



Taxonomic reexamination of *Portulaca boninensis* (Portulacaceae) in the Bonin (Ogasawara) Islands of Japan using molecular and morphological data

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Abstract

Molecular phylogenetic analyses, morphological observations, and nomenclatural studies were carried out to investigate the taxonomic status of *Portulaca boninensis*, endemic species from the Bonin (Ogasawara) Islands (Japan). The results addressed controversy between the widely naturalized *P. boninensis* and *P. pilosa*, indicating that they are phylogenetically and morphologically distinct. Furthermore, *P. boninensis* was showed to be conspecific to *P. psammotropha* which is until now recorded in southern China, Taiwan, and the northern Philippines, but not in the Ryukyus. The name of *P. psammotropha* was lectotypified on a specimen preserved at K. Based on phylogeography, *P. psammotropha* likely migrated to the Oceanic Bonin Islands oversea by sea-current dispersal or by exo- and/or end ozoochory through migratory birds without passing through Ryukyus.

Key words: Biogeography, ITS, lectotype, Philippines, *Portulaca psammotropha*, Taiwan, Taxonomic revision

Introduction

Portulaca Linnaeus (1753: 445) is the only genus belongs to Portulacaceae Juss. a monotypic family according to the molecular studies by Nyffeler & Egli (2010), and Ocampo & Columbus (2012). The genus has a worldwide distribution, mostly in the tropics and subtropics, and comprises over than 100 species (Ocampo & Columbus 2012). *P. boninensis* Tuyama (1939: 6) was described on the basis of a specimen collected from Chichi-jima Island of the Bonin (Ogasawara) Islands, which are oceanic islands about 1000 km south of Japan proper. Previously, this species has been recorded in five of the Bonin Islands, namely, Nakohdo-jima, Chichi-jima, Muko-jima, Iwo-to (Kobayashi & Ono 1987), and Minami-iwo-to (Fujita *et al.* 2008) (Fig. 1). Populations of *P. boninensis* in Muko-jima Island have disappeared, and they rarely occur in the other four islands (Kato H., pers. comm.). Because of its narrow distribution range and rarity in Japan, *P. boninensis* is considered a threatened species at metropolitan (Kato & Ohba 2014) and regional levels (Ono *et al.* 1986).

The taxonomic treatment of *P. boninensis* as a Japanese endemic species (Tuyama 1939) has been accepted in subsequent studies (Ono *et al.* 1986, Kobayashi & Ono 1987, Kato & Ohba 2014). However, Kato & Ohba (2014) mentioned that *P. boninensis* has been often misunderstood as *P. pilosa* Linnaeus (1753: 445), which is native to South America, and is now widely naturalized in the tropics and subtropics (PIER 2013) including the Bonin Islands (Kobayashi & Ono 1987). Because of the taxonomic complication, Toyoda (2003) considered the Bonin plants as an alien plant. Therefore, Geesink (1969), Fujita *et al.* (2008) and Toyoda (2014) discussed the need for taxonomic reexamination of *P. boninensis*.