



## Annotated list of island lady beetles from Chile (Coleoptera: Coccinellidae)

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### Abstract

We provide a list of coccinellids (Coleoptera: Coccinellidae) species from the island territories of Chile. We report a total of 68 records, coming from ten islands, including 42 species corresponding to more than 35% of the species of the country. This paper presents the first Coccinellidae records for the Islas Desventuradas, Isla Mocha and Isla Tenglo. Contrary to what has been reported on other islands and other taxonomic groups in Chilean islands, the level of coccinellid endemism is low (8%), with only one and two species endemic to the Juan Fernández archipelago and Isla de Chiloé, respectively, and probably a fourth species from the Isla Grande de Tierra del Fuego. The presence of species with worldwide distribution and of agricultural relevance is strong in the Chilean oceanic islands, particularly in Rapa Nui. The fauna of the continental islands is very similar to the one in the nearby continental areas and composed of native species. Further surveys of Coccinellidae and other insects are required for the islands of Chile, especially for several of them in which there are no records.

**Key words:** ecosystems, endemism, species list, isolation

### Introduction

Island ecosystems are ideal to examine a variety of ecological and evolutionary phenomena (Simberloff 1974; Yamanaka *et al.* 2015; Mikheyev *et al.* 2017). Many of them present high levels of endemism. For example, it is estimated that 68% of the Coleoptera species from the Hawaiian Islands are endemic (Eldredge & Miller 1995), and a similar situation happens in the Juan Fernández archipelago, Chile, where 70% of insects are considered endemic (Haberle 2009). Associated with the degree of endemism and due to the geographic isolation, islands are the most suitable scenario for several evolutionary phenomena as adaptive radiations (e.g., Coleoptera: Curculionidae: Cryptorhynchinae from Rapa, French Polynesia (Paulay 1985)), insular gigantism (e.g., weta crickets (Orthoptera) from New Zealand (Morgan-Richards 2001)), among others. At the same time, all this biodiversity is highly threatened by direct anthropic disturbances and climate change, therefore it is of high priority to know the local fauna in order to create better protection plans, or at least document it before it goes extinct (New 2008).

The relevance of researching insects on islands is related to the fact that they represent a large proportion of the animal species present in these ecosystems. Similar situation occurs with the microscopic fauna in marine environments (Martínez *et al.* 2019). However, due to the immense diversity of insects, most groups have not been deeply studied and many regions are poorly known. Regardless the fact that there are many studies in insular territories for Coccinellidae (e.g., Blackburn & Sharp 1885; Timberlake 1943; Van Dike 1953; Chapin 1965; Leeper 1976; Eizaguirre 2007; Romanowski *et al.* 2019, 2020), none of them describes, in a comprehensive way, the diversity of Coccinellidae in the Chilean islands.

Chile has 3,779 islands, representing 14% of its territory (Instituto Geográfico Militar 1988). Oceanic or volcanic islands are clustered in three groups: Juan Fernández archipelago, Islas Desventuradas and Rapa Nui, each

one with a different distance from the mainland, but all of them with a least more than 500 km (see Table 1 and Fig. 1). This degree of isolation has favored the development of *in situ* diversification and endemism (Kuschel 1963, Haberle 2009), however, all these islands have also been affected by biological invasions (Ingram *et al.* 2006).

Along the coast, particularly in the south of the country, it is possible to find continental islands. They correspond to the highest peaks of the Cordillera de la Costa, which is mostly submerged at those latitudes. The size of these islands is generally larger than the oceanic, and they have a lower level of isolation, being separated from the mainland by fjords and canals (Table 1). Among the largest continental islands are Isla Grande de Chiloé, Isla Riesco, Isla Wellington and Isla Grande de Tierra del Fuego, the last one shared with Argentina (Instituto Geográfico Militar 1988).

**TABLE 1. Islands in the study area.**

Island or Archipelago	Type	Latitude	Area	Distance
Desventuradas	Oceanic	26.2° S	4 km <sup>2</sup>	900 km
Rapa Nui	Oceanic	27.0° S	163 km <sup>2</sup>	3700 km
Juan Fernández	Oceanic	33.4° S	100 km <sup>2</sup>	600 km
Mocha	Continental	38.2° S	52 km <sup>2</sup>	34 km
Tenglo	Continental	51.6° S	4 km <sup>2</sup>	0.2 km
Chiloé	Continental	41.8°–43.3° S	9000 km <sup>2</sup>	2 km
Guarello	Continental	50.23° S	17 km <sup>2</sup>	1 km *
Riesco	Continental	53.0° S	5000 km <sup>2</sup>	1 km
Tierra del Fuego	Continental	52.0°–55.0° S	22600 km <sup>2</sup>	3.7 km
Navarino	Continental	55.0 ° S	2473 km <sup>2</sup>	1 km *

\* in these cases, is the distance to the nearest island, not to the continent

The entomofauna of Chilean islands has been rarely addressed in literature, and the family Coccinellidae is not the exception. There are few publications that systematically review the Coccinellidae fauna in the Chilean insular territories. The first reference of an island Coccinellidae in Chile was in 1842, when *Eriopsis opposita* Guérin-Méneville was described from the Juan Fernández archipelago. Blackwelder (1945) referenced four island species, particularly from Chiloé, Juan Fernández archipelago and the Isla Grande de Tierra del Fuego. Kuschel (1963) referenced three unidentified species from the Juan Fernández archipelago, while Campos & Peña (1973), identified two species in Rapa Nui, and Desender & Baert (1996), also reported seven Coccinellidae species in the same island. In the most recent list of Coccinellidae species from Chile (González 2019), a total of 21 island species were recorded, distributed between Rapa Nui, Juan Fernández archipelago, Chiloé, Tierra del Fuego and Navarino islands.

Here, we review the presence and distribution of species from the family Coccinellidae on island territories from Chile, combining literature and museum records, with new field information.

## Material and methods

Species records were extracted from literature, the web site Coccinellidae de Chile (González 2006) and the following collections and Museums: BMNH: British Natural History Museum, London, UK; CALH: Alfredo Lüer private collection, Santiago, Chile; CPAZ Álvaro Zúñiga private collection, Punta Arenas, Chile; CPDC: Darko Cotoras private collection, Santiago, Chile; CPGG: Guillermo González private collection, Santiago, Chile; CZIP: Instituto de la Patagonia, Universidad de Magallanes, Punta Arenas, Chile; JEBC: Juan Enrique Barriga-Tuñón private collection, Curicó, Chile; MNHN: Museo Nacional de Historia Natural, Santiago, Chile; UCCC: Museo de Zoología, Universidad de Concepción, Concepción, Chile; UMCE: Departamento de Biología, Universidad Metropolitana de Ciencias de la Educación, Santiago, Chile; USNM: U.S. National Museum of Natural History, Smithsonian Institution, Washington, USA. Additionally, for the invasive species *Harmonia axyridis*, records were provided from the Servicio Agrícola y Ganadero of Chile (SAG, personal communication) and the citizen science initiative “Chinita arlequín” (Grez & Zaviezo 2015). The biogeographic regions used are based on Peña (1966). The locations of the species cited by Desender & Baert (1996) were deduced from the species maps included in that work. The refer-

ences on the Examined Material sections are literal copies from the specimen labels, with correction of obvious misspellings, any additional clarification was added in brackets [ ].

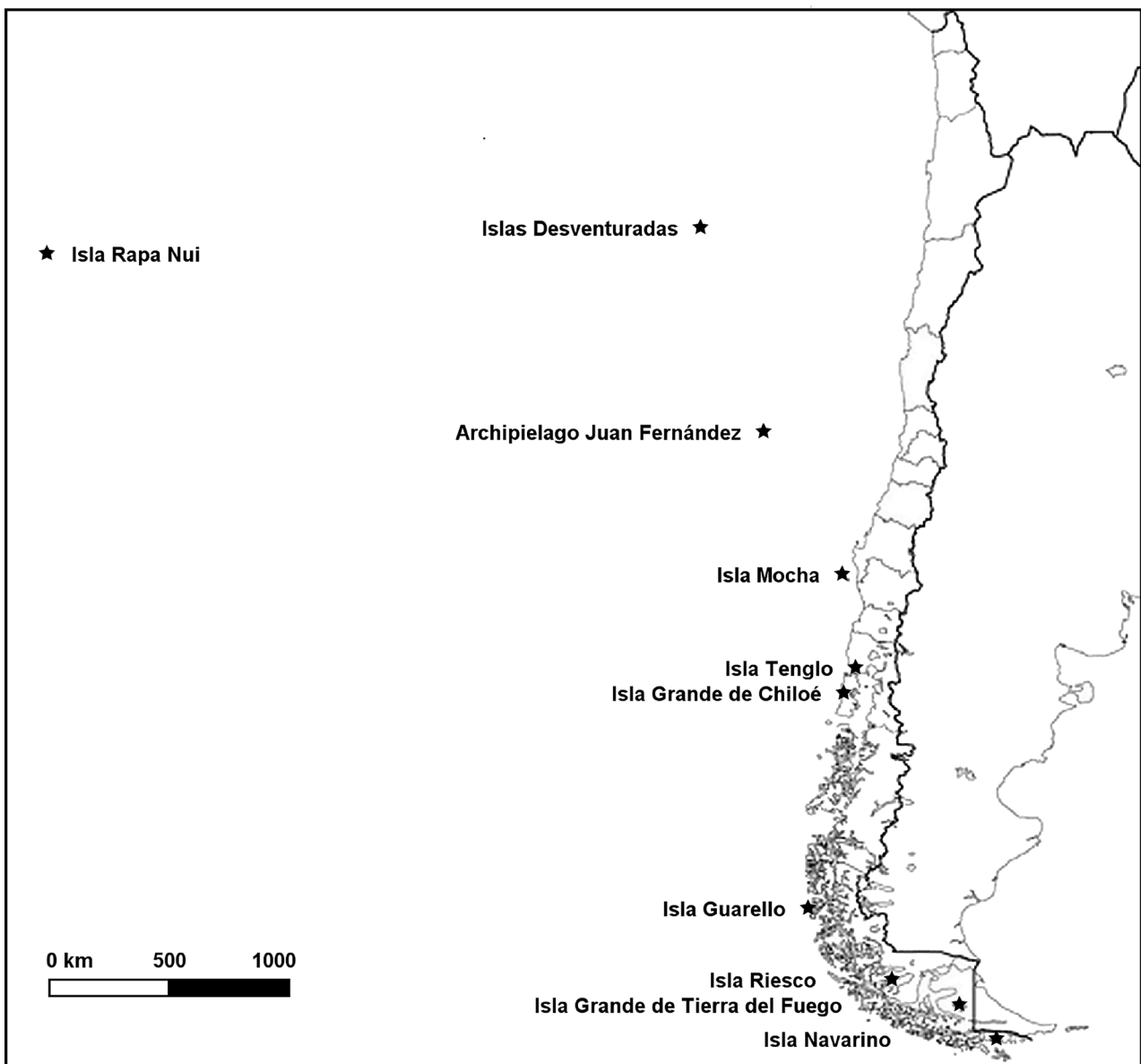


FIGURE 1. Geographic distribution of the examined territories

### Study area

(Table 1 and Fig. 1)

### Oceanic islands

**Islas Desventuradas**—Correspond to two small islands, San Félix and San Ambrosio (Table 1, Figs. 1, 2a), and two little islets. The archipelago is located off shore from the city of Chañaral. It does not have permanent human population. The weather is Mediterranean, hot and oceanic, with an average rainfall of 100 mm per year (Hoffmann & Teillier 1991). The vegetation is scarce. There is a total of 19 species of vascular plants with seeds, 12 (63%) of them endemics (Horst 1949). However, during the last decades the flora has changed, now including several introduced species (Castro *et al.* 2007). The terrestrial fauna is scarce due to the high isolation and low precipitation (Hoffmann & Teillier 1991). Particularly, the invertebrate fauna has been poorly characterized, with a total of 107 species. Approximately, 50% of them have been classified as endemics, however the majority have not been properly studied (Kuschel 1963). Currently those islands have conservation issues due to the historic introduction

of mammals, which deteriorated the little vegetal cover available (Molina & Guerra 2018). Up to now, no Coccinellidae has been reported to the islands.

**Rapa Nui**—Also known as Isla de Pascua or Easter Island, it is located 3,700 km west from the city of Caldera, at 27°S (Table 1, Figs. 1, 2b). Its climate is classified as subtropical oceanic with more than 1,100 mm of rain per year and temperatures that oscillate between 15° and 28°C (Pérez & Rodríguez 2011). Before the arrival of Europeans, the island already had a high degree of deforestation (Mann *et al.* 2008), situation which turned for the worst in the following years (Fischer 2005). The island was originally covered by a palm forest and the understory was composed by a collection of species typical of Polynesian islands (Dubois *et al.* 2013). Its pre-human fauna includes at least five species of terrestrial birds, but today there are only archeological records of them (Steadman 2007). There are 168 species of insects and 48 of arachnids recorded, less than a dozen are endemics (Berland 1924; Zimmermann 1924; Hammer 1970; Campos & Peña 1973; Desender & Baert 1996; Cotoras *et al.* 2017a). In recent years, 10 new species of invertebrates have been described for cave systems (Jordana & Baquero 2008; Mockford & Wynne 2013; Bernard *et al.* 2015; Taiti & Wynne 2015). However, many of the species of terrestrial invertebrates have not been recorded since their original description, suggesting potential extinctions as is the case of the endemic spider *Tetragnatha paschae* Berland (Arachnida: Araneae: Tetragnathidae) (Cotoras *et al.* 2017b). In 1935 the island was declared a national park (Parque Nacional Rapa Nui) and in 1976 the neighborhood marine areas were declared nature sanctuary. The Coccinellidae fauna was reviewed by Campos & Peña (1973), recording two species.

**Juan Fernández archipelago**—The archipelago is composed by three main islands: Robinson Crusoe (former “Más atierra”), Alejandro Selkirk (former “Más afuera”) and Santa Clara. It is located 670 km west from the city of San Antonio in the continent (Table 1, Figs. 1, 2c). The climate is maritime, temperate and humid, with an annual rainfall of 1,000 mm spread through the year (IREN 1982). There are high levels of endemism on many groups as plants, birds and terrestrial invertebrates (Haberle 2009). Kuschel (1963) reported 687 species of insects, from which about 440 (64%) were endemics. Among the major conservation threats, there is the introduction of invasive species (Vargas *et al.* 2011). Currently, the archipelago has the category of National Park (1935) and Biosphere Reserve (1977). Six species of Coccinellidae are known, including an endemic species, *Eriopis opposita* (Guerin-Meneville) (González 2006, 2008, 2019).

### **Continental islands**

**Isla Mocha**—Located west of Arauco province, in the biogeographic region known as North Valdivian forest (Peña 1966) (Table 1, Figs. 1, 2d), has an oceanic, temperate and humid weather. Its annual rainfall is around 1,350 mm. The central part of the island is covered by native forest and is protected as a National Reserve (Reserva Nacional Isla Mocha). The vegetal formation of the island is very similar to hydrophilic Valdivian forest, but with the remarkable absence of the genus *Nothofagus* (Nothofagaceae) (Pefaur & Yáñez 1980). There are no publications on the Coccinellidae of the island.

**Isla Tenglo**—Small island located in front of Puerto Montt city, it is separated from the city by a channel of no more than 200 m (Table 1, Figs. 1, 2e). Biogeographically it is classified as Valdivian forest, formation which extends along the coast of Chile from 41°S to 51°S (Peña 1966). It has a temperate, rainy, maritime weather with a rainfall between 2,000 and 3,000 mm per year (Díaz & Armesto 2007). The original vegetation of this area has been heavily reduced due to agriculture, cattle and tourism activities. There are no references of Coccinellidae species in the island.

**Isla Grande de Chiloé**. Located in the south corner of Los Lagos Region, in the biogeographic area of Valdivian forest (Peña 1966) (Table 1, Figs. 1, 2f). Geologically it is a continuation of the “Cordillera de la costa”, which peaks emerged from the sea after the sinking of the central valley. It has a temperate humid climate with strong oceanic influence, with an annual rainfall between 2,000 and 2,500 mm (Díaz & Armesto 2007). The original plant formation of this island is an evergreen forest with a large diversity of species, dominated in the more humid areas by coigüe (*Nothofagus dombeyi* (Mirb.) Oerst) (Luebert & Pliscoff 2005). However, the forest has been degraded due to invasive species, agriculture, cattle ranching and forest fires (Aravena *et al.* 2002; Quintanilla 2004). A total of 13 species of Coccinellidae are known from the island (González 2006; 2008; 2019), including the endemic species *Eupaleoides chiloensis* (Gordon 1994).



**FIGURE 2. Islands landscapes:** a: San Ambrosio Island, Islas Desventuradas (Lukas Mekis, Island Conservation). b: Rano Kau crater, Rapa Nui (DDC). c: Robinson Crusoe Island, Juan Fernández archipelago (DDC). d: Isla Mocha (DDC) e: Isla Tenglo (foto Manxuc, Wikipedia). f: Isla de Chiloé, (DDC). g: Isla Guarello (Carlos Pedraza, Wikipedia). h: Isla Riesco (kauyeken. cl). i: Isla Grande de Tierra del Fuego (DDC). j: Isla Navarino (DDC).

**Isla Guarello**—Small island located in the Madre de Dios archipelago. Geologically is almost completely formed by calcium carbonate, reason why mining operations have been established on the island (Bravo 2019) (Table 1, Figs. 1, 2g). It belongs to the biogeographic region called Austral Pacific (Peña 1966) and it is almost uninhabited. The weather is temperate, cold and rainy, with an annual rainfall between 8,000 to 10,000 mm, being affected permanently by strong winds of up to 210 km/h (Bravo 2019). In elevations lower than 50 m it has a plant cover dominated by coigüe de Magallanes (*Nothofagus betuloides* (Mirb.) Oerst), tepú (*Tepualia stipularis* (Hook. & Arn.) Griseb.) and canelo (*Drimys winteri* Forst & Forst), all those trees are typical of the Magellanic region. There is only one species of Coccinellidae recorded, *Orynipus ultimensis* (Gordon 1994).

**Isla Riesco**—The fourth largest island in Chile, it is located in the Magallanes province at the same latitude as the city of Punta Arenas (Table 1, Figs. 1, 2h) and it is separated from the mainland by a narrow channel of 1 km. It comprises different habitats: the northeast corner belongs to the Interoceanic Magellanic region with a low rainfall between 300 and 1,200 mm while the southwest corresponds to the Austral Pacific zone with an annual rainfall which can go up to 9,000 mm (Peña 1966). More than a half of the island is protected as the Kawésqar National Park, which extends to the north up to Madre de Dios archipelago, and to the south to Cabo de Hornos, with a mix of ecosystems including cold steppe, shrubs, peat land and Magellanic rainforest. This last forest formation is dominated by coigüe de Magallanes, ciprés de las Guaitecas (*Pilgerodendron uviferum* (D. Don) Florin), lenga (*Nothofagus pumilio*) and canelo. The typical fauna includes culpeo fox (*Lycalopex culpaeus* (Molina)), huemul (*Hippocamelus bisulcus* (Molina)) and sea otter (*Otaria flavescens* Show) (Markham 1970; Conaf 2014). The other half of the island has large cattle and mining operations. Coal mining is a threat to wildlife, as it has been reported by the Environmental Qualification Resolutions generated by the Chilean government. Two species of Coccinellidae have been reported to the island (Zúñiga-Reinoso 2011).

**Isla Grande de Tierra del Fuego**—This island is in the Magellanic Region and it is shared with Argentina (Table 1, Figs. 1, 2i). The Chilean side has an area of approximately 22,600 km<sup>2</sup>, been the largest island of the country. It is separated from the mainland by the Strait of Magellan, which on its narrower part extends for 3.7 km. Biogeographically this island is included in the Interoceanic Magellanic and Pacific Austral regions (Peña 1966). The weather is very variable with dry areas with an annual rainfall of 300 mm (Cold steppe and Transandean), and others with up to 3,000 mm of annual rainfall, strong wind gusts and snow in the south part of the island (Isothermic tundra) (IREN 1967). The plant formations are diverse, in the north there are steppe areas and grass semi deserts (Patagonian steppe), while in the south, dominates the deciduous Magellanic forest. The flora and fauna are diverse, but there is a small number of endemic species due to the continuity of the environment with those present on the mainland (Pisano 1981). Among the biggest conservation threats, it is the beaver (*Castor canadensis* Linnaeus) introduction, started in 1945 and since then the beaver population has increased and modified water courses and producing local deforestation (Baldini *et al.* 2008). Currently, seven species of coccinellids are known from the island (González & Vandenberg 2006; González 2006, 2008, 2019; Zúñiga-Reinoso 2011).

**Isla Navarino**—This island is on the south end of the continent separated from Tierra del Fuego by the Beagle Channel, with not more than 3 km on the narrowest part (Table 1, Figs. 1, 2j). It belongs to the Interoceanic Magellanic region (Peña 1966). The dominant weather corresponds to cold temperate with an annual rainfall between 500 to 1,000 mm without obvious seasonality (Llancabure 2011). A large part of the island is covered by different types of forests, including Magellanic deciduous and evergreen forest, as well as the Magellanic tundra. The dominant tree species are lenga, ñirre (*Nothofagus antarctica* Oerst.) and coigüe de Magallanes (Pisano 1977). The fauna includes guanaco (*Lama guanicoe* Müller), culpeo fox, bats, rodents and a large number of marine mammals and birds. Among the major biodiversity threats, are the introduced species as beaver (*Castor canadensis* Linnaeus), rabbits (*Oryctolagus cuniculus* (Linnaeus)), American mink (*Neovison vison* (Schreber)) and muskrat (*Ondatra zibethicus* (Linnaeus)) (Rozzi & Sheriffs 2002). Currently, four species of Coccinellidae are known from the island (González & Vandenberg 2006; Zúñiga-Reinoso 2011).

## Results

(Table 2)

## Oceanic islands

## Islas Desventuradas

(Table 1, Figs. 1, 2a).

### *Eriopis* sp. (Brèthes, 1925) (Fig 3m).

Examined material: 1 ex. (female) “Chile, Isla de San Ambrosio, 31-08-2018, leg. María José Vilches” “SANAM-F29-N2” (CPDC); 1 ex. (female), same collection information, except by “10-9-2018” “MANTA S-4” (CPDC).

Original reference: **First record of a species of Coccinellidae for Islas Desventuradas.**

Comments: The collection of only females does not allow to differentiate between three species of similar habitus present on the mainland: *E. chilensis* Hofmann, *E. loaensis* González and *E. concordia* González. It is possible that the specimens were introduced from the continent or the Juan Fernández archipelago.

**Summary:** Given the high endemism levels on the vegetation of the island, it is expected that something similar would occur with the Coccinellidae. However, the islands have been poorly entomologically prospected (Kuschel 1963). Further collecting of males would be needed to recognize the only species known from the island.

## Rapa Nui (Isla de Pascua or Easter Island)

(Table 1, Figs. 1, 2b).

### *Adalia bipunctata* (Linnaeus, 1758) (Fig 3b).

Examined material: Not available.

Original reference: Campos and Peña (1973): “Isla de Pascua, 7/5/1972”.

Comments: Palearctic species introduced to mainland Chile in 1940 (Zúñiga 1985). Currently, established from El Loa to Última Esperanza provinces. In South America also present in Argentina, Uruguay and Perú (González 2006). Probably introduced to the island from the continent.

### *Cryptolaemus montrouzieri* (Mulsant, 1853) (Fig 5e).

Examined material: 1 ex. “Chile, Isla de Pascua, Vai Atare, 19-IV-2006, leg. J. Mondaca E.” (MNHN); 1 ex. “Chile, Isla de Pascua, Anakena, 18-IV-2006, leg. J. Mondaca E.” (MNHN); 3 exx. “Chile, Isla de Pascua, Camino a Orongo, col. [On] *E. globulus* Laval, 18-V-2006, leg. J. Mondaca E.” (MNHN); 2 exx. “Chile, Isla de Pascua, Camino a Orongo, 21-IV-2006, leg. J. Mondaca E. (MNHN); 1 ex. “Chile, Isla de Pascua, Hanga Roa, 27°09'24.6"S 109°26'08.0"W, 50m, 16-VI-2006, leg. J. Mondaca E.” (MNHN); 2 exx., same collection data, except by “21-IV-2006” (MNHN).

Original reference: González (2008): “Isla de Pascua”.

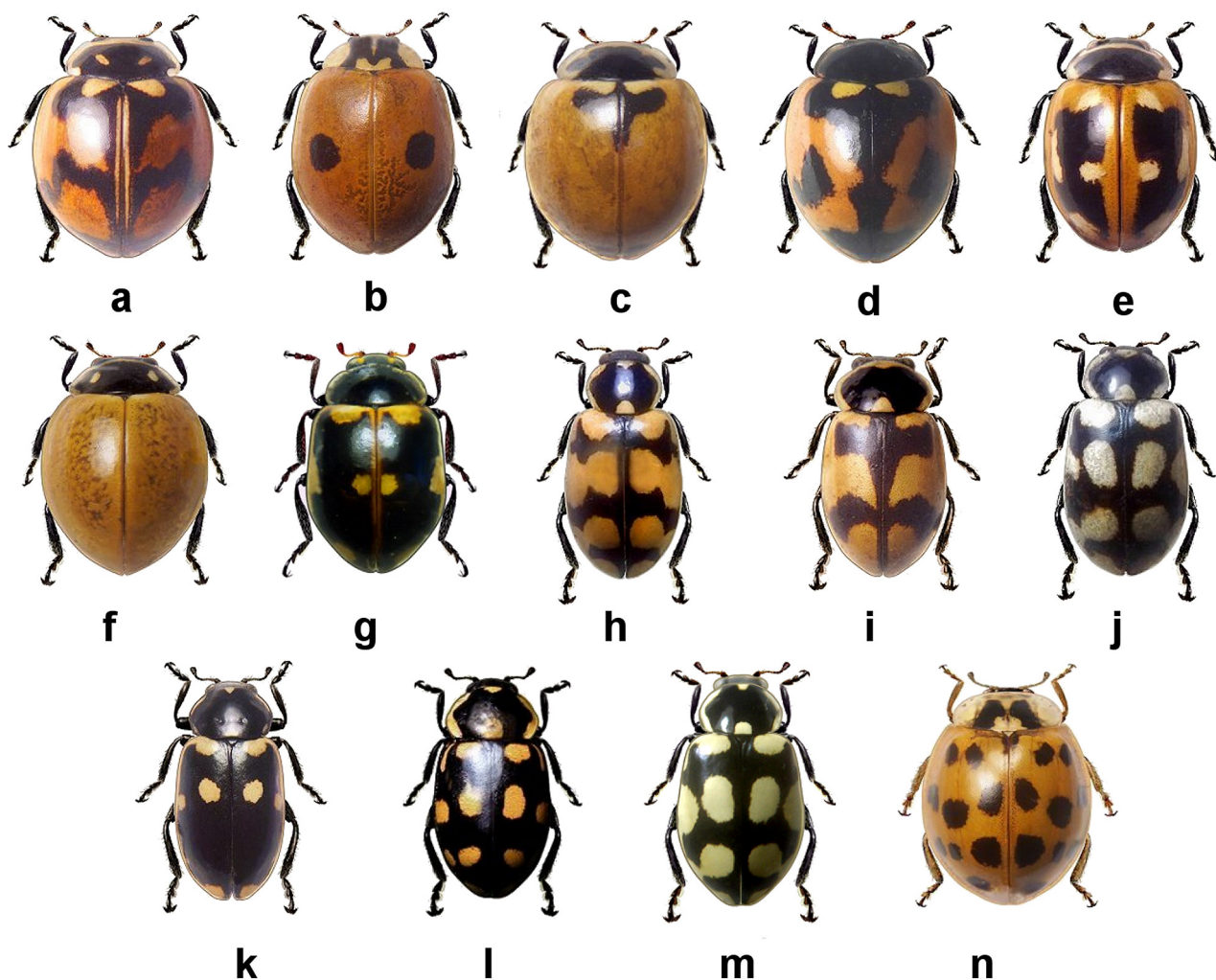
Comments: Of Australasian origin, currently with a cosmopolitan distribution. Several times between 1931 and 1975, it was introduced to Chile to control mealybugs (Hemiptera: Pseudococcidae). Currently found between Arica and Ñuble (González 2006).

### *Eriopis loaensis* González, 2014 (Fig. 3j).

Examined material: 3 exx. “Rapa Nui, 2018, leg. Darko D. Cotoras”, “♂ 1950” “*Eriopis loaensis*, det. G. González, 2019” (CPDC).

Original reference: **First record of this species for Rapa Nui.**

Comments: *Eriopis loaensis* is an endemic species from Chile, distributed between the provinces of Antofagasta and El Loa, 400 km north of Isla de Pascua.



**FIGURE 3. Island Coccinellidae from Chile, Coccinellini Part I.** a: *Adalia angulifera*; b: *A. bipunctata*; c: *A. deficiens* ; d: *A. kuscheli*; e: *Cycloneda gemainii*; f: *C. limbicollis*; g: *C. patagonica*; h: *Eriopis chilensis*; i: *E. eschscholtzii*; j: *E. loaensis*; k: *E. magellanica*; l: *E. opposita*; m: *Eriopis* sp.; n: *Harmonia axyridis*.

***Harmonia axyridis* (Pallas, 1772) (Fig 3n).**

Examined material: “II-2019, in avocado and lemon trees”, SAG.

Original reference: **First record of this species for Rapa Nui.**

Comments: This Asian species has been worldwide introduced, with presence in Chile since at least 2003 (Grez *et al.* 2010). Currently established between Iquique and Puerto Montt, with additional records in Arica and Magallanes. It is also present in most of the countries in South America (González 2006). This species has been assigned several times as a threat to local Coccinellidae, based on the effects reported in Chile and in other countries where it has established (Grez *et al.* 2016; Roy *et al.* 2016).

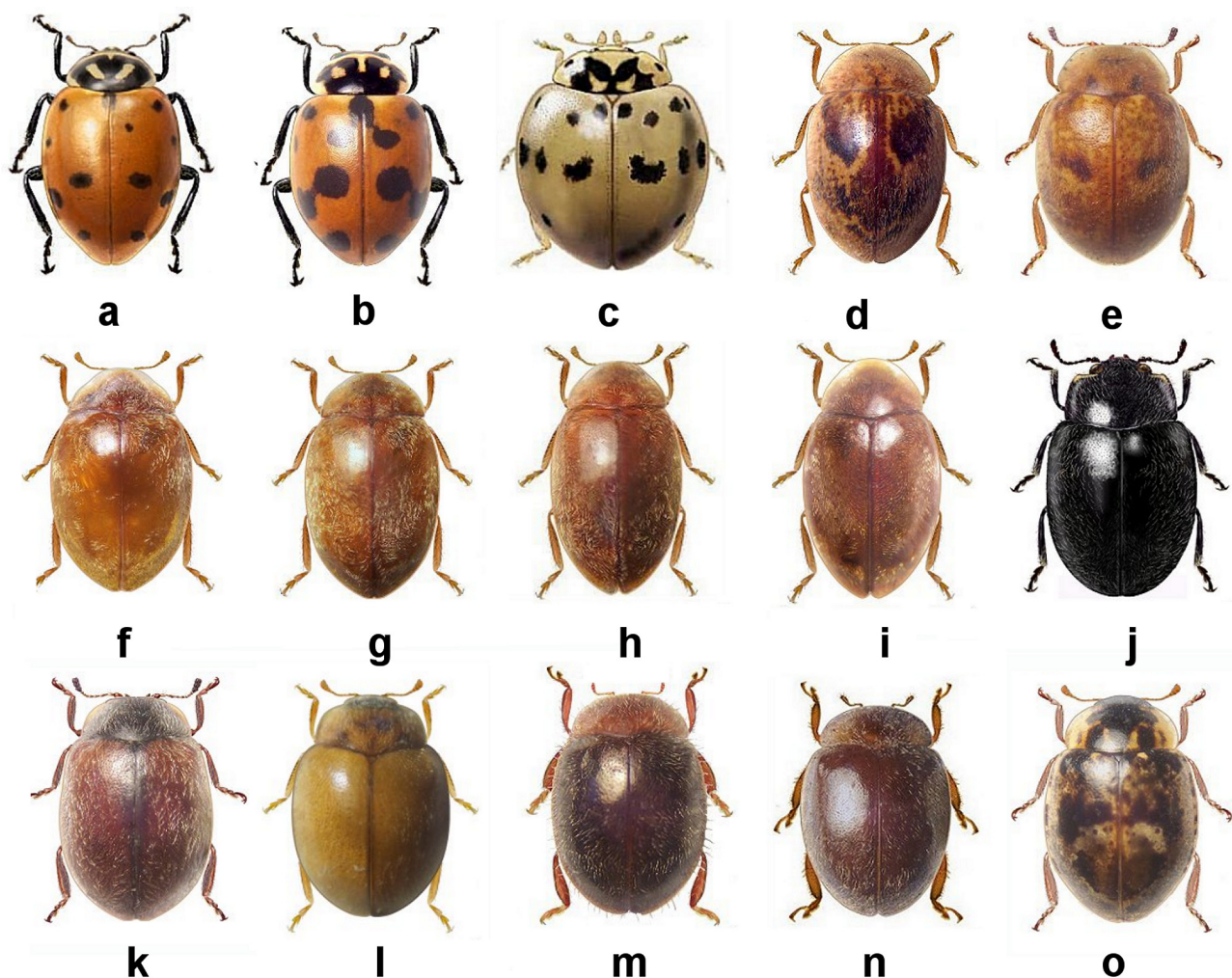
***Heterodiomus* sp.**

Examined material: Not available.

Original reference: Desender & Baert (1996): “*Heterodiomus* spec. 1, Easter Island, [Nr.16], 200m, 30 November–20 December 1996, pampa with 50% of vegetation cover of grasses and small shrubs, PF [Pitfall trapping]”.

Comments: the only female specimen was determined by R.D. Gordon, who established that it was probably a non-described species introduced from the mainland (Desender & Baert 1996). Species of this genus are distributed in Chile, Argentina, Brazil and Uruguay. There is no image of this species.





**FIGURE 4. Island Coccinellidae from Chile, Coccinellini part II and Coccidulini.** a: *Hippodamia convergens*; b: *H. variegata*; c: *Olla v-nigrum*; d: *Cranoryssus variegatus*; e: *Paracranoryssus chilianus*; f: *Orynipus chilensis*; g: *O. darwini*; h: *O. kuscheli*; i: *O. ultimensis*; j: *Eupaleoides Chiloensis*; k: *Nothocolus sicardi*; l: *Nothocolus* sp.; m: *Rhizophobus lophantae*; n: *Rhizophobus* sp.; o: *Stenadalia nigrodorsata*.

***Hippodamia variegata* (Goeze, 1777) (Fig 4b).**

Examined material: 1 ex. (male) “Rapa Nui, 2018, leg. Darko D. Cotoras”, “macho 1949”, “*Hippodamia variegata*, det. G. González, 2019” (MNHN); 1 ex. (female), same collection data, except by “female1949” (MNHN); 6 exx. “Rapa Nui, 2018, leg. Darko D. Cotoras” (CPDC).

Original reference: Desender & Baert (1996): “*Hippodamia variegata* Goeze, Easter Island, [Nr.59], 40m, 30 November–20 December 1996, Residential Gomero, culture zone, garden with open grassland (60% cover)”.

Comments: Species of Palearctic origin, currently present in most continents, including South America. In Chile, it is distributed between the provinces of Arica and Cautín (González 2006). Two of the collected specimens from Rapa Nui had laboulbenial fungi (Fungi: Ascomycota), been this the first record of them on a Coccinellidae species from Chile.

***Hyperaspis festiva* Mulsant, 1850 (Fig 5i).**

Examined material: Not available.

Original reference: Desender & Baert (1996): “*Hyperaspis festiva* Mulsant, Easter Island, [Nr.45], 10m, 30 November–20 December 1996, Anakena, tall grasses regularly burned, PF [pitfall trap]”.

Comments: very abundant species in all South America, except in mainland Chile (González 2006). Species probably introduced from some other South American country.

***Olla v-nigrum*** (Mulsant, 1866) (Fig 4c).

Examined material: 13 exx. “Chile, Isla de Pascua, Hanga Roa, 27°09'24.6”S 109°26'08.0”W, 50m, 13/IV/2006, leg. J. Mondaca E.” (MNHN); 8 exx., same collection information, except by the dates “21/4/2006”, “16/6/2006” and “30/3/2006” (MNHN); 1 ex. “Chile, Isla de Pascua, Camino a Orongo, 18/5/2006, leg. J. Mondaca E.” (MNHN); 3 exx. “Chile, V. Reg, Easter Island, Mataveri, 5-XII.2015, leg. F. Ramírez” (MNHN).

Original reference: González (2008): “Isla de Pascua”.

Comments: This species is native of America, distributed from Canada to Argentina/Chile. In Chile it is present between Tarapacá and Santiago (González 2006). It is also present on islands of Micronesia and Polynesia (Chapin 1965; Nishida 2008), while in the Galápagos there are two endemic species from this genus (Vandenberg 2004).

***Parastethorus histrio*** (Chazeau 1974) (Fig 5d).

Examined material: 2 exx. “Chile, Isla de Pascua, Hanga Roa, 27°9'24.6” S 109°26'08.0” W, 21-IV-2006, col. J. Mondaca” (MNHN).

Original reference: González (2008): “Isla de Pascua”.

Comments: The native distribution of the species is around the Indian Ocean, later introduced to South America as predator for spider mites (Arachnida: Tetranychidae). It is also present in Argentina, Brazil, Perú, Paraguay and Uruguay. In Chile is distributed between Arica and Valparaíso (González 2006), where it has been recorded as a predator of mite pests *Panonychus citri* (Mc. Gregor), *Tetranychus urticae* Kock, *Brevipalpus chilensis* Baker and *Panonychus ulmi* (Koch) (Aguilera 1987).

***Rhyzobius lophantae*** (Blaisdell 1892) (Fig 4m).

Examined material: 9 exx. “Chile, Isla de Pascua, Hanga Roa, 27°09'24.6” S 109°26'08.0” W, 21-IV-2006, leg. J. Mondaca E.” (MNHN); 4 exx. same data, except by the dates “16-VI-2006” y “18-IV-2006” (MNHN).

Original reference: Desender & Baert (1996): “*Lindorus lophanthae* Blaisdell, Easter Island, [Nr.59], 40m, 30 November–20 December 1996, Residential Gomero, culture zone, garden with open grassland (60% cover)”.

Comments: An Australian species (Tomaszewska 2010) used for biological control, introduced with this purpose in Argentina, Uruguay, Perú and Chile. In mainland Chile it is established between Arica and Talca (González 2006). Here, it was introduced in 1931 and 1944 to control *Planococcus citri* (Zúñiga 1985), because it is a predator of Pseudococcidae. Currently, it is mass reared for the purpose of biological control.

***Novius cardinalis*** (Mulsant, 1850) (Fig 5f).

Examined material: 7 exx. “Chile, Isla de Pascua, Hanga Roa, 30/3/2006, leg. J. Mondaca” (MNHN); 4 exx., same data, except by the dates “1/4/2006”, “16/4/2006” y “21/4/2006” (MNHN).

Original reference: González (2008): “Isla de Pascua”.

Comments: Species successfully introduced from Australia to USA in 1888 to control *Icerya purchasi* (Hemiptera: Monophlebidae), a pest which was attacking the citrus plantations in California. This species has been historically assigned to the genus *Rodolia* Mulsant, and has recently been assigned to *Novius* Mulsant (Kondo & González 2020, Pang et al. 2020). Currently present in all South America, in Chile introduced in 1931 (Zúñiga 1985), with established populations between Arica and San Antonio (González 2006).

***Scymnus (Pullus) loewii*** Mulsant 1850 (Fig 5h).

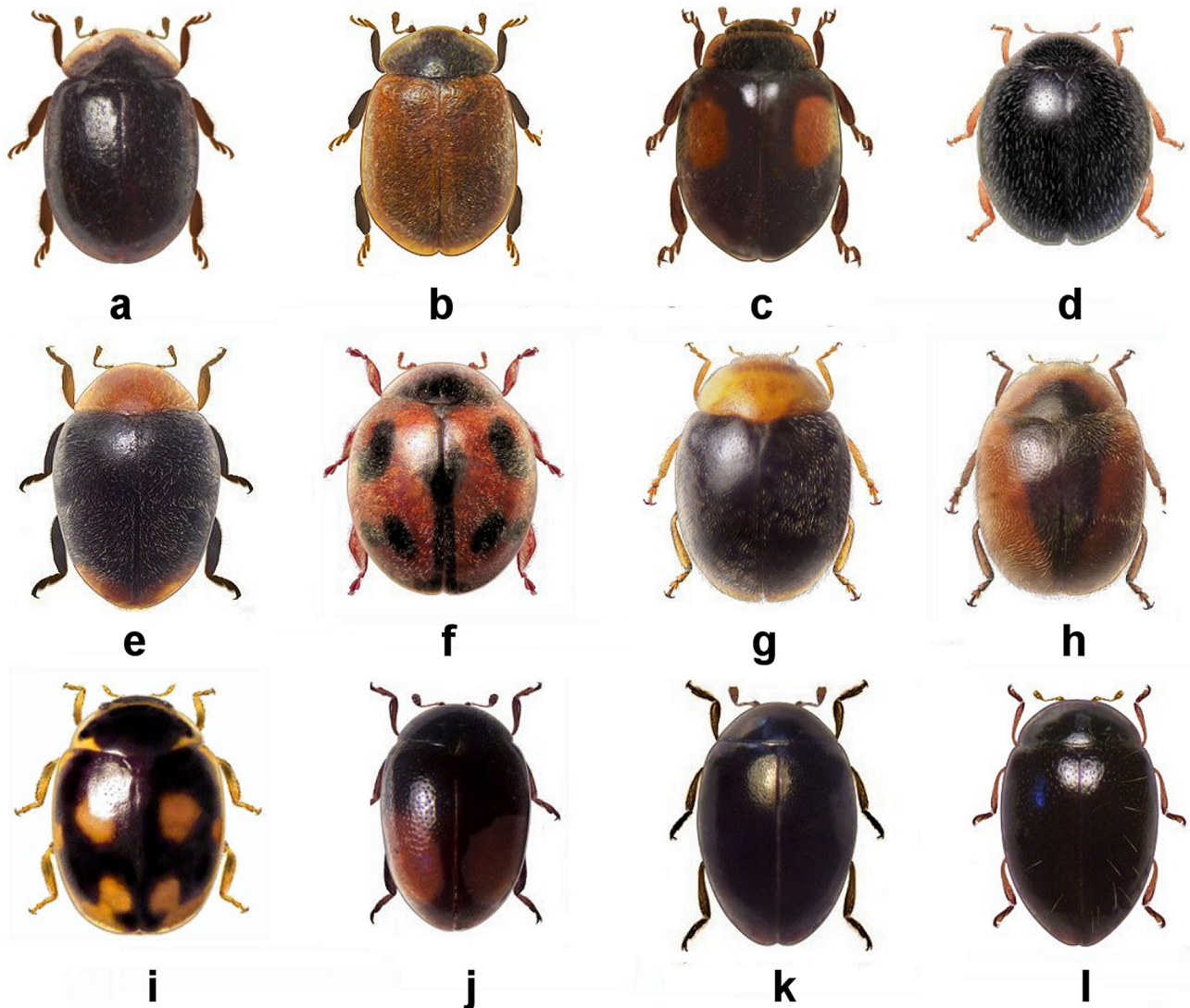
Examined material: Not available.

Original reference: Desender & Baert (1996): “*Scymnus loewii* Mulsant, Easter Island, [Nr.59], 40m, 30 November–20 December 1996, Residential Gomero, culture zone, garden with open grassland (60% cover)”.

Comments: North American species. Currently present in all South America, in mainland Chile recorded in 1989 (Aguilera & Rojas 1989), with established populations between Arica and Ñuble (González 2006).

**Summary:** The Coccinellidae fauna of Rapa Nui is composed of twelve species, all introduced and only two natives from Chile. There are not endemic species for the island. This could be associated to the degradation of the environ-

ment. Most of the species are related with pest control with high adaptability of a diverse range of environments. Campos & Peña (1973) and Desender & Baert (1996) recorded *E. connexa*. The Chilean specimens of this species has been currently split into: *E. chilensis* Hofmann, *E. loaensis* González and *E. concordia* González (González 2014). Actually, of all the species in the genus only *E. loaensis* has been found on the island.



**FIGURE 5. Island Coccinellidae from Chile, other tribes.** a: *Neoryssomus germainii*; b: *N. variabilis*; c: *Neorhynchobius fuegensis*; d: *Parastethorus histrio*; e: *Cryptolaemus montrouzieri*; f: *Novius cardinalis*; g: *Scymnus bicolor*; h: *Scymnus loewii*; i: *Hyperaspis festiva*; j: *Parasidis brethesi*; k: *Coccidophilus* sp.; l: *Stictospilus darwini*.

### Juan Fernández archipelago

(Table 1, Figs. 1, 2c).

#### *Adalia angulifera* Mulsant, 1850 (Fig 3a).

Examined material: Not available.

Original reference: Crotch (1874): “I. Juan Fernández”.

Comments: There is only one reference of the species and no specimens are known. The species in Chile is common on its range between Chañaral province to Última Esperanza. It is also present in Argentina (González 2006).

#### *Adalia bipunctata* (Linnaeus 1758) (Fig 3b).

Examined material: 4 exx. “Chile, J. Fernández, Bahía Cumberland, 15-XII-1985, Col. R. Honour” (MNHN). 1

ex. “[Chile, J. Fernández] Vaqueria, 4 Nov 2005, [en] *Fagara* [sp.]” (MNHN). 1 ex. “[Chile, J. Fernández] Vaqueria, 4 Nov 2005” (MNHN).

Original reference: **First record of this species for Juan Fernández archipelago.**

Comments: This species is of Palearctic origin. It was introduced to Chile in 1940 (Zúñiga 1985), with established populations between El Loa and Última Esperanza. In South America it is also present in Argentina, Uruguay and Perú (González 2006). Probably introduced to the island from the mainland.

*Adalia deficiens* Mulsant, 1850 (Fig 3c).

Examined material: 1 ex. “[Chile, J. Fernández], on [luma de Juan Fernández] *Myrceugenia fernandeziana* [(Hook. & Arn.) Johow] 5 Nov 2005, 700113, Plazoleta el Yunque, 6274877” (MNHN); 1 ex. “[Chile, J. Fernández], on luma [*Myrceugenia fernandeziana*], 33°37'05,7" [S]. 78°52'30.9" [W]” (MNHN).

Original reference: **First record of this species for Juan Fernández archipelago.**

Comments: Native to mainland Chile, has been abundant between the provinces of Antofagasta and Última Esperanza. It is also present in Argentina and probably in Uruguay (González 2006).

*Coccidophilus* sp. (Fig 5k).

Examined material: 1 ex. “Chile 11954/05 Arch. J. Fernández, R. Crusoe of. Conaf. 25-XI-2004, leg. H. González” (MNHN).

Original reference: González (2012): “Archipiélago de Juan Fernández”.

Comments: The only available specimen is a female, making it impossible to identify down to species level.

*Eriopsis loaensis* González, 2014 (Fig 3j).

Examined material: 4 ex. “Chile, J. Fernández, Róbinson Crusoe, 18-XII-1997, Col. J.C. Torres” (MNHN).

Original reference: **First record of this species for Juan Fernández archipelago.**

Comments: The species was originally described in the Antofagasta province at the north of Chile.

*Eriopsis opposita* (Guérin-Méneville, 1842) (Fig 3l).

Examined material: 2 exx. “Chile, Islas J. Fernández” “*Eriopsis opposita* Guérin, Hofmann det. 58” “Colección P. Germain” (MNHN); 2 exx. “Islas J. Fernández” “*Eriopsis opposita* Guérin, Hofmann det. 58” “Colección P. Germain” (MNHN); 7 exx. “Chile, Islas J. Fernández” “Colección P. Germain” (MNHN); 2 exx. “J. Fernández 6 [18]95” “Colección P. Germain” (MNHN).

Original reference: Guérin-Méneville (1842) (as *Cocc. (Hippodamia) opposita*): = “de l’île Juan Fernandez, au Chili”.

Comments: This endemic species is common in the archipelago. Undoubtedly, the species belongs to the *Eriopsis* genus, but it differs from the others by presenting insular gigantism and other morphological differences.

*Harmonia axyridis* (Pallas, 1772) (Fig 3n).

Examined material: “II-2019, en duraznero [on peach] and luma de Juan Fernández (SAG, pers. comm.).

Original reference: **First record of this species for Juan Fernández archipelago.**

Comments: see comments for the same species under the Rapa Nui species list.

*Parastethorus histrio* (Chazeau 1974) (Fig 5d).

Examined material: 1 ex. “Chile, 12043/05 I. Robinson Crusoe, Cordin [Cordón?] del Centinela, 5-III-2005, leg. H. González (SAG)” (MNHN).

Original reference: González (2008): “Isla Robinson Crusoe”

Comments: see comments for the same species under the Rapa Nui species list.

*Rhyzobius lophantae* (Blaisdell 1892) (Fig 4m).

Examined material: 1 ex. “Chile, Archipiélago Juan Fernández, Isla Robinson Crusoe, P. Los Viejos, leg. H. González” (MNHN); 1 ex. “Juan Fernández, Masatierra, B. Cumberland, 11.3.1952, P.G. Kuschel” “*Rhyzobius lophantae* Blaisdell, det. R. Gordon” (MNHN). 1 ex. “Chile, J. Fernández, Mirador de Selkirk, 16-XII-1985, Col. R. Honour” “*Rhyzobius lophanthae* 1955 Blaisdell” (MNHN).

Original reference: González (2008): “Archipiélago Juan Fernández”

Comments: see comments for the same species under the Rapa Nui species list.

***Rhyzobius* sp.** (Fig 4n).

Examined material: 1 ex. (hembra) “Ba. Cumberland, J. Fernández, 22.12.1954. col. Kuschel (MNHN).

Original reference: **First record of this species for Juan Fernández archipelago.**

Comments: The genus *Rhyzobius* Stephens, with more than a hundred species, is distributed mainly in Australia and New Guinea, with few more species in Europa and Africa (Tomaszewska 2010). The examined specimen was identified as Coccidulini based on the dorsal pubescence, the antenna with 11 antennomeres, with basal two not enlarged and with loose club (discarding Chnoodini, Azyini), the tarsal claws with only a triangular basal tooth (discarding Poorini) and the abdominal postcoxal line complete and recurved. The pronotum not concealing head, the oval body not dorsoventrally flattened, and the prosternum carinate discard all native South American genera of Coccidulini (keys after Gordon 1995). In Eastern Hemisphere genera, the specimen fits well with *Rhyzobius*, considering additional characters as the head normally exposed and normal sized eyes, the pronotum not grooved, hypomera not excavated, the cryptotetramerous tarsi, anterior margin of prosternum normal and tibiae not angulate externally (Ślipiński 2007; Tomaszewska 2010). It was not possible to identify the specimen to the species level, but the simple pubescence discard an immature of *Rhyzobius lophantae*. It could correspond to an exotic introduced species or a new one.

**Summary:** The Coccinellidae fauna of the Juan Fernández archipelago is composed by ten species with at least one endemic. Among the other species, four are cosmopolitan (also present in Rapa Nui and mainland Chile); three are introduced from mainland Chile; and two with uncertain origin. The Coccinellidae fauna of the archipelago is rather poor, due to most of the species being introduced for commercial or touristic activities. The presence of *Harmonia axyridis* is worrisome, a species known for its negative effects on the local Coccinellidae of many countries (Grez *et al.* 2016; Roy *et al.* 2016). González (2008) cited wrongly *Eriopsis chilensis* for Juan Fernández, but later genital dissection discarded that identification.

## Continental islands

### Isla Mocha

(Table 1, Figs. 1, 2d).

***Eriopsis chilensis*** Hofmann, 1970 (Fig 3h).

Examined material: 1 ex. “Chile, Isla Mocha, Germain leg.” (MNHN).

Original reference: **First record of this species for Isla Mocha.**

Comments: Endemic species of Chile, common in most of its distribution between the provinces of Copiapó and Chiloé (González 2006).

***Harmonia axyridis*** (Pallas, 1772) (Fig 3n).

Examined material: “II-2017, in *Pittosporum* sp.” (record from Aburto, Grez and Zaviezo 2015).

Original reference: **First record of this species for Isla Mocha.**

Comments: see comments for the same species under the Rapa Nui species list.

***Neoryssomus variabilis*** (Korschefsky, 1934) (Fig 5b).

Examined material: 6 exx. “Chile, Isla Mocha, 22-26 3-2017, leg. F. Campodónico” (CALH).

Original reference: **First record of this species for Isla Mocha.**

Comments: Endemic species of Chile. It is distributed between the provinces of San Felipe and Valdivia (González 2006).

***Orynipus kuscheli*** Hofmann, 1972 (Fig 4h).

Examined material: 1 ex. “Chile, Isla Mocha, 22-26 III-2017, leg. F. Campodónico” (CALH).

Original reference: **First record of this species for Isla Mocha.**

Comments: Common species in the Valdivian forest. In Chile it is distributed between the provinces of Ñuble and Magallanes; in Argentina, it is found in the Isla Grande de Tierra del Fuego (González 2006).

**Summary:** This is the first report of Coccinellidae species in the island. They are also present on the mainland in the adjacent province of Arauco, which has similar vegetation with the island. Therefore, other species from this area are predicted to be also present on the island.

### **Isla Tenglo**

(Table 1, Figs. 1, 2e).

#### ***Cranorrhus variegatus*** (Philippi & Philippi, 1864) (Fig 4d).

Examined material: 1 ex. "Chile, Isla Tenglo, 27-11-1995, leg. A. Lür" (CALH); 5 exx., same collection information, except by the dates "23-02-2005" and "3-10-2014" (CALH).

Original reference: **First record of this species for Isla Tenglo.**

Comments: This is a characteristic species of Valdivian forest, although its distribution extends from the province of Choapa to Chiloé, as well as in Argentina (González 2006).

#### ***Nothocolus sicardi*** (Brèthes, 1925) (Fig 4k).

Examined material: 1 ex. "Chile, Isla Tenglo, 03-10-2014, leg. A. Lür" (CALH).

Original reference: **First record of this species for Isla Tenglo.**

Comments: A very common species along Chile, distributed between the provinces of Curicó and Magallanes. In Argentina, is present in the Austral Patagonia (González 2006).

#### ***Orynipus darwini*** (Brèthes, 1925) (Fig 4g).

Examined material: 1 ex. "Chile, Llanquihue, Isla Tenglo, 22/1/1988, leg. A. Lür" (MNHN).

Original reference: **First record of this species for Isla Tenglo.**

Comments: This species is very common on the Valdivian forest. Distributed between the provinces of Curicó and Aysén, as well as in Río Negro, Argentina (González 2006).

#### ***Orynipus kuscheli*** Hofmann, 1972 (Fig 4h).

Examined material: 1 ex. "Chile, Isla Tenglo, 21-I-1998, leg. A. Lür" (CALH).

Original reference: **First record of this species for Isla Tenglo.**

Comments: This species is also very common on the Valdivian forest. Distributed between the provinces of Ñuble and Magallanes, as well as in the Argentinian part of the Isla Grande de Tierra del Fuego (González 2006).

#### ***Parasidis brethesi*** Honour & González, 2010 (Fig 5j).

Examined material: 3 exx. "Chile, Isla Tenglo, 03-10-2014, leg. A. Lür" (CALH).

Original reference: **First record of this species for Isla Tenglo.**

Comments: Small sized endemic species of Chile, distributed between the provinces of Llanquihue and Palena (González 2006).

#### ***Stictospilus darwini*** Brèthes, 1925 (Fig 5l).

Examined material: 8 exx. "Chile, Isla Tenglo, 03-10-2014, leg. A. Lür" (CALH).

Original reference: **First record of this species for Isla Tenglo.**

Comments: Abundant species throughout its distribution between the provinces of Valparaíso and Chiloé. Also present in Argentina (González 2006).

**Summary:** These are the first records of species of Coccinellidae in Isla Tenglo. All six species are shared with the mainland Llanquihue province. Therefore, other species from that area are predicted to be also present on the island.

## **Isla Grande de Chiloé**

(Table 1, Figs. 1, 2f).

### ***Adalia angulifera*** Mulsant, 1850 (Fig 3a).

Examined material: 1 ex. “Chile, Chiloé, Cucao, 18-22 febr. 2002, leg. A. Fierro” (MNHN); 2 exx. “Quellón, Chiloé, enero [January] 1955, J.S. Vargas col.” (MNHN).

Original reference: González (2019): “Chiloé”.

Comments: See comments for the same species under the Juan Fernández archipelago species list.

### ***Adalia deficiens*** Mulsant, 1850 (Fig 3c).

Examined material: 1 ex. “Chile, Chiloé, Chonchi, 30-11-1995, leg. A. Lüer, en Rosa sp.” (CALH).

Original reference: **First record of this species for the Isla Grande de Chiloé.**

Comments: See comments for the same species under the Juan Fernández archipelago species list.

### ***Adalia kuscheli*** Mader, 1957 (Fig 3d).

Examined material: 4 exx. “Dalcahue, prov. Chiloé, 20, 31-Enero [January]-71, Coll: G. Barriá” (MNHN), 4 exx. “Chile, Chiloé, Cucao, 5-II-86, [leg.] J. Solervicens” (UMCE). 8 exx. “Chile, Chiloé, Cucao, 28-29 11-1995, leg. A. Lüer, en [on] *Berberis* sp.” (CALH); 7 exx., same collection data, except by the dates “12-02-2004” (CALH).

Original reference: González (2008): “Chiloé”.

Comments: Endemic species from Chile distributed between Malleco and Chiloé provinces.

### ***Cranorrhynchus variegatus*** (Philippi & Philippi, 1864) (Fig 4d).

Examined material: Not available.

Original reference: Gordon (1994): “Chiloé prov.”.

Comments: See comments for the same species under the Isla Tenglo species list.

### ***Cycloneda limbicollis*** (Fairmaire, 1884) (Fig 3f).

Examined material: 1 ex. “Chile, Chiloé, Isla Chiloé, Puente la Caldera, 29 Ene. [January] 2000, leg. T. Cekalovic” (MNHN).

Original reference: **First record of this species for the Isla Grande de Chiloé.**

Comments: Common species on the austral areas, present in Chile between the Cordillera and Magallanes provinces; while in Argentina, in Chubut and Río Negro. The reports from Uruguay (Korschefsky 1932) and Paraguay (Blackwelder 1945) are doubtful and need to be verified (González 2006).

### ***Eriopsis chilensis*** Hofmann, 1970 (Fig 3h).

Examined material: 1 ex. “Chile, Chiloé, Cucao, 12-02-2004, leg. A. Lüer” (CALH)

Original reference: González (2014).

Comments: See comments for the same species under the Isla Mocha species list.

### ***Eupaleoides chiloensis*** Gordon, 1994 (Fig 4j).

Examined material: 1 ex. “Holotype, Chile, HC12, Chepu, Chiloé, 42 S, 30 ft. 11.X.1958, Secondary scrub (MNHN)”.

Original reference: Gordon (1994): “Chiloé”.

Comments: The species is only known from the male holotype. Endemic for the island.

### ***Harmonia axyridis*** (Pallas, 1772) (Fig 3n).

Examined material: Not available.

Original reference: Grez & Zaviezo (2015) “1 junio 2016 (Dalcahue)”, “2 junio [June] 2017 (Ancud)”.

Comments: See comments for the same species under the Rapa Nui species list.

***Neoryssomus germainii*** (Crotch, 1874) (Fig 5a).

Examined material: Not available.

Original reference: González (2008): “Chiloé”.

Comments: Record not confirmed, regardless the fact that the species is common in areas with Valdivian forest, from the Choapa province to Tierra del Fuego.

***Nothocolus sicardi*** (Brèthes, 1925) (Fig 4k).

Examined material: 1 ex. “Chile, Chiloé, Parque Chiloé, 30-01-1994, leg. A. Lüer” (CALH); 1 ex. “Chile, Chiloé, Cucao, 30-11-1995, leg. A. Lüer” (CALH).

Original reference: **First record of this species for the Isla Grande de Chiloé.**

Comments: See comments for the same species under the Isla Tenglo species list.

***Nothocolus* sp.** (Fig 4l)

Examined material: 1 ex. (female) “110 [?] Chile, Los Lagos Reg., Chiloé, Chinquén, [S] 42°37.069/W 74°05.951, 60msl, 4.03.2008, 22°C Fogging, 150cc / *Nothofagus nitida*—*A. luma*, 15.05pm, Arias et al. UC. Berkeley” “*Nothocolus* sp. 1 det G. Arriagada 2008” (MNHN).

Original reference: Not available.

Comments: The specimen has been assigned to the genus *Nothocolus* Gordon, based on the convex body, the dorsal pilosity of a single type, the head exposed anterior to eye, the antenna with 11 antennomeres, with compact club, extended near the posterior pronotal angle without reaching it, the abdominal postcoxal lines complete and recurved extending to mid-length of the first ventrite, the prosternal process not carinated, and the tarsal claw with sub-squared basal tooth. Among the species of the genus, it only bears a distant resemblance to *Nothocolus indefinitus* Gordon, from which it differs by its smaller size, the presence of five dark spots on the pronotum, the absence of designs on the elytra, and the shape slightly more wide, with elytra wider than the pronotum at the base. It corresponds to undescribed species known only from a female specimen. Endemic for the island.

***Orynipus chilensis*** (Crotch, 1874) (Fig 4f).

Examined material: Not available.

Original reference: Gordon (1994): “Chiloé Prov: 19 km S. Ancud, 120 m, Valdivian rain forest”.

Comments: Species distributed on areas with Valdivian forest, between the provinces of Ñuble and Chiloé. Also present in Argentina (González 2006).

***Orynipus darwini*** Brèthes, 1925 (Fig 4g).

Examined material: 2 exx. “Chile, Chiloé, Cucao, 12/2/2004, leg. A. Lüer”; 3 exx. “Chiloé” “*Orynipus darwini* Brèthes, Mader det.” (MNHN); 1 ex. “Quellón, Chiloé, Enero 1955, J. Vargas Col” (MNHN).

Original reference: Brèthes (1925) “de l’île Chiloé”

Comments: See comments for the same species under the Isla Tenglo species list.

***Orynipus kuscheli*** Hofmann, 1972 (Fig 4h).

Examined material: 1 ex. “Chiloé, Cucao, 29-11-1995, leg. A. Lüer” (CALH); 1 ex. same data, except by the dates “12-02-2004” (CALH).

Original reference: Gordon (1994): “Chiloé prov.: no further data”.

Comments: See comments for the same species under the Isla Tenglo species list.

***Paracranoryssus chilianus*** (Mader, 1957) (Fig 4e).

Examined material: Not available.

Original reference: Gordon (1994): “Chiloé Prov: 19 km S. Ancud, 120 m.”.

Comments: Common species in areas of Valdivian forest between the provinces of Valparaíso and Coyhaique. In Argentina, it is present in similar latitudes (González 2006).

***Parasidis brethesi*** Honour & González, 2010 (Fig 5j).



Examined material: 1 ex. (holotype) “Chile Chiloé / Puntra X Reg./10 Febr. 2002, M.Guerrero / Colección M. Guerrero” “Macho/196” (MNHN); 15 exx “Chile, Chiloé, Puntra, X Reg. 10 Feb. 2002. M. Guerrero” (MNHN); 1 ex. “Chile, Chiloé, Cucao, 12-22 Febrero 2002, leg. A. Fierro” (MNHN); 1 ex. “Chile, C12, Chepu, Chiloé, 42°S, 30 ft, 11.x.1958” (MNHN); 9 exx. “Chile, Provincia de Chiloé, Río Huelde, III-2008, leg. J.E. Barriga” (JEBC).

Original reference: Honour & González (2010): same data given above for holotype.

Comments: Small sized endemic species of Chile, distributed between the provinces of Llanquihue and Palena (González 2006).

***Scymnus (Pullus) bicolor*** (Germain, 1854) (Fig 5g).

Examined material: Not available.

Original reference: González (2008): “Chiloé”.

Comments: The species is very abundant along Chile between Copiapó and Chiloé. It has been also found sporadically in Neuquén, Argentina (González 2006).

***Stictospilus darwini*** Brèthes, 1925 (Fig 5l).

Examined material: 4 exx. “Chile, Chiloé, Puntra, 12/2/2002, leg. Marcelo Guerrero” (MNHN); 2 exx. “Chile, Chiloé, Quellón, I-1955, Vargas leg.” (MNHN); 4 exx. “Quellón, Chiloé, enero [January] -1955, J.S. Vargas [leg.] Coll” (MNHN); 1 ex. “Chile, HC8, Chepu, Chiloé, 42°S, 850 ft, 10.x.1958” (MNHN); 3 exx. “Chile, Chiloé, Vill...gallo [unreadable], 22-Ene [January]-1998, leg. T. Cekalovic” (MNHN); 1 ex. “Chile, Chiloé, Cucao, 12-02-2004, leg. A. Lüer” (CALH).

Original reference: Brèthes (1925): “de l'île Chiloé”

Other references: Gordon (1977): “Syntipe / Chiloé / Chiloé I.Chile. C. Darwin / Darwin Coll. 1885-119 / *Stictospilus darwini* Brèthes”.

Comments: The species is very frequent on the island, extending north up to Valparaíso. Also present in Argentina (González 2006, 2019).

**Summary:** The Coccinellidae fauna of Isla de Chiloé is composed by 18 species, 17 of them are native and the other one, exotic. This is consistent with the richness of the respective mainland territories (the adjacent province Llanquihue has 15 species). The presence of two endemic species on the island is remarkable considering that similar sized mainland provinces (Llanquihue, Osorno; Palena, etc.) do not have them. Among the native species, 12 of them are characteristic of the Valdivian forest. The presence of *Harmonia axyridis* is a threat to the native Coccinellidae on the island (Grez *et al.* 2016; Roy *et al.* 2016).

**Isla Guarello (Madre de Dios archipelago)**

(Table 1, Figs. 1, 2g).

***Orynipus ultimensis*** Hofmann, 1972 (Fig 4i).

Examined material: Not available.

Original reference: Gordon (1994): “Última Esperanza, Isla Guarello, Near the limestone mine, Lat. 50°22' S, Long. 75°21' W, A. C. Ashworth, 23-11-86” (USNM).

Comments: Not endemic to the island. The species is endemic to the Última Esperanza province.

**Summary:** The knowledge of the entomologic fauna of Isla Guarello and the Madre de Dios archipelago is overall very limited and non-existent in many groups. The only known species is endemic to the province and found on nearby mainland localities.

### **Isla Riesco.**

(Table 1, Figs. 1, 2h).

#### ***Eriopis magellanica*** (Philippi & Philippi, 1864) (Fig 3k).

Examined material: Not available.

Original reference: Zúñiga-Reinoso 2011: “Isla Riesco: Seno Skyring (CZIP)”.

Comments: This species inhabits a large part of the Magallanes region, being abundant on the steppe areas.

Also, it is distributed on the Aysén region and the Argentinian Patagonia (between Chubut and Tierra del Fuego) (González 2006).

#### ***Nothocolus sicardi*** (Brèthes, 1925) (Fig 4k).

Examined material: 5 exx. “Chile, Magallanes, Isla Riesco, Estancia Anita Beatríz, 53°0’S, 73°30’W, 21-28/12/2019, leg. Audrey Grez” (CPGG).

Original reference: **First record of this species for the Isla Riesco.**

Comments: See comments from the same species under the Isla Tenglo species list.

#### ***Orynipus kuscheli*** Hofmann, 1972 (Fig 4h).

Examined material: Not available.

Original reference: Zúñiga-Reinoso 2011: “Provincia de Magallanes: Isla Riesco: Punta Rocallosa (UCCC)”.

Comments: See comments from the same species under Isla Grande de Chiloé species list.

#### ***Stenadalia nigrodorsata*** (Fairmaire, 1884) (Fig 4o).

Examined material: 1 ex. “Chile, Magallanes, Isla Riesco, Estancia Anita Beatríz, 53°0’S, 73°30’W, 21-28/12/2019, leg. Audrey Grez” “reared from a larva of the IV stage, collected over calafate *Berberis microphylla* G. Forst.”; 4 exx. (1 adult and 3 larvae), same data except “01/2020, leg. Gabriela Simonetti-Grez” (CPGG).

Original reference: **First record of this species for the Isla Riesco.**

Comments: This species is distributed in Chile between Coyhaique and Magallanes provinces. It is also known to have been recorded in Argentina (González 2006).

**Summary:** There are no endemic species of Coccinellidae in Isla Riesco, while the few existing species have wide distribution on the Magallanes region, extending even to the further south latitudes of Chile and Argentina. Due to the extension and climatic variability of the island, it is possible that many of the species from the provinces of Última Esperanza and Magallanes would also be present.

### **Isla Grande de Tierra del Fuego**

(Table 1, Figs. 1, 2i).

#### ***Cycloneda germainii*** (Crotch, 1874) (Fig. 3e).

Examined material: 1 ex. “Chile XII Región, Porvenir, 01.03, Coirón, leg. N. Véjar” (CPGG).

Original reference: González (2008): “Tierra del Fuego”.

Other reference: Zúñiga-Reinoso (2011): “Punta Espora” (CZIP), “Bahía Azul (bajo follaje de *Senecio patagonico*)” (CPAZ).

Comments: Species with wide distribution along Chile, from Elqui to the Última Esperanza province, Magallanes and Tierra del Fuego. It is also present in Argentina between Mendoza and Santa Cruz (González 2006).

#### ***Cycloneda limbicollis*** (Fairmaire, 1844) (Fig. 3f).

Examined material: 1 ex. “Tierra del Fuego, Chile, Bahía Azul, 4-XI-2004, Coll. A. Zúñiga” (CPAZ); 1 ex. “Chile, Tierra del Fuego, Puerto Percy, 25-01-2017, leg. A. Lüer, bajo piedra” (CALH).

Original reference: Zúñiga-Reinoso (2011): “Provincia de Tierra del Fuego: Bahía Azul (bajo follaje de *Senecio*

*patagonico*) (CPAZ)”.

Comments: Frequent species on the Austral areas from Cordillera to Magallanes provinces, while in Argentina between Chubut and Río Negro (González 2006). The records from Uruguay (Korschefsky 1932) and Paraguay (Blackwelder 1945) are doubtful and must be verified.

***Cycloneda patagonica*** González & Vandenberg, 2006 (Fig. 3g).

Examined material: 1 ex. (paratype) “Tierra del Fuego, NosePeak, 14-19.1.05. R. Crawshay 1906-230” (BMNH); 1 ex. (paratype) “Tierra del Fuego. Useless Bay, Dec. 1904, R. Crawshay, 1906–230/573 [black underline] FCC-683” (BMNH); 1 ex. “Tierra del Fuego—Chile, Bahía Azul, 4-XI-2009, coll. A. Zúñiga” (CPAZ); 3 exx. “Chile, Tierra del Fuego, Porvenir, 25-01-2017, leg. A. Lüer, en pastizal [on grass]” (CALH).

Original reference: González & Vandenberg (2006): the first two specimens mentioned in the “Examined material” section.

Comments: Similar looking species to *C. germainii*, but with smaller size and flatten shape. Present in the Chile and Argentinian sides of Tierra del Fuego (González 2006).

***Eriopis eschscholtzii*** Mulsant, 1850 (Fig. 3i).

Examined material: 1 ex. “Chile, Tierra del Fuego, Porvenir, 25-01-2017, leg. A. Lüer. En pastizal [on grass]” (CALH).

Original reference: **First record of this species for the Isla Grande de Tierra del Fuego.**

Comments: See comments for the same species under Isla Riesco species list.

***Eriopis magellanica*** (Philippi, 1862) (Fig. 3k).

Examined material: 3 exx. “Chile, T. del Fuego, Cameron, 1-2-2005, col. J. Mondaca E” (CPGG); 1 ex. “Tierra del Fuego—Chile, Bahía Chilota, 11-XI-2004, coll. J. Cárcamo” (CPGG); 1 ex. “Caleta Josefina, 9-II-55, M. Codoceo leg.” (MNHN); 1 ex. “Chile, Tierra del Fuego, Vicuña, Enero 1995, [leg.] P. Estrada” (UMCE).

Original reference: Blackwelder (1945): “T. del Fuego”.

Other references: Zúñiga-Reinoso (2011): “Punta Espora (CZIP), Cerro Sombrero (CPAZ), Cameron”.

Comments: See comments for the same species under Isla Riesco species list.

***Hippodamia convergens*** (Guerin-Meneville, 1842) (Fig. 4a).

Examined material: Not available.

Original reference: Zúñiga-Reinoso (2011): “Provincia de Tierra del Fuego: Punta Espora (CZIP)”.

Comments: Nearctic species introduced to Europe and a large portion of South America. In Chile, it is present between Arica and Magallanes, where it is abundant in urban and rural areas (González 2006).

***Neorhynchobius fuegensis*** (Brèthes, 1925) (Fig. 5c).

Examined material: Not available.

Original reference: Brèthes (1925): “Useless Bay, à la Terre de Feu” (BMNH).

Comments: The only endemic species of the island. It has not been collected again since its original description. It needs to be reviewed. The genus is endemic to Chile with a distribution between the provinces of Copiapó and Valdivia (González 2006).

***Neoryssomus germainii*** (Crotch, 1874) (Fig. 5a).

Examined material: Not available.

Original reference: González (2019): “Tierra del Fuego”.

Comments: The species is distributed for most of the territory of Chile between the provinces of Choapa and Magallanes (González 2006). The Tierra del Fuego record needs to be verified.

**Summary:** The Coccinellidae fauna of the Isla Grande de Tierra del Fuego is composed by eight species, seven of them natives (one possibly endemic) and one introduced. Six species are shared with nearby territories including the Magallanes province. Only two species reach areas of Central Chile.

**Note:** Brèthes (1925) mentioned many species from “Valle del Lago Blanco, Patagonia”. Even if that locality exists near Porvenir in the Isla Grande de Tierra del Fuego, it seems more likely that the real locality corresponds to Lago Blanco, in Chubut, Argentina, as it is considered by Gordon (1994) and against what is suggested by Zúñiga-Reinoso (2011). That is why the species mentioned by Brèthes are not included here.

## Isla Navarino

(Table 1, Figs. 1, 2j).

### *Adalia angulifera* Mulsant, 1850 (Fig. 3a).

Examined material: Not available.

Original reference: Zúñiga-Reinoso (2011): “Comuna Cabo de Hornos: Puerto Williams, (UCCC)”

Comments: See comments for the same species under Juan Fernández archipelago species list.

### *Cycloneda patagonica* González & Vandenberg, 2006 (Fig. 3g).

Examined material: 1 ex. (male holotype) “Chile, I. Navarino, Pto. Williams, 1.2.57/ Coll. Kuschel (MNHN)”; 1 ex. (paratype) “Chile, I. Navarino, Pto. Williams, 1.2.57” “*Coccinella germaini* Crotch,” (MNHN); 1 ex. (paratype) “Pto Williams, 1 feb 1962, Cekalovic coll / Coleccion T. Cekalovic 1972” (MNHN).

Original reference: González and Vandenberg (2006): same data as above, more additional specimens: 1 ex. (female allotype) “Magellanes, Canal Beagle, Isla Navarino / Pto. Williams, Feb.1.1957, T. Cekalovic / Chpn Slide 58-369 [female genitalia and abdomen on separate slide mount]” (USNM); 1 ex. “Magellanes, Canal Beagle, Isla Navarino/Pto. Williams, Feb.1.1957, T. Cekalovic” (USNM); 1 ex. Magellanes, Canal Beagle, Isla Navarino / Pto. Williams, Feb.1.1957, T. Cekalovic” “*Coccinellina sicardi* (Brèthes), det. Chpn 1958” (USNM).

Other reference: Zúñiga-Reinoso (2011): “Puerto Williams” (UCCC)”.

Comments: See comments for the same species under Isla Grande de Tierra del Fuego species list.

### *Eriopis magellanica* (Philippi & Philippi, 1864) (Fig. 3k).

Examined material: Not available.

Original reference: Zúñiga-Reinoso (2011): “Comuna Cabo de Hornos and Antártica Chilena: Puerto Williams (UCCC)”

Comments: See comments for this species under Isla Riesco species list.

### *Orynipus kuscheli* Hofmann, 1972 (Fig. 4h).

Examined material: Not available.

Original reference: Zúñiga-Reinoso (2011): “Comuna Cabo de Hornos y Antártica Chilena: Puerto Navarino (UCCC)”.

Comments: See comments for this species under Isla Grande de Chiloé species list.

**Summary:** The Coccinellidae fauna of Isla Navarino is composed of four species. Three of them typical of the Austral end of Chile, while the other extends up to the north part of the country. There are no endemic or introduced species.

## Discussion

The composition of the Coccinellidae fauna on Chilean islands reveals a large diversity, with consistent climatic and geographic differences. There are 42 species (four unidentified), which corresponds to approximately the 35% of the known species of the country. Four of them are endemic to the island territories, while the rest are present in mainland Chile. Eight are widely distributed cosmopolitan species.

For oceanic islands, the faunistic composition is very different from each other. For example, while the diver-

sity in Rapa Nui is very low and dominated by introduced species due to its isolation and historical human impacts (Diamond 2005; Mann *et al.* 2008), in the Juan Fernández archipelago there is a combination of natives, endemics and of uncertain origin species. For the Desventuradas Islands, the information is insufficient, but given the small size it is very likely that there are no more species than the one reported here.

**TABLE 2. Coccinellid species reported from each island.**

Species List	Islas Desventuradas	Isla Rapa Nui	Juan Fernández Archipelago	Isla Mocha	Isla Tenglo	Isla Grande de Chiloé	Isla Guarello	Isla Riesco	Isla Grande de Tierra del Fuego	Isla Navarino
<b>Endemics to one island</b>										
<i>Eriopis opposita</i>			X							
<i>Eupaleoides Chiloénsis</i>						X				
<i>Neorhynchobius fuegensis</i>									X	
<i>Nothocolus</i> sp.						X				
<b>Endemics to Chile</b>										
<i>Adalia kuscheli</i>						X				
<i>Eriopis chilensis</i>				X		X				
<i>Eriopis loaensis</i>		X	X							
<i>Neoryssomus germainii</i>						X			X	
<i>Neoryssomus variabilis</i>				X						
<i>Orynipus ultimensis</i>							X			
<i>Parasidis brethesi</i>					X	X				
<b>Natives to Chile, non endemics</b>										
<i>Adalia angulifera</i>			X			X				X
<i>Adalia deficiens</i>			X			X				
<i>Cranorrhysus variegatus</i>					X	X				
<i>Cycloneda germainii</i>									X	
<i>Cycloneda limbicollis</i>						X			X	
<i>Cycloneda patagonica</i>									X	X
<i>Eriopis eschscholtzii</i>									X	
<i>Eriopis magellanica</i>								X	X	X
<i>Nothocolus sicardi</i>					X	X		X		
<i>Olla v-nigrum</i>		X								
<i>Orynipus chilensis</i>						X				
<i>Orynipus darwini</i>					X	X				
<i>Orynipus kuscheli</i>				X	X	X		X		X
<i>Paracranoryssus chilianus</i>						X				
<i>Scymnus (Pullus) bicolor</i>						X				
<i>Stenadalia nigrodorsata</i>								X		
<i>Stictospilus darwini</i>					X	X				
<b>Introduced to Chile</b>										
<i>Adalia bipunctata</i>		X	X							
<i>Cryptolaemus montrouzieri</i>		X								

.....continued on the next page

TABLE 2. (Continued)

Species List	Islas Desventuradas	Isla Rapa Nui	Juan Fernández Archipiélago	Isla Mocha	Isla Tenglo	Isla Grande de Chiloé	Isla Guarello	Isla Riesco	Isla Grande de Tierra del Fuego	Isla Navarino
<i>Harmonia axyridis</i>		X	X	X		X				
<i>Hippodamia convergens</i>									X	
<i>Hippodamia variegata</i>		X								
<i>Hyperaspis festiva*</i>		X								
<i>Parastethorus histrio</i>		X	X							
<i>Rhizobius lophantae</i>		X	X							
<i>Novius cardinalis</i>		X								
<i>Scymnus (Pullus) loewii</i>		X								
<b>Non defined status</b>										
<i>Coccidophilus</i> sp.			X							
<i>Eriopis</i> sp.	X									
<i>Heterodiomus</i> sp.		X								
<i>Rhizobius</i> sp.			X							
<b>Total species: 42, records: 68</b>	<b>1</b>	<b>12</b>	<b>10</b>	<b>4</b>	<b>6</b>	<b>18</b>	<b>1</b>	<b>4</b>	<b>8</b>	<b>4</b>

\* Introduced to Rapa Nui, but not in mainland Chile.

In the case of the continental islands, as Isla Mocha, Isla Tenglo, Isla Grande de Chiloé, Isla Guarello, Isla Riesco, Isla Grande de Tierra del Fuego and Isla Navarino, there is a strong tendency to share the species with the adjacent mainland areas, with small numbers of introduced and endemic species. A remarkable exception is the Isla de Chiloé, which has two endemics species. For a continental island, separated in the narrowest point (Canal del Chacao) by less than 2 km from the continent, the presence of these endemism could be explained because the north west corner of the island was not covered by ice on the Last Glacier period (Villagrán 2000), acting as a glacier refuge, which could have favored the formation of new species or protecting relict ones. Similarly, due to its insular and ice-free condition during the Last Glacier maximum, it would be expected to find endemic species on Isla Mocha, but that has not been observed so far. *Neorhizobius fuegensis* is reported as endemic from Isla Grande de Tierra del Fuego, but the species has not been collected since its description. On the other hand, *Cycloneda patagonica* is not endemic to any particular island, but only known from island territories.

Another evolutionary particularity of the Coccinellidae present on Chilean islands is the presence of gigantism (Morgan-Richards 2001). *Eriopis opposita*, endemic to the Juan Fernández archipelago, has a length up to 6.5 mm, while other species in the genus have an average of 4 mm, with exceptional cases of 5.6 mm (*Eriopis connexa*). This is not the only case of arthropod insular gigantism on the archipelago. The spider *Laminacauda gigantea* (Arachnida: Araneae: Lyniphiidae) also presents this condition (Millidge 1991).

There a big gap in the knowledge related with the lack of data from many islands of large size as the Chonos archipelago, Isla Wellington, Isla Madre de Dios, or Isla Hoste. This situation could be easily explained by the absence of human settlement in most territories and the severe weather conditions.

It is urgent to survey those islands to be able to characterize their biodiversity before it is affected by various local (habitat loss, fragmentation, pollution, or invasive species) and global (climate change) threats. This information will also be useful to improve biogeographical hypothesis to explain their current distribution and species patterns. This lack of information compromises the possibility to properly protect these fragile environments, which hosts unique biodiversity.

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