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# Recent introduction of *Gracilaria parvispora* (Gracilariales, Rhodophyta) in Baja California, Mexico

**Abstract:** *Gracilaria parvispora* is reported for the first time as an invasive species in northwestern Mexico based on morphological, anatomical and molecular data. The species is widely distributed in the region, where it colonizes sandy and rocky habitats from intertidal areas down to a depth of 1.5 m. The morphological and anatomical data from the Mexican specimens matched the circumscription of the species in Hawaiian waters. Two molecular markers (*rbcl* and *cox1*) showed that the Mexican populations were closer to the Hawaiian populations than the Korean populations, which may relate to a similarity in seawater temperatures between Hawaii and Baja California. *Gracilaria parvispora* formed extensive mats together with *Gracilaria vermiculophylla*. It was found in stomach samples from a green turtle (*Chelonia mydas*) in the coastal lagoons of Baja California Sur. The ecological impacts of the two alien *Gracilaria* species on other native species and communities have yet to be determined. This is the first demonstration of a second invasive *Gracilaria* species, following the introduction of *G. vermiculophylla* into the northwestern Mexico region.

**Keywords:** coastal lagoons; *Gracilaria parvispora*; *Gracilaria vermiculophylla*; invasive species; northwestern Mexico; rocky reefs.

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## Introduction

*Gracilaria* is economically important as an agarophyte and is used for food in Asia, Hawaii and South America. It comprises more than 169 currently flagged species in AlgaeBase (Guiry and Guiry 2012) that are widely distributed from tropical to temperate waters. *Gracilaria* has been the focus of numerous systematic studies (e.g., Gurgel and Fredericq 2004); however, taxonomy of the species based on the morphological features is difficult. Two of the species, *Gracilaria salicornia* (C. Agardh) E.Y. Dawson and *Gracilaria vermiculophylla* (Ohmi) Papenfuss, are invasive in European and North American waters (Freshwater et al. 2006, Thomsen et al. 2007, Kim et al. 2010).

*Gracilaria parvispora* I.A. Abbott (Abbott 1985) was considered endemic to the Hawaiian waters until Kim et al. (2008) reported its occurrence in Korea and Japan, where it was known for a considerable period as *G. bursa-pastoris* (S.G. Gmelin) P.C. Silva. *Gracilaria parvispora* is distributed on flat reefs and sandy habitats in waters that have low to moderate turbulence and salinity and high nutrient levels (Abbott 1999). Over-harvesting for human consumption accounts for serious shortages in the natural populations; until the 1970s, it was the most “common limu” found in the Honolulu fish markets (Abbott 1996). Dreckmann (1999, 2006) recorded the occurrence of *G. parvispora* in coastal lagoons of the tropical Mexican Pacific based on extensive surveys in the Tehuantepec area, but without molecular identification.

As a part of a systematic evaluation of the family Gracilariaceae along the northwestern coast of Mexico (R. Riosmena-Rodríguez, L.D. García-Rodríguez and S.M. Boo, unpublished data), thalli of *G. parvispora* became available, and we confirmed its occurrence in the area based on molecular and morphological evidence. Here, we discuss the likely human-mediated distribution of *G. parvispora* in the Mexican Pacific region.