



## An annotated checklist of scale insects (Hemiptera: Coccoidea) of Portugal, including Madeira and Azores Archipelagos

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### Abstract

A first comprehensive checklist of the scale insects of Portugal, including Azores and Madeira Archipelagos, is presented comprising a total of 168 species: 124 from Mainland, 109 from Madeira, and 52 from Azores. The listed species are distributed among 85 genera and 15 families.

**Key words:** coccoids, insect fauna, Iberian Peninsula, Europe, Palaearctic

### Introduction

Scale insects or coccoids (Coccoidea) are sap sucking hemipterous insects comprising nearly 8000 species and up to 32 extant families, being more diverse than any of the other closely related sternorrhynchan groups, i.e. the aphids (Aphidoidea), jumping plant lice (Psylloidea) and whiteflies (Aleyrodoidea) (Gullan & Cook, 2007). Many scale insects are serious agricultural pests, especially on fruit trees, woody ornamentals, forest trees and shrubs, and indoor plantings (Kosztarab & Kozár, 1988, Miller *et al.*, 2005). As highly specialized, sedentary, plant-parasitic insects and due to their small size (usually, less than 5 mm length) and cryptic behaviour, coccoids have been frequently introduced and acclimatized in different parts of the World, mainly through horticultural and ornamental trade (Kondo *et al.*, 2008, Miller *et al.*, 2005, Pellizzari & Germain, 2010). Alien scale insects often colonize anthropogenic habitats, such as agricultural lands and urban areas, including gardens and parks, botanical gardens, nurseries and greenhouses. However, some species may also spread to natural habitats (Pellizzari & Germain, 2010). These insects are also ecologically important, namely due to the diverse trophic interactions they establish with other organisms. For example, honeydew-producing scale insects provide a sugar-rich food resource for a range of species at several trophic levels, including micro-organisms, invertebrates, reptiles and birds (Beggs *et al.*, 2005). Knowledge on coccoid fauna is therefore of significant importance.

Knowledge on coccoid fauna of Europe is still incomplete. Although relatively well studied in some European countries, such as Hungary, France and Italy (Foldi, 2001; Kosztarab & Kozár, 1988; Pellizzari & Russo, 2005), the scale insect fauna in other parts of Europe, such as Portugal, is poorly known. Based on the results of a small survey, during which 12 new species were added to the list of coccoids of Continental Portugal, and based on the known scale insect diversity of other Mediterranean countries, Kozár & Franco (1995) postulated that the Portuguese scale insect fauna should have more than 200 species.

The information available from the literature on Portuguese coccoids is incomplete and scattered. Lindinger (1912), Neves (1935, 1936a, 1936b, 1936c, 1936d, 1943, 1954b), Saraiva (1936a, 1936b), Seabra (1918, 1930a, 1930b, 1941, 1942), Kozár & Franco (1995), and Mazzeo *et al.* (2009) for mainland Portugal; Lindinger (1912), Green (1923), Balachowsky (1938, 1939), Vieira (1953), Vieira *et al.* (1983), and Borges *et al.* (2008) for Madeira,