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RESEARCH ARTICLE

First report of the ambrosia beetle, *Amasa parviseta* (Curculiondae: Scolytinae), in South Africa

G Townsend[1*], M Hill[2], BP Hurley[3], WJ Nel[3], C Crous[1] and F Roets[1]

[1]Department of Conservation Ecology and Entomology, Stellenbosch University, Stellenbosch, South Africa.
[2]Centre for Biological Control, Department of Zoology and Entomology, Rhodes University, Makhanda, South Africa.
[3]Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria, South Africa.

Worldwide introductions of non-native bark and ambrosia beetles (Coleoptera: Scolytinae) are increasing, with several species now capable of attacking living trees and introducing pathogenic fungi having been recorded in naïve habitats. Here we provide the first record of the exotic *Amasa parviseta* Knížek & Smith 2024 in continental Africa, based on four specimens collected across the Western Cape province of South Africa. This species is known to primarily colonise stressed or dying Eucalyptus and other Myrtaceae species. While no impacts have thus far been documented locally on commercially grown Eucalyptus, the species' known ability to vector pathogenic fungi in other regions highlights its potential threat to not only South Africa's commercial forestry industry but also its native species of Myrtaceae. We recommend targeted monitoring of this non-invasive species and investigations into its symbiotic fungi for potential phyto-pathogenicity. The discovery of this potentially harmful exotic species in South Africa underscores the importance of ongoing surveillance for non-native scolytine beetles to ensure early detection, proper risk assessment, and phytosanitary interventions to prevent establishment and mitigation of possible negative impacts.

CORRESPONDENCE
G Townsend

EMAIL
garyndelport123@gmail.com

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INTRODUCTION

Worldwide introductions of non-native bark and ambrosia beetles (Coleoptera: Scolytinae) into new ranges are increasing (Pureswaran et al. 2004; Ploetz et al. 2013). Most ambrosia beetles colonise stressed or dying trees and are of little concern (Hulcr et al. 2017). However, several species have become highly destructive when introduced into new ranges, attacking living trees and introducing pathogenic fungal symbionts, leading to tree decline and death (Hulcr and Stelinski 2017). Some of the most invasive ambrosia beetles belong to the tribe Xyleborini (Gomez et al. 2018) and include pests such as the redbay ambrosia beetle (*Xyleborus glabratus* Eichoff 1877) (Fraedrich et al. 2007) and the polyphagous shot hole borer (PSHB, *Euwallacea fornicatus* Eichoff 1868), which have caused significant damage to trees in introduced areas (Hanula et al. 2008; Boland and Uyeda 2019; Mendel et al. 2021; Townsend et al. 2025). In South Africa, various non-native and cosmopolitan bark and ambrosia beetle species have been detected (Nel et al. 2025). This includes for example the PSHB which was first reported in 2018 (Paap et al. 2018) and has since had a continued and significant impact on trees in urban, agricultural, and natural systems (de Wit et al. 2021; Engelbrecht et al. 2024; Roberts et al. 2025; Townsend et al. 2025).

The genus *Amasa* Lea 1894 (keyhole borers) contains more than 40 species and is originally from the East Asian and Australian regions (Wood and Bright 1992). Members of the genus have established outside of their native ranges in many other regions, including Spain (2009), Brazil (2011), Chile (2016), Uruguay (2017), Argentina (2018), France (2018) and Portugal (2019) (Barnouin et al. 2020; Flechtmann and Cognato 2011; Gómez et al. 2017; Knížek and Smith 2024; Marchioro et al. 2022; Rainho et al. 2018; Viñolas and Verdugo 2011). Most *Amasa* species were described from single specimens, and because of highly discrete intraspecific variation, synonymy among specimens from different regions was previously difficult to recognise (Knížek and Smith 2024). An example of the difficulty in taxonomy in this genus can be seen with the recently described *Amasa parviseta* Knížek & Smith 2024, where careful consideration of morphological and molecular evidence showed that specimens previously identified as *Amasa truncata* Erichson 1842, *Amasa resectus* Eggers 1923, *Amasa* sp. near *truncata* Erichson and *Amasa* sp. all belong to the same species, namely *A. parviseta* (Knížek and Smith 2024).

Like all Xyleborini, *Amasa* species display haplodiploidy and are largely inbred, with males rare, dwarfed, and flightless (Kirkendall et al. 2015). Species typically breed in stressed and dying *Eucalyptus* L'Hér. 1789 and related Myrtaceae (Moore 1959, 1962; Flechtmann and Cognato 2011), but have also been found colonizing several other plant families (Flechtmann and Cognato 2011; Hulcr et al. 2007). Currently, species are considered of little economic importance in both their native invaded ranges, with their impact localized to certain tree species and regions (Flechtmann and Cognato 2011; Rainho et al. 2018). The only reports of significant damage are rapid wilting and dieback in *Eucalyptus globulus* Labill. 1799 in New Zealand, which was attributed to *Amasa truncata*, and an associated *Ceratocystis* fungus (Milligan 1969; Zondag 1977). However, these could potentially represent mis-identified specimens of the newly described *A. parviseta.* Although not yet reported, there are also concerns of *Amasa* species attacking native Myrtaceae species in Brazil (Flechtmann and Cognato 2011), which highlights the potential broader impacts of *Amasa* species in invaded regions.

Early detection and reporting of potentially invasive scolytine beetles are imperative to help prevent their establishment and to mitigate any potential negative impacts they may have within an introduced range (Brockerhoff et al. 2003; Ploetz et al. 2013). Recent surveys of Scolytinae in the Western Cape Province of South Africa revealed the presence of an unidentified species that morphologically resembled individuals of *Amasa*. Given that no *Amasa* species are known from the African continent (Nel et al. 2025), we set out to formally identify and characterize these specimens utilizing morphological characters, as well as DNA sequence data.

MATERIALS AND METHODS

Beetle trapping and collection

Scolytinae trapping surveys were conducted at 54 sites in the Western Cape province of South Africa between 2022 and 2024. Initially, surveys were aimed at detecting *E. fornicatus* (PSHB) presence and abundance in indigenous forests (Roberts et al. 2025; P. Barker. pers. comm.; N. Esterhuizen pers. comm.); as well as to document general Scolytinae diversity in these forests (Townsend et al., in press). Beetles were collected using both ethanol- and quercivorol-baited Bamabara beetle traps (Hulcr and McCoy 2015; Byers et al. 2018). During these surveys, four specimens of an unknown ambrosia beetle species were collected at four separate localities (Figure 1; Table 1). *Eucalyptus* spp. were present in close proximity to the traps at all localities except for the site in Wilderness, where the closest *Eucalyptus* stand is ~10km from the trap site. One specimen was pinned for identification, and the remaining three were stored at −20°C in 99% ethanol.

Morphological examination

Specimens were examined at 100× magnification using an Olympus SZ2-ILST stereomicroscope (Nagano, Japan). Focus-stacked photographs of individual beetles and taxonomically informative characters were produced using a Keyence VH1-X1 digital microscope (Osaka, Japan). Specimens were morphologically compared to described genera and species using available keys and images (Wood and Bright 1992; Smith et al. 2020; Knížek and Smith 2024). All specimens are housed at the Stellenbosch University Entomological Collection (USEC), Stellenbosch University, Stellenbosch, South Africa.

DNA barcoding

To further clarify the identity of the specimens, genomic DNA was extracted from three specimens using three legs of each (specimens 1–3, Table 1). A TIANamp genomic DNA kit (Tiangen Biotech, Beijing, China) was used to extract genomic DNA from beetle tissue, which was subsequently used as a template for PCR amplification of the target marker following the manufacturer's instructions. A fragment of the mitochondrial cytochrome c oxidase subunit I (COI) gene was amplified using the universal invertebrate primers LCO1490 (5'-GGTCAACAAATCATAAAGATATTGG-3') and HCO2198 (5'-TAAACTTCAGGGTGACCAAAAAATCA-3'), commonly used in Scolytinae identification (Albo et al. 2019). PCR amplifications were performed in 25 µL reaction volumes (2µL template DNA, 1 µL of each primer and 21µL PCR reaction mixture). Thermal cycling conditions consisted of an initial denaturation at 94 °C for 2 min, followed by 35 cycles of 94 °C for 30 s, 50 °C for 45 s, and 72 °C for 1 min, with a final extension at 72 °C for 5 min.

Membrane-based post-PCR product clean-up and sequencing were conducted in both directions at Stellenbosch University's Central Analytical Facility (CAF, Stellenbosch University, South Africa). Forward and reverse chromatograms were manually inspected and assembled into consensus sequences in MEGA v.12 (Kumar et al. 2024). High quality sequences were obtained for two of the three specimens (specimens 2 and 3, Table 1), and one specimen was excluded from further analyses due to poor sequence quality (Specimen 1, Table 1). Sequences were compared against the NCBI nucleotide database using BLASTn to confirm preliminary taxonomic identity and to identify suitable reference sequences. The relevant sequences from GenBank were aligned with our sequences using the ClustalW algorithm (Thompson et al. 1994) in MEGA v.12. Alignments were trimmed to a common length to ensure comparability, and pairwise sequence divergences were calculated using the Maximum Composite Likelihood method (Tamura et al. 2004).

RESULTS

Beetle specimens, morphology, and DNA barcoding

Four specimens of an unknown ambrosia beetle were collected during our surveys. Examination using stereomicroscopy

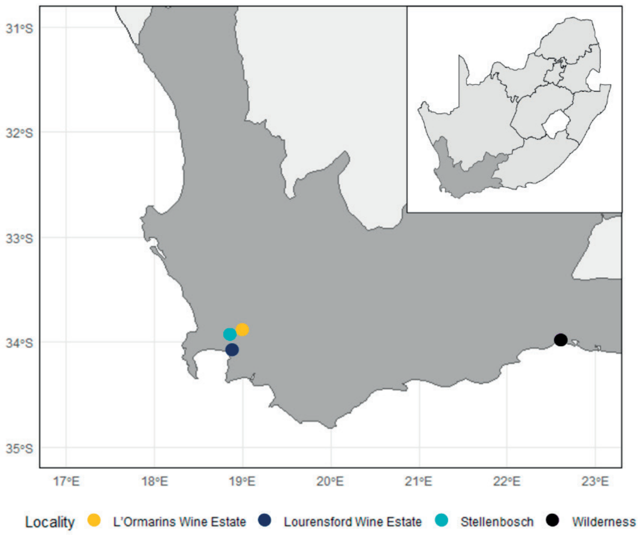

Figure 1: Locations within the Western Cape province of South Africa where beetle specimens were collected.

Table 1: Collection details and GenBank accession numbers for partial sequences of the mitochondrial cytochrome c oxidase subunit I (COI) gene region of each specimen generated in this study.

Locality	USEC accession number	Latitude	Longitude	Trap type	Date collected	GenBank accession number
L'Ormarins Wine Estate	AP2025.1	-33,879833	19,003032	Querciverol-baited Bambara trap with Polypropylene glycol as preservative	November 2022	NA
Lourensford Wine Estate	AP2025.2	-34,071972	18,888722	Querciverol-baited Bambara trap with Polypropylene glycol as preservative	January 2024	PX434427
Stellenbosch	AP2025.3	-33,933694	18,865917	Ethanol-baited Bambara trap	March 2024	PX434428
Wilderness	AP2025.4	-33,983972	22,609139	Ethanol-baited Bambara trap	February 2022	NA. Pinned as reference specimen.

found that all four specimens were morphologically identical. Initial morphological identification suggested these specimens belonged to the genus *Amasa* (keyhole borers) (Figure 2) with taxonomic characters conforming to the recently described *A. parviseta* (Smith et al. 2020; Knížek and Smith 2024). This species can be distinguished from other *Amasa* species by the basic structure of the pronotum, the anterior margin of which is serrate; and the smooth and nearly glabrous, slightly convex elytral declivity, with multiseriate granulated declivital interstriae 1–4, and with convex declivital interstriae (Figure 2; Knížek and Smith 2024). Pairwise comparisons of the COI sequences generated in this study (Table 1) and three *A. parviseta* reference sequences downloaded from GenBank (Knížek and Smith 2024 – Portugal: OP143861, France: OP143862, and Australia: SBGB053-03), revealed very low divergences (<0.2%), indicating conspecificity.

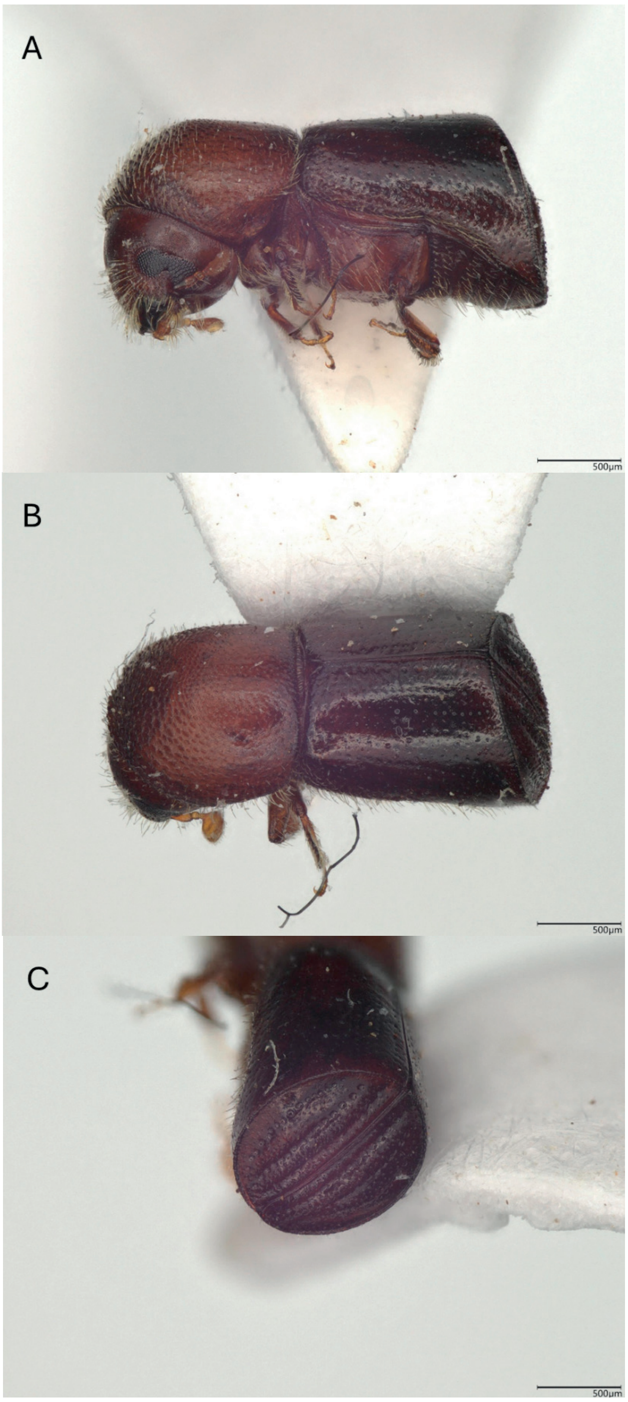

Figure 2: A female specimen of *Amasa parviseta*, A) lateral view, B) dorsal view, C) elytral declivity.

DISCUSSION

Our study here reports the first record of *Amasa parviseta* on continental Africa, with four specimens collected from four different locations in the Western Cape province of South Africa. The furthest distance between collection sites is ~400km, suggesting a widespread distribution of the species in the Western Cape. Currently, its presence in other parts of the country is unknown, as well as its abundance, impact, and host range and preference. As *Eucalyptus* is a substantial resource in South Africa's international trade (Bennett 2010), this could represent the pathway through which the beetle was introduced into the country (Meurisse et al. 2019). Given the reports of this beetle species occurring in various countries it has likely been introduced into many more than currently reported (Flechtmann and Cognato 2011; Knížek and Smith 2024).

This species is native to Australia, where it has been recorded in the Australian Capital Territory, New South Wales, and Queensland. Outside its native range, it has been reported in Europe (France, Portugal, and Spain) and South America (Argentina: Tucumán; Brazil: Minas Gerais and São Paulo; Chile: Valparaíso; and Uruguay) (Flechtmann and Cognato 2011; Gomez et al. 2018; Knížek and Smith 2024; Rainho et al. 2018; Viñolas and Verdugo 2011). *Amasa parviseta* has not been reported to cause significant damage to native Myrtaceae or *Eucalyptus* spp. in its introduced ranges (Flechtmann and Cognato 2011; Kirkendall 2018). Even in Brazil, where it has likely been present since 1996, the beetle has not caused any apparent damage to the more than 1000 native Myrtaceae species. However, no comprehensive surveys of this species and its impacts on native and introduced Myrtaceae have been conducted (Flechtmann and Cognato 2011; Zondag 1977). Also, although preferentially infesting species of Myrtaceae, *A. parviseta* may be polyphagous (Flechtmann and Cognato 2011; Hulcr et al. 2007; Knížek and Smith 2024) as members of the genus have been reported infesting more than 30 plant species from 9 families (Flechtmann and Cognato 2011; Hulcr et al. 2007; Zondag 1977). In South Africa the introduction of this species may thus be of concern, as it could pose a threat to both native plant species and commercially grown *Eucalyptus* (including *E. dunni* and *E. grandis*).

This study reports on the third non-native ambrosia beetle detected in South Africa in less than a decade, with PSHB formally reported in 2018 (Paap et al. 2018), and *Xylosandrus crassiusculus* Motschulsky 1866being reported in 2020 (Nel et al. 2020). These discoveries stress the importance of regular monitoring for potential invasive and damaging insect pests in forest and plantation habitats. Although no impacts caused by *A. parviseta* have been reported so far in South Africa, this may be due to a lack of comprehensive surveys especially of native Myrtaceae and of Eucalyptus in the Western Cape where they are not grown commercially. The PSHB beetle has likely been present in South Africa since ~2012 (van Rooyen et al. 2021), but its impacts have only been observed during the past eight years. Therefore, targeted trapping with α-pinene + ethanol for *A. parviseta*, especially in *Eucalyptus* plantations, should be considered (Flechtmann and Cognato 2011).

Important future research will include isolating the symbiotic fungi from living specimens of *A. parviseta* and investigating their potential pathogenicity towards at risk native Myrtaceae species, as well as high value commercial *Eucalyptus* species and clones. Other species of *Amasa* have been reported to vector species of *Ceratocystis* (Flechtmann and Cognato 2011; Zondag 1977) and *Raffaelea* spp. (Hulcr and Stelinski 2017), both genera of which contain important vascular wilt pathogens. If *A. parviseta* is a vector of a *Ceratocystis* species in South Africa, it may pose a serious threat to the South African forestry industry, as numerous

Ceratocystis species are highly virulent vascular pathogens of *Eucalyptus* and other tree species resulting in wilting, cankers, and dieback (Roux and Wingfield 2009, De Beer at el. 2014, Lynn et al. 2025).

CONCLUSIONS

Introductions of non-native bark and ambrosia beetles are on the rise, with many species having the potential to cause significant damage to a wide variety of tree species (Ploetz et al. 2013; Hulcr et al. 2017). Also, with ongoing climate change, previously non-damaging bark and ambrosia beetles have become, and will continue to become, much more damaging in both their native and introduced ranges (Cudmore et al. 2010; Ge et al. 2017). In addition, novel pest-pathogen complexes, combined with a changing climate, could alter how vegetation responds to pest and pathogen pressures, with major ecological consequences. (Dale et al. 2001; Ennos 2015; Ramsfield et al. 2016). It is therefore important to reiterate improved phytosanitary interventions at borders and ports of entry to prioritise the interception of wood-boring insects before they become established (Brockerhoff et al. 2003). Widespread monitoring of natural and plantation forests combined with research on the beetles and their fungal associates should be strongly considered as the economic and ecological consequences of scolytine beetle invasions could be insurmountable (Boland 2016; de Wit et al. 2021; Cook and Broughton 2023; Johnson et al. 2025).

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ORCID IDS

G Townsend: https://orcid.org/0000-0001-9128-961X
M Hill: https://orcid.org/0000-0003-0579-5298
BP Hurley: https://orcid.org/0000-0002-8702-5547
WJ Nel: https://orcid.org/0000-0001-6368-2203
C Crous: https://orcid.org/0000-0002-0920-5868
F Roets: https://orcid.org/0000-0003-3849-9057

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