

Gracilaria tikvahiae

McLachlan 1987

Gracilaria tikvahiae was introduced for commercial mariculture to relieve the overharvesting of the native *G. parvispora*. Containment to mariculture sites have been fairly successful, but its opportunistic nature makes it a potentially successful invasive species.

Division Rhodophyta
 Class Rhodophyceae
 Order Gracilariales
 Family Gracilariaceae
 Genus *Gracilaria*



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IDENTIFYING FEATURES

DESCRIPTION

Thallus 12-15 cm tall, comprised of finely branched clumps, irregularly branched, 1mm wide. Axes compressed or flattened, with short laterals bearing more slender than axes with spinous branchlets. Branching mostly dichotomous, but can be highly irregular, with dichotomous below, alternate above and dichotomous at apices. Apices tapered and pointed, often unevenly forked with one side longer than the other.

The morphology of this alga is highly variable. Plants grown commercially are often completely dichotomously branched with axes and branches of nearly the same diameter throughout. Cultured plants are often very dark green to nearly black.

COLOR

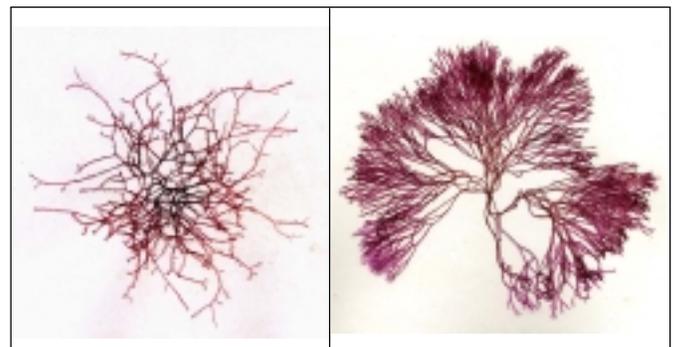
In the wild, the plant can range from dark green to shades of red and brown.

HABITAT

Gracilaria tikvahiae is found intertidal, less than 1 meter, attached to limestone and basalt substrates. In the Caribbean and Florida where it is very common, *G. tikvahiae* is found in protected and high-energy intertidal habitats in estuaries and bays to 10 meters deep. This plant may grow unattached or attached to rocks or coral rubble.

STRUCTURAL

Medullary cells irregular, 70-270 μm diam. Cortex 2-3 cells thick; surface cells round to angular, 5-13 μm diam., densely pigmented. Tetrasporangia oval to spherical, 10-35 μm diam., 17-45 μm long, cruciately divided, scattered in surface layers. Spermatangia in sori, scattered. Cystocarps hemispherical, to 1mm diam., numerous; carposporangia spherical to oval, 15-40 μm diam.



G. tikvahiae
 morphological variations:
 Left: wild variety
 Right: cultured

DISTRIBUTION

HAWAI'I

Near Oceanic Institute, Makapu'u, O'ahu.

WORLDWIDE

Nova Scotia, Western Atlantic, Canada to Florida.

MECHANISM OF INTRODUCTION

This species was brought to the Hawaiian Islands from Florida in 1987 for commercial mariculture.

ECOLOGY

Gracilaria tikvahiae has a widespread distribution throughout the world, and is often associated with eutrophic conditions. As demonstrated by its temperate and tropical locations, it is able to tolerate large environmental variations in levels of nitrogen, irradiance and temperature. This red alga has also been found to have a high nutrient uptake efficiency, making it a successful invasive in many types of marine environments. Because of its hardiness and greater adaptability than the Hawaiian endemic species, *G. tikvahiae* has the potential to be an invasive species on Hawaiian reefs.

Gracilaria tikvahiae was brought to the Hawaiian islands in 1987 to relieve the dwindling availability of *G. coronopifolia* and *G. parvispora*, the two most popular edible species of the genus. This species has a high growth rate under non-limiting irradiance and nutrient conditions. It also has the ability to store large amounts of dissolved nitrate and nitrite, enabling it to continue growth in conditions of fluctuating nitrogen availability. Productivity of *G. tikvahiae* can be as high as any terrestrial crop on earth and is being studied for its viability as an agar weed.

Established populations of *Gracilaria tikvahiae* have not been found in the wild in Hawai'i, although occasional escapes have been reported. This species has not reproduced sexually in mariculture but does quickly reproduce vegetatively, and has demonstrated successful invasive characteristics elsewhere. Its success on intertidal areas with moderate water motion makes it a potential competitor of the two already

stressed endemic species, *G. coronopifolia* and *G. parvispora*. With the growing concern of eutrophic conditions developing along Hawaiian coastlines due to coastline development and *G. tikvahiae*'s opportunistic nature, this species needs to be carefully handled for mariculture and wild populations should be reported and monitored.

REFERENCES

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- Doty, M.S. 1986. Experiments with *Gracilaria* in Hawai'i, 1983-1985. Hawai'i Botanical Science Paper, no. 46, University of Hawai'i, Honolulu, Hawai'i.
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- Schneider, D.W. and R.B. Searles, 1991. Seaweeds of the Southeastern United States. Duke University Press, London, England.

WEB LINKS

- Marine Invasives of Hawai'i. <http://www.botany.hawaii.edu/Invasive/default.htm>
- The Indian River Lagoon Species Inventory; <http://www.serc.si.edu/sms/IRLSpec/index.htm>