

Article

Invasive Bark Beetles (Coleoptera, Curculionidae, Scolytinae) in Chile and Argentina, Including Two Species New for South America, and the Correct Identity of the *Orthotomicus* Species in Chile and Argentina

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Abstract: The rate of establishment of non-native bark beetle species is accelerating in many parts of the world and is considered a serious threat to forests and forest crops. Distributional data for exotic bark beetles are urgently needed, but they must be based on sound taxonomy. Using primary literature and original records, I review for the first time the invasive bark beetle (Scolytinae) species in Chile and Argentina, and I give a short risk assessment for each. I also provide the best sources for identifying these species. The invasive pine bark beetle commonly referred to in Chilean research as *Orthotomicus erosus* (Wollaston) is not that species: evidence suggests that the only *Orthotomicus* that is or has been in Chile is *O. laricis* (Fabricius), which is also the *Orthotomicus* species reported in the most recent research from Argentina. I add new information on the distributions of two other abundant pine-breeding invasive species, *Hylurgus ligniperda* (F.) and *Hylastes ater* (Paykull), and I report that populations of *Hylastes linearis* Erichson have been found in Chile. This is the first known occurrence of the species in South America. *Phloeotribus willei* Schedl, a tiny bark beetle collected from domestic fig trees in Chile and Peru, has been considered native heretofore. I argue that it must be an introduced Neotropical species, and I present new localities for Chile. I present the first Chilean records of the Myrtaceae specialist ambrosia beetle *Amasa truncata* (Erichson), an Australian species recently found in southern Brazil and northeastern Uruguay, and new Argentinian records that seem to be the earliest finds of *Xylosandrus crassiusculus* (Motschulsky) in South America. The Canary Island palm seed specialist *Dactylotrypes longicollis* (Wollaston) is reported for the first time from South America, from Chile. The presence in Chile of another spermatophage, *Coccotrypes dactyliperda* (F.), is confirmed. New Chilean regions and new host records are given for *Pagiocerus frontalis* (F.), a species that breeds in Lauraceae seeds but also in stored maize. Other exotic species treated briefly include *Hylastinus obscurus* (Marsham), *Hylesinus taranio* (Danthione), *Scolytus multistriatus* (Marsham), *S. rugulosus* (Müller), *Coccotrypes cyperi* (Beeson), and *Xyleborinus saxeseni* (Ratzeburg). Finally, reports of several species from Chile or Argentina are considered unsupported by evidence: *Scolytus kirschii* Skalitzky, *Pityokteines curvidens* (Germar), *Coccotrypes robustus* Eichhoff, and *Hypothenemus hampei* (Ferrari).

La velocidad de establecimiento de especies de coleópteros descortezadores no nativos se está acelerando en muchas partes del mundo y se considera una amenaza seria a bosques y cultivos forestales. Se requiere datos distribucionales urgentemente, pero estos tienen que basarse en taxonomía sólida. Utilizando literatura primaria y registros originales, reviso por primera vez la fauna invasora de especies de descortezadores (Scolytinae) en Chile y Argentina, y ofrezco una evaluación breve del riesgo de cada una. También proporciono los mejores referencias para identificar estas especies. La especie descortezador invasora de pinos comunmente citado en investigaciones chilenas como *Orthotomicus erosus* (Wollaston) no es esa: la evidencia sugiere que la única especie de *Orthotomicus* actualmente o históricamente presente en Chile es *O. laricis* (Fabricius), la cual es

la especie de *Orthotomicus* reportado en las investigaciones más recientes de Argentina. Agrego información nueva sobre las distribuciones de otros dos especies abundantes invasoras que se reproducen en pinos, *Hylurgus ligniperda* (F.) y *Hylastes ater* (Paykull) y comunico que poblaciones de *Hylastes linearis* Erichson se han encontrado en Chile, siendo esta el primer hallazgo de la especie en Sudamérica. *Phloeotribus willei* Schedl, una especie minúscula colectado de higueras cultivadas en Chile y Perú, se ha considerado nativa hasta ahora: presento argumentos que debe de ser una especie neotropical introducida y presento nuevas localidades para Chile. Presento los primeros registros chilenos de *Amasa truncata* (Erichson) coleóptero ambrosial, especialista en Myrtaceae, especie australiana recientemente encontrada en el sur de Brasil y nordeste de Uruguay, y nuevos registros argentinos que parecen ser los primeros hallazgos de *Xylosandrus crassiusculus* (Motschulsky) en Sudamérica. Se registra la especialista en semillas de palma, *Dactylotrypes longicollis* (Wollaston), originario de las Islas Canarias por primera vez de Sudamérica; se confirma la presencia en Chile de otra espermatófito, *Coccotrypes dactyliperda* (F.). Se presentan nuevos registros regionales de Chile y de hospederas por *Pagiocerus frontalis* (F.), especie que se reproduce en semillas de Lauraceae pero también en maíz almacenado. Otras especies exóticas tratadas brevemente incluyen *Hylastinus obscurus* (Marsham), *Hylesinus taranio* (Danthione), *Scolytus multistriatus* (Marsham), *S. rugulosus* (Müller), *Coccotrypes cyperi* (Beeson), y *Xyleborinus saxeseni* (Ratzeburg). Finalmente, registros de varias especies de Chile o de Argentina se consideran sin apoyo de evidencia: *Scolytus kirschii* Skalitzky, *Pityokteines curvidens* (Germar), *Coccotrypes robustus* Eichhoff, y *Hypothenemus hampei* (Ferrari).

Keywords: Alien; invasive; exotic; biodiversity; Patagonia; *Pinus radiata*; *Eucalyptus*

1. Introduction

Half a century ago, Stephen L. Wood [1] published the first paper discussing in detail the intra- and intercontinental spread of Scolytinae. Since then, awareness has grown that introduced bark beetles pose serious threats to forests, forest products, and certain crops [2–12]. The effects of invasive scolytines on their hosts are often due to or magnified by symbiotic microorganisms borne by the beetles. The consequences of these parasite–symbiont–host plant interactions are further complicated by climate change [4,13–16].

Awareness of the potential threats posed by exotic bark beetles has, in turn, led many countries to develop or strengthen quarantine restrictions and to initiate monitoring of forests or of sites (such as ports) where imports arrive. Quarantines can severely impact the economies of countries exporting timber or wood products, so correct identification of potential pest species is critical. Monitoring has greatly increased our knowledge of the diversity and numbers of bark beetles coming into a region, e.g., [2,3,17], and of the native fauna as well e.g., [18]. As a result, we now know much about the invasive species *sensu* [7] (p. 229) in North America and Europe but much less where monitoring is relatively new and where the native fauna is not well known, such as the southern regions of South America. Established non-native Scolytinae in Chile and Argentina can potentially impact both quarantine issues and native and urban forests as well as trees in plantations.

During visits to Chilean insect collections and via correspondence with foresters in both Chile and Argentina, I have found specimens of several exotic species new to Chile or Argentina. I have also recorded collection data for many non-native species previously only known from country records, some of which significantly extends their known ranges.

This paper is a contribution to the memorial issue in honor of the late Guillermo “Willy” Kuschel. Willy Kuschel was well aware of the importance of detecting and identifying alien species, though “foreign” species was a focus in only one of his papers [19]. Similarly, though his interests were broad with respect to weevils [20], bark beetles are the prodigal child of weevilology, and few of his papers dealt extensively with Scolytinae; he did treat bark beetles thoroughly in his papers on the weevil fauna

of *Araucaria* [21] and the suburban beetles of New Zealand [22]. He was nonetheless instrumental in investigating the bark beetle fauna of Chile (native or otherwise) by engaging the lasting interest of the Austrian world expert Karl E. Schedl via two significant loans of material in the 1950s [23,24].

2. Methods

2.1. Sources of Data

The data reported here come primarily from museum loans of Scolytinae, correspondence with collectors in Chile and Argentina, and short visits to the main SAG entomological collections outside of Santiago, the Chilean Natural History Museum in Santiago, the University of Concepción, and the coleopterist Juan Enrique Barriga. During these visits, I recorded identifications and borrowed small numbers of specimens. A visit to my lab by Paula (“Vicky”) Klasmer supplied me with important specimens from Bariloche in Argentina. I also examined older faunistic papers for records missed by Wood in his monograph of the bark beetles of South America [25], particularly papers by Karl E. Schedl for both countries and Manuel J. Viana for Argentina. The recent review of the weevil fauna of Chile [26] summarizes Scolytinae species in Chile based on the MNNC collections as well as on Schedl’s older review [27].

2.2. Abbreviations Used for Collections

SAGC	<i>Servicio Agrícola y Ganadero</i> (Agricultural and Livestock Service), Lo Aguirre, Chile
LRKC	Lawrence R. Kirkendall collection, Univ. Bergen, Norway
MNNC	<i>Museo Nacional de Historia Natural</i> , Santiago, Chile
NHMW	<i>Naturhistorisches Museum Wien</i> , Vienna, Austria
UCCC	<i>Universidad de Concepción, Museo de Zoología</i> , Concepción, Chile
USNM	United States National Museum, Washington, D.C., USA

Frequently used common names (e.g., “the Granulate Ambrosia Beetle”) are capitalized, to distinguish them from descriptive text.

Chilean provinces in collection data are often referred to by number given as a Roman numeral, as in “Región V,” plus greater Santiago, which is known as Región Metropolitana (RM). The region numbers basically run from north to south, but the recently added region XV is now the northernmost region. Publications, on the other hand, use the formal names of the provinces (Valparaíso instead of Región V). For maximum clarity, I have generally followed both systems by adding names where region numbers are used and vice versa. Province names for Chile and Argentina are given in Figure 1.

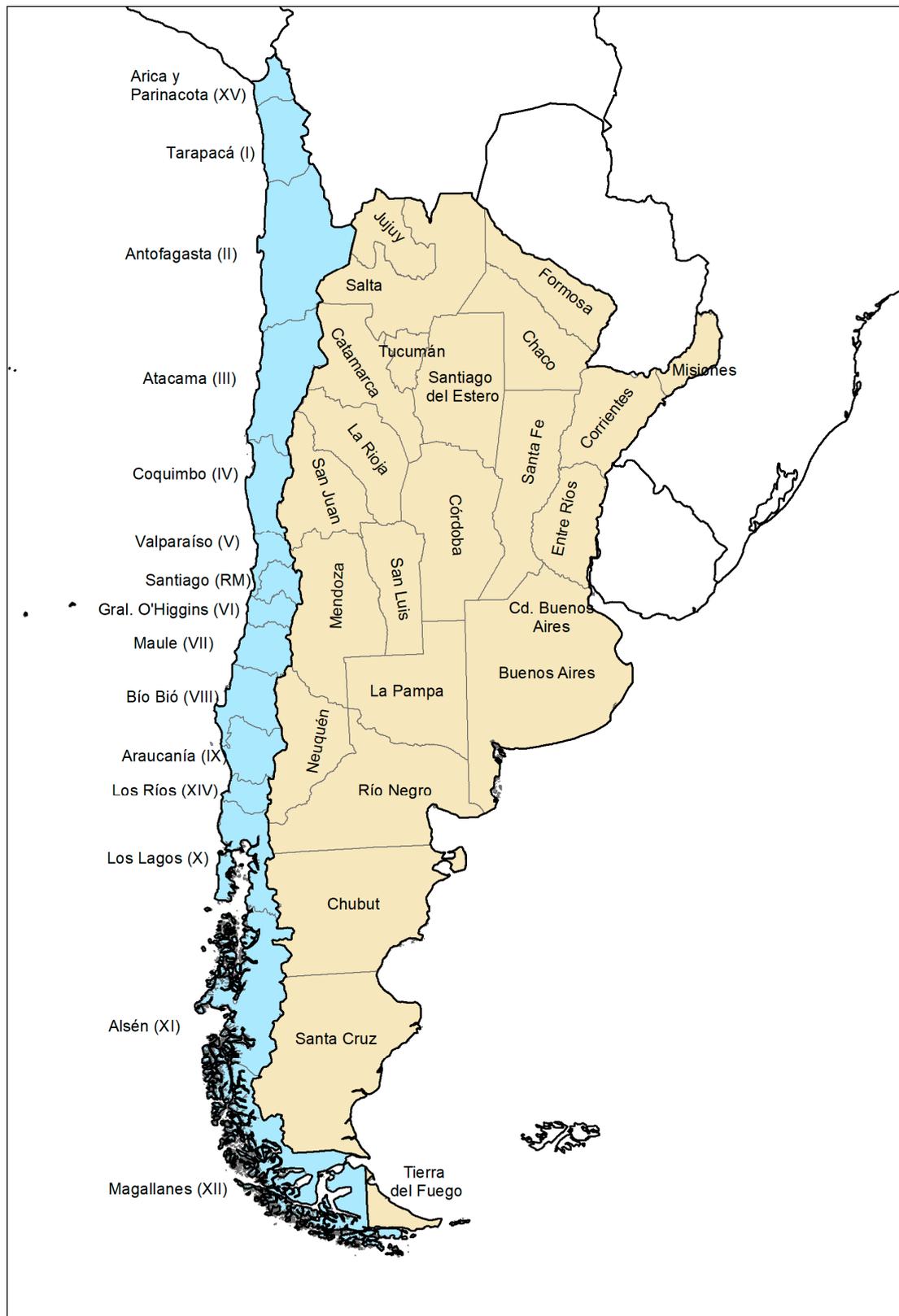


Figure 1. Map of Chile and Argentina, with province names and numbers for Chile, prepared by T. H. Atkinson.

2.3. Resources for Identification by Non-Specialists

There are general resources available for aid in identifying the species in this paper. The monographs of the bark beetle fauna of North and Central America [28] and that of South America [25] include non-native species which have been established for at least several decades. (Sadly, no such monographs exist for other continents.) Non-native species are included in the keys in these works. For identifying more recently established species, I give alternative sources. The primary sources for good photos of Scolytinae are T. H. Atkinson's website <http://www.barkbeetles.info>, Forestry Images <https://www.forestryimages.org>, and PaDIL <http://www.padil.gov.au>. The European bark beetles mentioned in this paper are also illustrated in [29,30].

Detailed collection data are given only for specimens I have personally examined. Generally, my identifications were based on comparisons with type material or with specimens in NHMW which were identified by K. E. Schedl or, for European species, specimens in my reference collection that were identified by Miloš Knížek (Forestry and Game Management Research Institute, Prague, Czech Republic).

Species are organized by ecology and feeding behaviors, which generally also clusters species similar in appearance. "Bark beetles" in the context of feeding behavior refers to species that breed in the inner bark of woody plants. In other contexts, "bark beetles" is used taxonomically to refer to Scolytinae. The "ambrosia beetles" treated here breed in wood, but larvae and adults feed on symbiotic fungi cultivated by parent beetles in the tunnel systems. As the name suggests, "seed beetles" reproduce in seeds that are large enough to support a bark beetle brood. Within each ecological category, species are ordered primarily by significance of the new record(s) and secondarily by alphabet.

3. Results

Fourteen exotic Scolytinae species are apparently established in continental southern South America: two are highly polyphagous ambrosia beetles, four are bark beetles breeding in plantations of exotic pines, one is an ambrosia beetle that breeds in exotic *Eucalyptus* plantations, five are bark beetles, and three are seed beetles that are associated with agricultural crops or urban trees. A 15th species (an extreme host generalist bark beetle) is found on Easter Island (Chile). Four species previously attributed to Chile or Argentina could not be verified and should not be considered established in the region.

3.1. Bark Beetles

3.1.1. *Orthotomicus Laricis* (Fabricius) Is the *Orthotomicus* in Southern South America

New records: CHILE, [Maule] Talca, Constitución, August 1984, L. Cerda (1, SAGC); [Los Ríos] [Biobío] Talcahuano, in *Pinus*, 16 May 1986, R. Muñóz (2, SAGC); [Araucanía] Gorbea, in pine, 16 May 1986, J. Luna (1, SAGC); Valdivia, Santo Domingo, 13 August 1989, E. Krahmer (3, SAGC). ARGENTINA, Neuquén, −40.1561, −71.5589, 4 November 2010, ex *Pinus ponderosa*, P. Klasmer (4, 1 in LRKC). Note that this species was collected frequently from both Chubut and Neuquén in 2009–2011 for the bluestain fungus study of de Errasti et al. ([31] and de Errasti pers. comm. 21 February 2018).

Comments. *Orthotomicus laricis* (F.) is one of the three pine-breeding Scolytinae discovered 30 years ago by William Ciesla to be common in Chile's extensive monocultures of Monterrey pine (*Pinus radiata*) [32]. However, the *Orthotomicus* species was reported as *O. erosus* (Wollaston) by Ciesla and most subsequent authors. The Chilean records given here are the earliest collections in the SAGC. Elgueta and Marvaldi [26] give the distribution as Maule Province (VII) to Bio-Bio (VIII); the 1987 specimens are from Valparaíso (V), and Lanfranco et al. [33] trapped specimens in small numbers in regions Bio-Bio and Los Lagos (X). Ruiz and Lanfranco [34], the most recent source, give the range as Valparaíso to Los Lagos (V–X), throughout the range of *Pinus radiata* in Chile.

The report of *O. erosus* from Chile was by forest entomologist William Ciesla, who was carrying out an FAO survey of pine bark beetles there [32]. Ciesla's 1987 Chilean specimens of *Orthotomicus* are from Valparaíso, Vina del Mar, 1987 in *P. radiata*, and are in the S. L. Wood Collection housed in the USNM: these are all *O. laricis*, identified by Sarah Smith, a bark beetle expert (R. Rabaglia, pers. comm., 14 February 2018, Sarah Smith, pers. comm., 14 February 2018). Photographs taken at the time by William Ciesla show the unique gallery structure of *O. laricis*, the only *Orthotomicus* known to me that lays eggs in clusters in a large chamber rather than in niches along narrow tunnels e.g., ([29]; see forestimages.org or http://baza.biomap.pl/en/taxon/genus-orthotomicus-orthotomicus/photos_rc/tr/y). The European bark beetle expert Miloš Knížek (pers. comm.) concluded that beetles sent to him taken from Parral, Chile (SAG specimens) were *O. laricis*, and I can confirm that all specimens I have examined in the SAGC (March 2017) were correctly identified by curator Sergio Rothmann or by SAG entomologist Margarita Peralta as *O. laricis*. Earlier bark beetle lists for Chile or for Argentina do not include any records of *Orthotomicus* [27,35–37], so its presence in southern South America is recent.

The *Orthotomicus* in Chile has been referred to as *O. erosus* in a wide variety of publications since Ciesla's report [25,33,34,38–45]. This species is correctly cited as *O. laricis* by de Errasti et al. [31], for both Argentina and for Chile, in a paper on the ophiostomoid fungi associated with pine bark beetles in Patagonian Argentina. Haack (Table 9 in [2]) and Brockerhoff (Table 1 in [5]) list both *Orthotomicus* species as being found in Chile. However, both Haack and Brockerhoff have confirmed that their published records of *O. erosus* were based on the literature, not on new identifications (both, pers. comm. 14 February 2018).

Orthotomicus specimens were sent to S. L. Wood for identification (Ciesla, pers. comm. January 2018), so the original error stems from Wood. It is unknown what led to this mistake. Since Wood had little direct experience with European bark beetles, it could be that his identification as *O. erosus* was based on specimens misidentified by someone else; he may have been unaware of the general similarity of *O. erosus* to *O. laricis* and the small details (such as the sutures of the antennal club) separating the two species, though they are well illustrated in at least one work he must have possessed [29]. *Orthotomicus erosus*, known as the Mediterranean pine beetle, is originally from southern Europe, northern Africa, and Asia minor but is now distributed around the world [38,39]. The well-known wide distribution of this *O. laricis* look-alike may then have led Wood and subsequent researchers to assume that the species in Chile was also *O. erosus*.

The first published record of *Orthotomicus* in Argentina seems to be [46] in 2010, where the species was identified as *O. laricis* by bark beetle expert Anthony Cognato (Michigan State Univ., USA). Tiranti reported two collections from *Pinus ponderosae* in Neuquén, the earliest being from 2007. Massimo Faccoli, a forest entomologist well familiar with these species, has only seen *O. laricis* in specimens sent to him from a trapping study currently underway in pine plantations close to Bariloche (Faccoli, pers. comm. 6 October 2017 and 31 January 2018). Similarly, the one Argentinian specimen I have examined (also from near Bariloche) is *O. laricis*.

In conclusion, while it is possible that both *Orthotomicus* have been in Chile at some point, no specimens of *O. erosus* from Chile or from Argentina have been seen by SAG personnel, Miloš Knížek, Massimo Faccoli, or myself. Interestingly, the species which has recently colonized many Uruguayan pine plantations actually is *O. erosus* [47]. Uruguay, then, is the only South American country currently hosting *O. erosus*.

Identification. The subtle differences between *O. laricis* and *O. erosus* are described (but not illustrated) in [1,47]. Good illustrations of the differences in the sutures of the antennal club, the most easily used character, are in [29,30].

Risks. *Orthotomicus laricis* has not proven to be an important pine pest in Chile, where it is said to now be difficult to find [25,38]. *Orthotomicus erosus* is one of the most frequently intercepted exotic species in the USA and New Zealand and has succeeded in colonizing pine plantations around the world, and consequently has attracted a great deal of attention from foresters and researchers [2,5,38,39]. *Orthotomicus laricis*, by contrast, is much less frequently intercepted [2,5], and I know of no other

established exotic populations. The species is native to Eurasia and North Africa, and the populations in Chile and Argentina seem to be the only successful establishments of the species outside its native range.

3.1.2. Further Argentina Locality Records for *Hylurgus ligniperda* (Fabricius), and the Earliest Date for Chile

Collections. **CHILE**, Valparaíso, July 1981, P. Ojeda, ex *Pinus* (3, MNNC). Valparaíso, “trampas” [traps], March 1988, J. Godoy (5, MNNC). **ARGENTINA**, Chubut, −41.9992, −71.5442, ex *Pinus contorta*, 23 February 2010, P. Klasmer (4, 1 in LRKC); Neuquén, −40.1561, −71.5589, ex *Pinus ponderosa*, 11 December 2009, P. Klasmer (1, LRKC). Note that this species was collected frequently from both Chubut and Neuquén (in 2009–2011), for the bluestain fungus study of de Errasti et al. ([31] and de Errasti pers. comm. 21 February 2018).

Comments. This is said to be the most abundant of the three pine bark beetles in Chile [33,34]. Elgueta and Marvaldi [26] give the range as Maule to Araucania (VII–IX), Wood [25] has records ranging from Valparaíso (V) to Bio-Bio (VIII), and Lanfranco et al. [33] trapped many in both Bio-Bio and Los Lagos (X). Ruiz and Lanfranco [34], the most recent source, give the range as Valparaíso to Los Lagos (V–X), throughout the range of *Pinus radiata* in Chile. A 1985 SAG collection from Bio-Bio (VIII) from 1985 seems to be the earliest published record [25].

I can find no papers that specify where this species occurs (or does not) in Argentina, and the CABI datasheet on this species lists Chile, Brazil, and Uruguay but not Argentina as South American countries with *H. ligniperda* (<https://www.cabi.org/isc/datasheet/27364m>, visited 15 February 2018). Andres de Errasti (CIEFAP, Argentina: pers. comm. 23 February 2018) informed me that the *H. ligniperda* in their study [31] were collected from both Chubut and Neuquén. Tiranti [46] reports the species from both Chubut and Neuquén from 2007 and 2008. Records in neighboring Uruguay go back at least to 1956 [35].

Known as the Red-Haired Bark Beetle, this Eurasian species is established in pine plantations around the world [48]. It was first discovered in Chile in the 1980s [32]. Of the three species discovered at the same time in Chile [28], *H. ligniperda* has been the most successful and now occupies the entire distribution of Monterrey pine in the country [49]. The Valparaíso specimens from 1981 seem to be the earlier record of any of the pine-breeding species in Chile.

For Argentina, *Hylurgus ligniperda* is not included as a significant pest in the recent FAO report on forest pests of that country [50]. *Hylurgus ligniperda* attacks logging residues, including stumps, roots, and logs, and can breed on roots of seedlings and saplings; they also feed on the root collars of one- and two-year-old seedlings, both in natural regeneration and plantations.

Identification: *Hylurgus* is larger, less elongate, and more densely “hairy” than the *Hylastes* species in southern South American pines. Excellent photos of *H. ligniperda* are widely available on the internet.

Risks. It is suspected *H. ligniperda* can vector *Leptographium* root diseases [51]; otherwise, breeding in logs leads to discoloration due to the associated blue-stain fungi, which can lower their eventual value for lumber.

3.1.3. *Hylastes Linearis* Erichson New to South America

New records. **CHILE:** [Región V] Valparaíso, El Turco, 16 May 2013, funnel trap, M988, FP 40507, H. Rodriguez (1, LRKC).

Comments. According to Sergio Rothmann of SAG (pers. comm., 5 February 2018), *H. linearis* was first detected over a decade ago in September of 2006. It is most frequent in Región VI (O’Higgins region), where SAG has collected it from Las Cabras, Santa Cruz, Litueche, Marchigüe, and Peralillo. In addition, the species has been detected in Región V (Valparaíso Region), the Región Metropolitana (Paine), and Región VIII (Bio-Bio Region, Bulnes and Ranquil).

These established Chilean populations and those in South Africa are the only long-distance establishments of *H. linearis* and are anthropogenic. The populations on Madeira and the Canary

Islands could represent either anthropogenic or natural dispersal to islands close to natural source populations. The Chilean populations could stem from either Mediterranean Europe, the source of US interceptions [2,9], or South Africa.

Identification. Recent descriptions can be found in [52,53]. Photos are available in [53] and at Forestry Images, PaDIL, http://coleoptera-neotropical.org/paginas/3ac_familias/CURCULIONOIDEA/2sp/Scolytinae/Hylastini/Hylastes-linearis.html.

Risks. *Hylastes linearis* breeds in the dead roots and stumps of various pine species [53]. It is not considered a significant pest species, so there is little research into its biology, which seems to be similar to that of *Hylastes ater* [54]. Even its distribution in Europe seems to be poorly known [52,53], and it is considered to be a rare species [53,55,56]. It is not considered an economically important species where it is native, other than some feeding damage to the root collar of seedlings, nor do invasive populations in Israel cause concern [54]. In South Africa, where it is introduced and established (the only long-distance introduction of the species), individuals carry *Verticicladiella alacris*, a root fungus, but it has not been demonstrated that they actually vector the disease-causing organism; the fungus apparently only attacks wounded or severely stressed pines [57]. It could become a pest of planted seedlings in Chile [58,59]. Lee et al. [41] consider *H. linearis* to be an intercepted species that, though not currently in the United States, could potentially establish populations and become a pest species if introduced.

3.1.4. *Hylastes ater* (Paykull), Second Province for Argentina

New records. **CHILE:** Valparaíso, March 1988, traps, J. Godoy (5, MNNC); Valparaíso, July 1981, *Pinus*, P. Ojeda (3, MNNC). **ARGENTINA,** Chubut, −42,0361, −71,5456, *P. ponderosa*, 14 February 2011 (1, LRKC); Neuquén, −40,1561, −71,5589, *P. ponderosa*, 25 November 2011 (1, LRKC). This species was collected from Neuquén and Chubut (in 2009–2011) in the bluestain fungus study [31] (de Errasti, pers. comm. 23 February 2018).

Comments. *Hylastes ater*, the Black Pine Bark Beetle, is a Eurasian species that is now established in pine plantations in most of the world, though not yet in North America (<https://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsid=28047>). It is common and abundant in pine plantations in Chile. The most recent source [34] give the range as Valparaíso to Los Lagos (V–X) throughout the range of *Pinus radiata* in Chile.

Though the occurrence of the Black Pine Bark Beetle is apparently known to foresters in Argentina, I can find only one published province (Neuquén) for the country [46,60]. The most recent CABI invasive species data sheet lists Chile but not Argentina [61].

Identification. *Hylastes* species are most similar to *Hylurgus* species. *Hylastes ater* is very similar to *H. linearis*, which is also present in Chile, but is larger (nearly 5 mm, vs 3 mm for *H. linearis*). Identifying the genera and species can be accomplished by careful use of keys and photos.

Risk: *Hylastes ater* breeds primarily in the roots of weakened, sick, or recently killed Pinaceae, but can also breed in dead trunks and large branches. Its economic damage is to seedlings, which can be girdled by the feeding activities of recently emerged adults; though often not lethal in themselves, open wounds on seedlings are frequently invaded by fungi [58]. Dense populations of this species can result in significantly reduced regeneration in pine plantations and nurseries [59,62,63] (but see [64] for a contrary view). However, the draft report [49] concludes that *H. ater* has been outcompeted by *H. ligniperda* and no longer an abundant species in Chile.

3.1.5. New Records for an Olive Tree Bark Beetle, *Hylesinus taranio* (Danthione)

New records. **CHILE:** Reg. VII, Rauco, Nov. 1996, olive tree, leg. L. Peralta (1, SAGC); Reg. Metropolitana, El Monte, 1 March 1990, olive tree, leg. M. Beeche (1, SAGC); Reg. V, Panquehue, December 1999, olive tree, E. Pastor (1, SAGC); Reg. VI, Rancagua, October 1999, olive tree, leg. E. Prado (2, SAGC).

Comments. The species is common around the Mediterranean, where it breeds in *Fraxinus* (ash), *Fagus*, and *Syringia* as well as olive [29,45]. The earliest dated collection is from Chile, for the holotype of *H. antipodus* Schedl (a junior synonym) collected from Rengo in 1947 [27] (synonymy verified by me). Wood [25] adds Colchagua, 1977 from *Olea* (olive) (Región VI). Elgueta and Marvaldi [26] give the range as Arica to Bio-Bio (XV–VIII) but without giving specific collection data.

Argentina is listed as only a country record [25]. For Argentina, Bosq [65] remarks on two collections of *H. oleiperda* (the most common junior synonymy) from the province of Buenos Aires but gives no dates. Schedl [35,66] reports collections from Buenos Aires in 1941 and 1953, the latter from olive branches, while Holgado [67] cites a 1939 interception in the port of Buenos Aires, in olives imported from Italy, as the possible starting point for the colonization of Argentina. Miriam Holgado's ecological investigation [67], based on research carried out in the early 1990s, was carried out in Mendoza, where the species was first recorded around 1982. From these data, it would appear that *H. taranio* has been in Chile and Argentina equally long.

Identification. Excellent photos are available on the internet (e.g., <https://www.forestryimages.org/browse/subthumb.cfm?sub=10223>), and Grüne has keys and drawings. There are also keys and some illustrations in other European works, though most are in languages other than English.

Risks. Attacks on young branches and twigs can lead to reduced olive production [67]. The olive oil industry is growing fast in Chile, so this species should be carefully monitored.

3.1.6. The Smaller European Elm Bark Beetle, *Scolytus multistriatus* (Marsham), in Chile and Argentina

New records. **CHILE**, [Región Metropolitana] Pudahuel, October 1993, M. Beéche (1, MNNC); [Región Metropolitana] Aerop. A. M. B., *Ulmus*, M. Beéche (1, LRKC). These specimens are apparently vouchers for [68].

Comments. The Smaller European Elm Bark Beetle, *Scolytus multistriatus*, is native to Europe, Asia and northern Africa, and is invasive to North America (including Mexico). The only South American records in [25] are country records for Argentina and, as a questionable record, Chile, and Wood had not seen specimens himself from these countries. The first confirmed South American find is that of Beéche and Muñoz [68], who surveyed elms in Región Metropolitana (Santiago and environs) and Región V (Valparaíso) immediately north in 1992–1993. They found *S. multistriatus* in four different metropolitan localities but none in Región V.

Smith and Cognato [69] confirmed the presence of *S. multistriatus* in Brazil (Mato Grosso) and Argentina (Buenos Aires and Mendoza). These recent finds suggest that the species is now established in temperate South America, but it should be emphasized that only single specimens are known from each collection.

Identification. Note that *Scolytus schevyrewi* Semenov (not yet reported from S. America) is extremely similar in morphology and ecology [70,71] (their Figure 1). The best sources for photos, keys, and descriptions for these invasive elm bark beetles are [69,71]. There is a description of *S. multistriatus* in Spanish and an illustration in [68].

Risks: The Smaller European elm bark beetle is the principle vector of Dutch Elm Disease in North America, where it has decimated both wild and planted elm trees across the continent. It is also an important vector of the disease pathogens in its native range. It must be considered a potential threat to urban elms in Chile and Argentina, though to my knowledge no such problems have yet been detected. Similarly, both *S. multistriatus* and *S. schevyrewi* are present in Mexico, but there has so far been no sign of the disease there (Thomas H. Atkinson, Univ. Texas Insect Collection, pers. comm. 27 January 2018).

3.1.7. Expanded Range for *Scolytus rugulosus* (Müller), a Secondary Bark Beetle of Stone Fruit Trees

New records. **CHILE:** [Región VI] Colchagua, 23 December 1965, corteza de damasco [bark of peach], leg. R. H. Gonzalez (2, UCCC); [Región XIV] Valdivia, 21 January 1982, T. Krehmar (1, UCCC). **ARGENTINA:** Rio Negro, −41,9161, −71,522, *Prunus*, 5 January 2011, P. Klasmer (6, 1 in LRKC).

Comments. In the Museo Nacional de Historia Natural (Santiago, Chile), there are 11 specimens of which only 3 are labeled: the labels read “ex pruni/Laudbeck I 1882”—meaning, probably, from *Prunus*, Región I (Tarapacá), collector Laudbeck. This is the only record cited in [27], in Schedl’s summary of the bark beetles of Chile. This record is first given in [23]. Klein Koch and Waterhouse [44] list it from regions IX and X (Araucanía and Los Lagos) without giving any specific dates or places.

In Argentina, the earliest record seems to be a collection from a cherry tree in 1917 in Buenos Aires [72]. Otherwise, Schedl [73] reports collections from Tigre and Martín García in 1938. Schedl [74] lists a collection but no date from Buenos Aires. Schedl [72] records the species from Córdoba, Calamuchita in 1938, and he adds an additional collection from Buenos Aires [75]. Viana [37] lists a variety of locations but without any more collection data. These are probably the specimens Schedl cites in papers based on Viana’s collection. Córdoba and Atkinson [76] add La Ríoja. From these new records and the published data, we must conclude that *S. rugulosus* is fairly widespread in both countries, though the paucity of collections could mean that it is not abundant.

Identification: Photos are readily available on the internet, and the species can be keyed out in Wood [25,28]. The best source for photos and keys is [69].

Risks: This species is listed in [40] as an exotic species in urban trees of Chile but not discussed in the text, suggesting that it is not a noteworthy pest. *Scolytus rugulosus* is generally considered a secondary bark beetle, only breeding in dead or stressed trees and not causing much damage [77]. Klein Koch and Waterhouse [44] list apple (*Malus*) and a variety of fruit and nut trees (*Prunus* spp.). On the other hand, Viana [37] (but no later authors?) describes *S. rugulosus* as a true pest of fruit trees, even healthy ones.

3.1.8. The Bark Beetle Collected from Fig Trees in Chile and Peru, *Phloeotribus willei* Schedl

New records. **CHILE:** Región RM, Metropolitana, El Monte, September 1993, M. Beeche (3, SAGC); Región I, Qda. de Chaca, Em. 15, 12 June 1999, *Ficus carica*, M. Beeche (4, SAGC); Región I, Qda. de Chaca “Em. 15. 12. June 1999”, 12 June 1999, *Ficus carica* branch, M. Beeche (2, SAGC); Región I, Quebrada de Chaca, *Ficus*, 2001, M. Beeche (8, LRKC); Región XV, Arica, Azapa, 28 February 2001, *Ficus*, SAGC (2, SAGC); Región V, Valparaíso, Arch. Juan Fernandez, Masatierra, Cerro Centinela, 23 April 2004, deforested area, H. Gonzalez (1, SAGC); Región III, Atacama, Copiapó, 4 February 2011, *Ficus*, R. Vieyra (1, SAGC); Región III, Atacama, Vallenar, 10 August 2011, blacklight, V. Zlater (1, SAGC); Región RM, Santiago, Rinconada de Maipu, 11 October 2011, J. Mondaca (1, SAGC). **PERU,** Lima, Lima, 18 February 1999 (1, SAGC).

Comments. The holotype of *Phloeotribus willei* Schedl is from Lima, Peru, while the holotype of the junior synonym *Ph. chiliensis* Eggers was collected from Valparaíso, Chile [27]. Specimens examined by Wood [25] are from Lima, Peru, and from regions I (Tarapacá) and V (Valparaíso) in Chile. The only host specified is *Ficus* (1 record). Schedl [24] reports two interesting early collections from *Ficus carica* twigs by Willy Kuschel, one from Masatierra, the Juan Fernández Islands [23], the other from Región XV (Arica and Parinacota) in the far north in 1948. The earliest record is a country record, “Chile, C. E. Porter, 1912” [27].

This species has been considered a native species in Chile. There are few collections and the known localities seem to be disjunct (Lima, northern Chile, central Chile, Juan Fernandez Islands). On the other hand, bark beetles in western Peru and coastal Chile are undercollected. Notably, the only host recorded is an introduced species, the cultivated edible fig *Ficus carica*; the beetle has been collected multiple times from this tree, in both countries, and from no other hosts. There are no native *Ficus* in coastal Chile. The fact that the species has only been found in disjunct localities and only in an introduced host species argues that it is an exotic species in Chile and possibly in western Peru as well. If so, the most likely origin is the Neotropics; there are several Neotropical species which are similar in appearance [25]. If it is non-native, then since it is clearly well adapted to arid and semiarid climates, it should be looked for in woody Moraceae (*Brosimum*, *Ficus*, etc.) in drier forest ecosystems in the Americas.

Identification. The key and description in Wood [25] are useful. This is the only *Phloeotribus* species known from Chile. Curiously, no *Phloeotribus* are known from drier regions of Argentina.

Risks. None known, but the biology of *Ph. willei* has not been investigated.

3.1.9. The Clover Root Borer, *Hylastinus obscurus* (Marsham)

New records. **CHILE:** S. Barbara, 29 April 1986, trifolium rosada [*Trifolium pratense*], leg. R. Arce (1, UCCC); Región X, Rio Bueno, 15 April 1991, Trifolium rosada, leg. SAGC X (SAGC 5, LRKC 3); Reg. Bio-Bio [VIII], Nacimiento, CMPC STA.FE, 10 October 2008, M. Beeche.

Comments. *Hylastinus obscurus* is native to Europe and North Africa but is a widespread invasive species in North America. Elgueta and Marvaldi [26] give the range as Talca to Llanquihue (Región VII–Región X). Wood [25] gives records for Araucanía (IX) that are probably from MNNC.

Identification. Can be keyed out in standard works; excellent photos can be found on a variety of websites.

Risks. As an invasive species to North America and Chile, it is a serious pest of the important forage crop red clover *Trifolium pratense* [78–81]. In Chile, it is considered the main cause of *T. pratense* decline, and pesticides have not been able to control it [81]. In its native range, it breeds primarily in woody legumes [29].

3.2. Ambrosia Beetles

3.2.1. First Chilean Record of *Amasa truncata* (Erichson) in Chile, an Ambrosia Beetle Breeding in Eucalyptus and Relatives

New records: **CHILE:** Valparaíso, Villa Alemana, Fundo Lo Moscoso, funnel trap, 25 February 2016, O. Ibaceta, 24143/11 (1, SAGC); Same locality, collected from *Eucalyptus* and funnel trap, 21 March 2017 (details from Margarita Peralta of SAG, pers. comm.). Valparaíso, Limache, funnel traps, 2016 and 2017 (information from owner, via Sergio Rothmann of SAG, pers. comm.). Valparaíso, Los Andes, funnel traps, 2018 (Rothmann, pers. comm.).

Comments: These traps were in *Eucalyptus* plantations. The traps at Fundo Lo Moscoso and Limache are ca 12 km apart. Los Andes is a town near the Andes mountain range, elevation ca 800 m, about 90 km west of Limache. This is the easternmost and highest locality for *A. truncata* in Chile.

The biology of *A. truncata* is reviewed in [82,83]. Known as the Keyhole Ambrosia Beetle because of the shape of the egg tunnel, this distinctive Australian species is only the second non-native ambrosia beetle to be collected from Chile. The species has recently invaded Brazil, the first land to be colonized other than New Zealand [82]. It was collected in late 2015 in northeast Uruguay [84] in mixed *Eucalyptus* plantations that had been monitored since 2012. Funnel trap collections made over two years from two localities 12 km apart in Valparaíso province indicate the presence of at least one established population in Chile. In Brazil, the species is clearly established but has thus far only been collected from traps in *Eucalyptus* plantations, as in Uruguay. It does not seem to have spread significantly from the sites from which it was first reported (Flechtmann pers. comm., October 2017; [84]). In Australia, *A. truncata* normally breeds in *Eucalyptus* and a few other Myrtaceae, but the species has been collected breeding in *Acacia* and *Albizia* (Fabaceae) in New Zealand, a country in which the species has been present since at least the 1930s [83].

Identification: In southern South America, photos are sufficient to identify this *Amasa*; the best photo is in [84]. There are no similar ambrosia beetle species in these temperate regions of South America (or indeed in the Neotropics).

Risks: *Amasa* could become a pest of *Eucalyptus* plantations in Chile and Argentina, and Gómez et al. [84] worry that it could move onto native Myrtaceae. However, though the species attacks stressed and even healthy live trees, it is not considered a pest of *Eucalyptus* in Australia or New Zealand [82,83], and no significant damage has been reported from the recently established populations in Brazil or Uruguay (C. Flechtmann, pers. comm., October 2017; [84]).

3.2.2. The Earliest Collections of *Xylosandrus crassiusculus* (Motschulsky) in South America, and a Second Province in Argentina.

New records: **ARGENTINA**, Misiones, Corpus, February 2001, leg. D. Carpintero (14 specimens); Misiones, Corpus, February 2001 (1); Misiones, Corpus, November 2003 (1).

Comments: The Granulate Ambrosia Beetle, *Xylosandrus crassiusculus*, has spread in recent times from Asia to warmer regions of Africa, Europe, Oceania, and the Americas [85,86]. This highly polyphagous ambrosia beetle was first reported from eastern North America in 1974, and the first Neotropical collections were from 1996 for Costa Rica and 2003 for Panama [85]. Flechtmann and Atkinson [86] subsequently found a specimen collected from Guatemala in 2008 and report collections from French Guiana (2009) and coastal Brazil (2008–2014).

The three collections from Misiones are the third report of the Granulate Ambrosia Beetle in Argentina. The first report comprises two collections in 2013 from Campana, Buenos Aires [87]. Most recently, Córdoba and Atkinson [76] add Famallá, Tucumán, in 2016. The Misiones collections predate by a decade the earliest trap records from coastal Brazil. The first collection in Uruguay is from 2010 [87]. Given the long-term trapping programs in Brazilian and Uruguayan forest plantations, the species was likely absent from Brazil at the time the Argentinian specimens were collected. This suggests that either there may have been an initial introduction of *X. crassiusculus* to Argentina, and the species then moved up the coast into Uruguay and Brazil, or that one or more subsequent introductions produced the current distribution.

Identification: This ambrosia beetle can be identified from descriptions and careful comparison with photos [87,88]. It can also be identified by DNA barcoding [87].

Risks: *Xylosandrus crassiusculus* is on the EPPO Alert List [89] and considered a high risk quarantine pest by CABI [90]. It can be a pest of nurseries or stressed young trees in natural forests, and colonization of stacked lumber can produce economic loss [88,90]. Occasional attacks on apparently healthy small trees have been reported [88,90].

3.2.3. Range Expansions for *Xyleborinus saxeseni* (Ratzeburg) in Chile and Argentina.

New Records. **CHILE:** [Región VI] San Fernando, Nov. 1978, trunk of apple, R. Charlin (3, UCCC) [Región VI] San Fernando, 4–10 December 1978, trunk of apple, R. Charlin (1, UCCC); Región X, Santo Domingo, Valdivia, 5 October 1980, E. Krahmer (11, UCCC); Región X, Valdivia, 21 October 1984 (3, UCCC); Región VII, Curicó, 20 km E Portrero Grande, *Nothofagus dombeyi*, 153963, 25 February 2004, J. E. Barriga (5, LRKC). **ARGENTINA:** Chubut, −42.0361, −71.5456, 29 December 2010, ex *P. contorta*.

Comments. This widespread invasive ambrosia beetle has been recorded from Paraguay, Brazil, Argentina, and Chile in South America. There are no Chilean localities given by Wood [25] and only two in Schedl's review [27] (under *Xyleborus paraguayensis* Schedl): for a specimen from Bio-Bio in 1950, the earliest date for the species, and for a specimen from Valdivia in 1962 (as *Xyleborus saxeseni*). In [26], the range is given as from Atacama (III) Los Rios (XIV), and [33] extends the southern limits of the range to Los Lagos (X).

Previous Argentina records (Buenos Aires, Entre Rios) are from subtropical provinces in the north, including new finds in Tucumán and Salta [76]. The earliest record seems to be a collection by Bosq from Entre Rios in 1920 [91]. The Chubut collection reported here is the much further south, and in a cold temperate climate.

Identification. The species can be identified by keys and photos in the standard works.

Risks. This ambrosia beetle is native to Eurasia and North Africa but is cosmopolitan in distribution [92]. It is highly polyphagous, breeding in many families of both gymnosperms and angiosperms. CABI [88] rates it a “high-risk quarantine pest,” but, where it is an established exotic species, it is not currently thought to cause significant problems for native or crop forests.

3.3. Seed Beetles

3.3.1. First Record of the Palm Seed Specialist *Dactylotrypes longicollis* (Wollaston) in South America

New records. **CHILE:** R. M. Colina, Fdo. San Miguel, ex *Phoenix canar.*, 09 December 2016, leg. R. Cabrera, 65952/16 (5 on one pin, LRKC); R. M. Colina, Reg. Artilleria Antiaerea, funnel trap 10 May 2016 R. Cabrera (22, 5 each on three pins and 7 in a gelatin capsule, SAGC).

Comments. The monotypic *Dactylotrypes longicollis* (tribe Dryocoetini) coevolved with the Canary Island date palm (*Phoenix canariensis*), both of which are endemic to the Canary Islands. In recent decades, *D. longicollis* has rapidly expanded its range to include Madeira, the Mediterranean, and northern Africa [7]. It was found very recently in California in western North America [93]. It is often found in the same localities as one or the other of two other seed predators, *Coccotrypes carpophagus* (Hornung) and *C. dactyliperda* (F.), which species are now circumtropical in their distribution. In Chile, the two collections of *D. longicollis* are from the town of Colina, ca 30 km N of Santiago. *Dactylotrypes longicollis* seems to be common in this one town, but it is likely more widespread since fallen date seeds are often overlooked by general collectors. The colonization is probably recent: Schedl was familiar with this species but does not list it in his Chile papers, there are no specimens in the Museo Nacional de Historia Natural, and those at SAG are from 2016. No other records have been published for South America for *D. longicollis*. Given the secretive habits of the species, this could be due to undercollecting.

Identification. The description, key and photos in [89] will help separate *D. longicollis* from species of *Coccotrypes* or of superficially similar scolytines.

Risks. This species primarily breeds in seeds of palm trees (Arecaceae) and thrives in urban areas with planted palms. It is a potential predator of seeds of the narrowly distributed endemic Chilean wine palm (*Jubaea chilensis*) and hence could hamper local attempts at reforestation.

3.3.2. Range Expansion for *Coccotrypes dactyliperda* (Fabricius)

New records. **CHILE:** Región Metropolitana, Santiago, SAGC funnel trap, March 2002, J. Mondaca (1 female, SAGC); 12078/04, Santiago, Zool. Metrop. 15–IV–2004, leg. J. Mondaca (1 female, LRKC); Región Metropolitana, Santiago, Museo Nacional de Historia Natural, seed *Phoenix canariensis*, 25 March 2008, L. R. Kirkendall (1, LRKC).

Comments. This date seed specialist is known from tropical and subtropical regions around the world. Wood [25] cites unspecified country records for Chile and Argentina, unaware that more specific data existed at the time. For Chile, Schedl [27] summarizes his previously published records: “Chile” (no more exact locality information), ex *Chamaerops gracilis* in 1915, and Antofagasta [Región II] in 1942. Elgueta and Marvaldi [26] summarize the range as Antofagasta to Valparaíso; the new records here for the metropolitan region extend the known range further south.

Bosq [65] lists Buenos Aires (Isla Martín García) for the species, without more data, and states that the species is established. Schedl [35] reports collections in 1950 of *C. dactyliperda* from both Buenos Aires and Entre Rios in Argentina.

Though rare in collections, it would appear that the species is widely (if perhaps discontinuously) distributed in southern South America and has been in this part of the continent for over a century.

Identification: Most species of *Coccotrypes* cannot be identified by nonspecialists, other than by DNA barcoding.

Risks. See *Dactylotrypes longicollis*.

3.3.3. New Regions and New Hosts for the Lauraceae Seed Specialist *Pagiocerus frontalis* (Fabricius) in Chile

New records. **CHILE:** Región III, Copiapó, Aug. 1998, ex *Persea americana* (avocado), H. Carrillo (1, LRKC). Región Metropolitana, Santiago, Providencia, Plaza La Alcadesa, ex. “belloto del norte” [*Beilschmiedia meirsii*, Lauraceae], 5 June 2008, H. Carrillo (4, SAGC).

Comments. Gómez and Aguilera [94] report that the species was only found in Región I and had only been found in maize. Wood [25] has one Chile record: [Región I] Valle [de] Lluta, Arica, Prov. Tarapacá, XI–1996, J. Jimenez. Elgueta and Marvaldi [26] report only Arica. Only a country record is reported for Argentina in Wood [25], but Córdoba and Atkinson [76] have a record from Tucumán in the north, which is probably part of the natural range of the species.

Pagiocerus frontalis is the only widespread species in its genus. The other four species are known only from southern Brazil [25]. In nature, this species has been found most often in large seeds of tropical and subtropical Lauraceae (*Persea*, *Nectandra*, *Ocotea*) [45]. *Pagiocerus frontalis* is known to breed in seeds of commercial avocados [95,96] and is considered the main pest of stored maize in the Andes [97–99]. It has spread (or been spread) widely, obscuring traces of its original distribution. The specimens from Chile are probably not native. There are no collections from Lauraceae in native forests of Chile or from bordering Argentinian Patagonia. The one collection from a native host was from a planted tree in the capital city of Santiago. The closest collection to these is from subtropical forests of northern Argentina (Tucumán), where natural hosts occur. For these reasons, I treat it as an exotic species for Chile. The three Chilean localities are well separated (the Arica site is near the border with Peru), suggesting that the species is well established in the country. The only Argentinian locality known is from a recent collection from Tucumán [76], which is presumably part of its native range. Bosq [65] remarks on collections made from maize imported from Peru, but states that the species is not established in nature, a conclusion cited without further comment by Viana [37].

Identification. The species can be identified using keys and photos in the standard works.

Risks. Importantly, the Chilean specimens from Providencia are from “belloto del norte,” *Beilschmiedia miersii*, a native lauraceous tree from central Chile, indicating that *P. frontalis* could potentially become a seed predator in native forests.

3.3.4. *Coccotrypes cyperi* (Beeson) Recorded from Easter Island

New record. Valparaíso, Easter Island, October 2009, trampa tablero (1 female, SAGC)

Comments. This polyphagous *Coccotrypes* is widely distributed in tropical and subtropical environments around the world, and breeds in everything from seeds and twigs to under bark of branches. It has not yet been identified from all suitable New World regions [100], but this is most likely due to undercollecting. It is to be expected to eventually colonize at least northern Argentina and perhaps northern or central Chile. The only record for these countries thus far is Easter Island.

Identification: Most species of *Coccotrypes* cannot be identified by nonspecialists, other than by DNA barcoding.

Risks. None known.

3.4. Species Not Included

3.4.1. *Scolytus kirschii* Skalitzky

This small Eurasian elm bark beetle is known from southern Brazil [25]. The record for Argentina is said to be an “oral report, not confirmed” [25]. A single specimen was collected by Vicky Klasmer from Rio Negro province, near El Bolsón, in 2008, but the collection record states it was collected from *Pinus radiata*. The identification as *S. kirschii* was by Lee Humble in 2010 (Vicky Klasmer, pers. comm.). Given that the differences among similar *Scolytus* species are very slight, this identification should be confirmed by an expert. However, the specimen could not be located. Further, it was recorded as being collected from a non-host and in a region with no elm trees (Vicky Klasmer, pers. comm.). Regardless, being only a single specimen, if it is not one of the currently established *Scolytus* species, it is possible that it represents a failed invasion. The species can vector the fungus responsible for Dutch Elm Disease and is considered a threat to elms both in parts of its native range and where it is invasive [101].

3.4.2. *Pityokteines curvidens* (Germar)

Though listed in Wood and Bright [45] and earlier works as occurring in Argentina, there are no modern records that confirm the presence of this tiny spruce bark beetle in South America, and it is not included in Wood's monograph of the bark beetles of South America [25]. There are no native spruces in Argentina.

3.4.3. *Coccotrypes robustus* (Eichhoff)

In NHMW, there is an old specimen of this species labeled Chile (identification confirmed by me), with no further data.

3.4.4. *Hypothenemus hampei* (Ferrari)

There is a single record of the coffee berry borer from Isla Martín García, Buenos Aires, Argentina [72] (as *Stephanoderes glabellus* Schedl). However, Argentina is not a coffee-producing country (<https://www.indexmundi.com/agriculture/?country=ar&commodity=green-coffee&graph=production>), and there have been no further reports of *H. hampei* from Argentina. It is likely this was either a misidentification or an interception.

4. Discussion

The native bark beetle fauna of South America is indisputably undercollected [25,76,102,103], and the finds reported here suggest that the exotic bark beetle fauna, too, is poorly known. It is probable that the rate of establishment of non-native scolytines is increasing for this part of the continent, just as it is for North America [9] and Europe [7,8]. We can also conclude (if cautiously) that the ranges of many of the introductions are increasing or have reached the distributional limits of their hosts. Many or most of the species listed here seem most likely to have come directly from Europe, though some may have come from other South American populations (e.g., *Amasa truncatus*) or from almost anywhere with an appropriate climate (*Coccotrypes dactyliperda*).

Three guilds of bark beetles are represented in the exotic faunas of Chile and Argentina, bark beetles, ambrosia beetles, and seed feeders. These have probably followed three well-known pathways for invasive insects: wood (dunnage, crating, timber); infested imported plants or plant parts; and commodities, such as dried maize for *P. frontalis* [104]. Species breeding in hosts such as pines, *Eucalyptus*, stone fruit trees, or avocado find large monocultures of their host plants in Chile and Argentina, many of which are close to ports or nurseries. Species breeding in hosts that are widely planted in temperate cities (such as figs, ornamental olives, ornamental fruit trees, ashes, elms, or palms) also find many potential hosts near ports of entry. On the other hand, those requiring dead plant tissues (such as dead branches or tree trunks) will find little host material in well-tended cities and towns.

The historical misidentification of *Orthotomicus laricis* as *O. erosus* has repercussions for the risk assessment of Chilean timber exports. Although the general biology of the two species may be similar, we simply do not know in what ways the species do differ. There might (or might not) be significant differences in the effects of fungi and other microbes associated with *O. laricis* vs *O. erosus*, for example. Since *O. laricis* has not been considered an aggressive species in Europe and only recently has been recognized as an alien species, there is little detailed knowledge of its ecology and behavior.

The detection of alien species is directly correlated with the intensity of monitoring [11,104]. There is currently little research being done on bark beetles in most parts of South America, but where systematic investigation (especially trapping) has been initiated, new invasive species have been quickly detected [47,86,87,105]. Documenting the future spread of potentially destructive non-native scolytines will require effective monitoring strategies and the collaboration of taxonomic specialists.

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