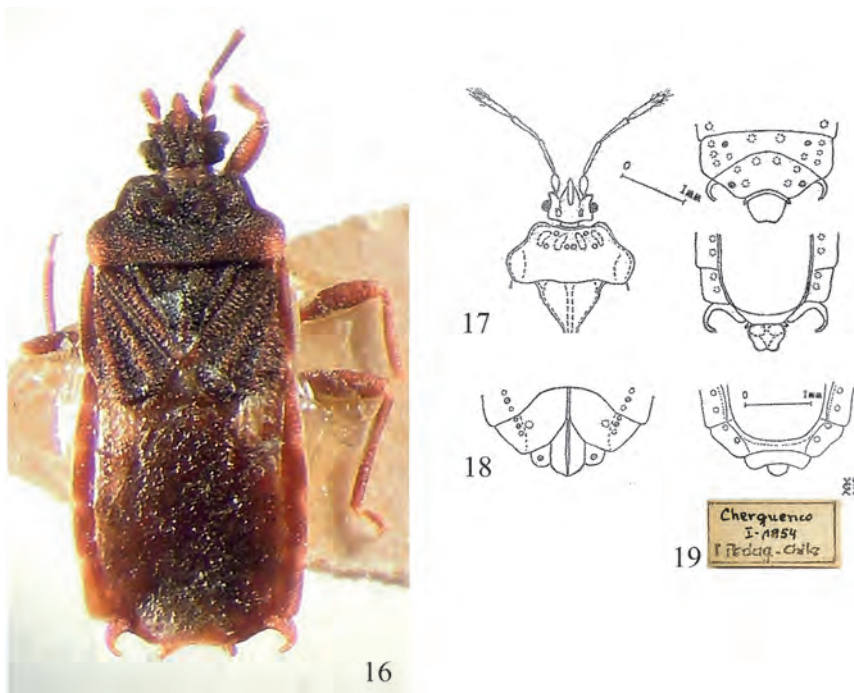
*Llaimacoris penai* KORMILEV, 1964: 118 (original description, figs terminal segments ♂, ♀)

*Llaimacoris penai*: COSCARON & CONTRERAS 2012 (catalog, distribution)

To date only the male holotype, a male and three female paratypes are recorded from Chile, Prov. Cautin, Cherquenco I-II 1954, L. Peña leg.. No further records are reported in the literature since.

**M a t e r i a l e x a m i n e d :** 1♂ from the type locality, labelled: Cherquenco / I 1954 / (illegible word)- Chile // (from collection L.Peña) (CEHI). This damaged specimen from the type locality is figured (Fig.16)

**D i s t r i b u t i o n :** Chile, Cautin Province, Cherquenco.



**Figs 16-19:** *Llaimacoris penai*. (16) male from Cerquenco, damaged and pygophore missing; (17) original illustrations of a male: head and pronotum, terminal segments ventral and dorsal; (18) ditto of female terminal segments (from KORMILEV 1964); (19) label of topotypical male of fig. 16.



Subfamily *Mezirinae* OSHANIN, 1908*Mezira americana* (SPINOLA, 1852) (Figs 20-22)*Brachyrhinchus americanus* SPINOLA, 1852: 202 (original description)*Mezira americana*: SIGNORET 1863: 576 (taxonomy)*Mezira americana*: KORMILEV 1953: 227 (figs terminal segments ♂, ♀, distribution in Argentina)*Mezira americana*: KORMILEV & FROESCHNER 1987: 148 (catalog)*Mezira americana*: COSCARON & CONTRERAS 2012: 48 (catalog, bibliography)*Mezira americana*: CONTRERAS & COSCARON 2012: 18 (figure habitus ♂, distribution)

**Figs 20-22:** *Mezira americana*: (20) habitus male; (21) habitus female; (22) female, ventral.

**Material examined:** ♂♂, ♀♀ (in alcohol) with label: Chile: Osorno Pr.: P.N. Puyehue, Antillanca road, 750m, 40°46.40'S, 72°16.60'W, 1.i.1997, *Nothofagus* spp. forest; under bark, *Nothofagus* log, A. Newton & M. Thayer Field Museum Nat. Hist. (FMNH); ♂♂, ♀♀ (in alcohol) with label: Chile: Valdivia Pr.: Rincón de la Piedra, turnoff 14.8km SE Valdivia, 50m, 39°55.32'S, 73°06.27'W, 2.ii.1997, disturbed Valdivian rainforest w/ *Nothofagus dombeyi*, *Podocarpus saligna*; under bark, *Persea lingue* log, A. Newton & M. Thayer 990, Field Museum Nat.Hist. (FMNH); 2♂♂ Chile / Pichinahuel / Arauco, XII 1976 / L.Peña leg. // (CEHI); ♂♂, ♀♀ Chile / Malleco Province / Lonquimey / I 2004 A.Peña leg. // (CEHI); 1♂ Chile, X r. 6.2.2005 / 45km W of / La Unión / 40°12'784 – 73°23'462 / 900m, Sv. Bilý leg. // (CEHI); 3♂♂, 4♀♀ Chile, IX r. 12-14.II / 2005, Trm.de Tolhuaca / 38°14'162 – 71°44'027 / 900m, S. Bilý lgt. // (CEHI); 2♂♂, 1♀♀ Chile, IX r. 4-5.II / 2005, Laguna kalma / 38°49'148 – 71°19'097 / 1250m, S. Bilý lgt. // (CEHI); 1♂, 3♀♀ Chile E Reg.VIII / E of Curacautin / Rio Blanco // 13 II 2005 Snižek lgt. (CEHI); 1♀ Chile W Reg.X / Purranque 600m/ W of Hueyusca / 26 I 2005 Snižek lgt. // (CEHI); 1♀ Chile CW, reg.XI / W of La Unión / E of El Mirador / 27 I 2004 / lgt. M.Snižek // (CEHI); 3♂♂, 3♀♀ Chile – Isla de Chiloe / 30km SW Ancud, 10.2.2005 / 41°58.3'S, 73°59.1'W 7 leg. M.Halada, 250m // (CEHI); 1♂, 1♀ 26 I 2001 / Paillaco / Chili (region IX) // S39.21380° / W71.72117° / Alt.460m GPS 73 // Forêt sombre sous écorces, bois mort / J-C Streito // (CEHI); 1♂, 1♀ Chile – S Chile / lg.H.Franz / SA 169 (on reverse side) // (CEHI); 1♀ Chile Cautin Prov. / Villarica 30km II 16-31 XII-964 / L.Peña // (CEHI); 1♀ Chile Cherquenca / Cautin I 1954 / L.E.Peña // (CEHI).

Seems to be the most common Aradid species in Chile and was collected even in large numbers under bark of *Nothofagus* sp.

**Distribution:** Chile: literature citations (partly without localities): Algo, Antihue, Corral, Los Lirios, Valdivia, Los Muermos Forest, Osorno, Puhue, Purranque, NE Pucon, El Abanico, Bio Bio, Lago Llanquihue, Sierra de Nahuelbuta, Cayutúe. Argentina: several literature records.

***Neuroctenus chilensis* KORMILEV, 1975** (Figs 23-26)

*Neuroctenus chilensis* KORMILEV, 1975: 12 (original description, figures terminal segments of ♂)

*Neuroctenus chilensis*: COSCARON & CONTRERAS 2012: 67 (catalog, bibliography)

*Neuroctenus chilensis* was described upon a single male from Chile, W of Angol, crest of Sierra Nahuelbuta, 1200m; the holotype is the only record to date.

Species of the genus *Neuroctenus* are macropterous and good flyers, of which 35 species are reported from the Neotropical Region. Therefore it seems unlikely that such a species remains unrecorded for the last 40 years. As this taxon is virtually unknown, photos of the holotype are presented here for the first time to facilitate its recognition. This is credited to Mrs. Rachel Diaz Bastin from the Californian Institute of Science (CAS) where the type is housed.



**Figs 23-26:** *Neuroctenus chilensis*, male holotype. (23) habitus dorsal; (24) lateral view; (25, 26) labels attached to the pin.

As the last key, presented by KORMILEV, 1973 for neotropical *Neuroctenus* is outdated and no other one including all later described species is available, a comparative examination of the types of several habitually similar species would be necessary for a reliable identification of these taxa to proof if *N. chilensis* is a synonym of another already described species or true endemic to Chile.

**D i s t r i b u t i o n :** Chile: Only recorded from the holotype.

### Discussion

When new collecting methods – eg. sifting of leaf litter and bark debris – suitable for searching apterous Aradidae, will be adopted, it can be expected, that further flat bug species come to light, increasing the presently poor number of recorded taxa.

### Acknowledgments

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