



Multilocus phylogeny reveals *Gibsmithia hawaiiensis* (Dumontiaceae, Rhodophyta) to be a species complex from the Indo-Pacific, with the proposal of *G. eilatensis* sp. nov.

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Abstract

Gibsmithia hawaiiensis is a peculiar red alga characterized by furry gelatinous lobes arising from a cartilaginous stalk. The species has been recorded from tropical reef systems throughout the Indo-Pacific. A multilocus phylogeny (UPA, *rbcL*, COI-5P) of 36 specimens collected throughout the species distribution range, showed high genetic diversity at species level. Two major groups were identified, each consisting of multiple lineages. Genetic variability was low in the Hawaiian Islands and the northern Red Sea and high in the Western Indian Ocean and the Coral Triangle, where lineages overlap in distribution. Genetic distances suggest that *G. hawaiiensis* represents a complex of five cryptic species, with no difference observed in the external morphology corresponding to separate lineages. Anatomical and reproductive differences were observed at the microscopic level for the lineage from the Red Sea, which is here described as *G. eilatensis* sp. nov. The geographic range of the species complex is here expanded to include Madagascar, the Red Sea and the Indo-Malay region, and the genotype seems endemic to the Hawaiian Islands. Algal diversity on coral reef systems is discussed from a conservation perspective using *G. hawaiiensis* as an example.

Keywords: Cryptic species, DNA barcoding, *Dudresnaya*, Gigartinales, systematics

Introduction

The genus *Gibsmithia* (Dumontiaceae, Gigartinales) was erected in 1963 (Doty) for a marine red alga characterized by an ephemeral cluster of gelatinous lobes borne from a perennial cartilaginous stalk. There are currently four species within the genus, *G. hawaiiensis* Doty 1963:458 (type of the genus), *G. dotyi* Kraft & R.W. Ricker 1984:433, *G. larkumii* Kraft 1986:439, and *G. womersleyi* Kraft & Ricker ex Kraft 1986:441, each with well-defined diagnostic features based on their external morphology (Kraft 1986). *G. hawaiiensis* stands out from its congeners by having cortical filaments that extend beyond the surface of the gelatinous lobes, giving the plant an overall furry appearance (Fig. 1). Nevertheless, the above four species of *Gibsmithia* share a female reproductive system consisting of separate carpogonial- and auxiliary-cell filaments, and isomorphic tetrasporophytes (Kraft 1986).

Gibsmithia is widespread throughout the Indo-Pacific, with *G. hawaiiensis* presenting the largest distribution range (Fig. 2), occurring on coral reefs from South Africa to French Polynesia and the Hawaiian Islands (Guiry & Guiry 2016). Recent records from scattered localities suggest that the species is more common than once thought (Abbott 1999) and might have been overlooked by collectors because of (1) its ephemeral occurrence in the subtidal, (2) low population abundances, and (3) its resemblance to soft corals.