



## Scale insects (Hemiptera: Sternorrhyncha: Coccoidea) of the Krakatau Islands including species from adjacent Java

DOUGLAS J. WILLIAMS<sup>1</sup> & DOUGLASS R. MILLER<sup>2,3</sup>

<sup>1</sup>Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK

<sup>2</sup>Systematic Entomology Laboratory, PSI, Agricultural Research Service, USDA, Rm. 137, Bldg. 005, BARC-W, Beltsville, MD 20705, U.S.A. E-mail: DOUGLASS.MILLER@ARS.USDA.GOV

<sup>3</sup>Corresponding author

### Abstract

In this paper we provide a list of all species of scale insects that have been collected in the Krakatau Islands since the catastrophic eruption of 1883. Included in the list are species collected during the La Trobe University Expedition in 1984 from the islands and from the adjacent mainland in Java and also species collected in earlier expeditions, including those during 1919–1933, discussed by Dammerman (1948). In addition, we describe two new species of armoured scales, *Aulacaspis thorntoni* Williams & Miller and *Greeniella calophylli* Williams & Miller and provide a key to the species of *Greeniella* Cockerell.

**Key words:** Krakatau, introduced species, *Aulacaspis thorntoni* sp. n., *Greeniella calophylli* sp. n., key to *Greeniella*

### Introduction

The purpose of this paper is to list the scale insects that have been collected in the Krakatau Islands since the catastrophic volcanic eruptions of 1883 which sterilised the islands. The islands are situated in the Sunda Strait and lie almost midway between the southern tip of Sumatra and the north-east corner of Java. Prior to these eruptions, the Krakatau Islands comprised five main islands, Rakata, Panjang, and Sertung, forming a ring about 12 km in diameter around two central islands, Daman and Perbuatan, all formed after an earlier eruption in Prehistoric times. After the eruption in 1883, the two central islands disappeared along with much of the other islands. After a series of eruptions starting in 1927 in the centre of the islands, a new island emerged in 1930 and was named Anak Krakatau (Fig. 1). In 1952, all plant and animal life on Anak Krakatau was wiped out when it erupted again.

As a result of zoological surveys of the Krakatau Islands during 1919–1922 and 1929–1933, some scale insects were collected and these were listed by Dammermann (1948). Several of these are deposited in The Natural History Museum, London, and a few others have been added since. The present list includes these scale insects and records from the literature but the list has been largely increased by collections made during the La Trobe University Expeditions in 1984. An overview of the 1984, 1985 and 1986 expeditions was presented by Thornton (1987). The list also includes a few species collected during the expedition on the mainland of Java on the Ujung Kulang Peninsula, opposite the Krakatau Islands.

Female scale insects are wingless and winged adult males do not feed. First-instar nymphs are often transported by wind, and any instar can be introduced on plant material. Phoretic methods, perhaps on birds, cannot be ruled out as mechanisms for introduction to these islands. Even so, the list includes a variety of species from seven scale insect families. One species, *Icerya jacobsoni* Green (family Monophlebidae), was observed in 1982 infesting many plant species especially *Ficus fistulosa* and *Pipturus argenteus* on Rakata (Yukawa, 1984). Most of the species are cosmopolitan but it is interesting that other species of *Icerya* are also present. *Icerya samaraia* (Morrison) has become widely distributed throughout the Krakatau Islands in recent