

Gracilaria Parva: A Novel Species

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Introduction

Problems with algal classification are mostly due to the past use of morphology and anatomy which have generally been successful for classifying species through the higher ranks to Classes or Phyla,



Figure 1. *Gracilaria corticata* (Reprinted with permission from ref 4. Copyright 2017. Pharmaceutical and Biological Evaluations.)

but it has not been helpful in distinguishing the relationships within these groups.¹ As such, this approach is not reliable enough for species identification especially within *Gracilaria* in which most species contain a very similar cylindrical and stringy morphology as seen in Figure 1.² However, DNA sequence analysis is much more reliable for characterizing and identifying species.³

Our focus has been on red algal genus *Gracilaria* due to its widespread economic importance from agar used in biological labs and multiple food products.^{5,6} To this end, we have focused on the bottom clades in Figure 2, starting with *Gracilaria chouae*.

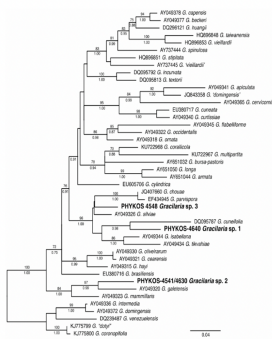


Figure 2. Maximum likelihood tree of various *Gracilaria* species using rbcL-3P sequences. (Reprinted with permission from ref 7. Copyright 2017 Diversity.)

Results

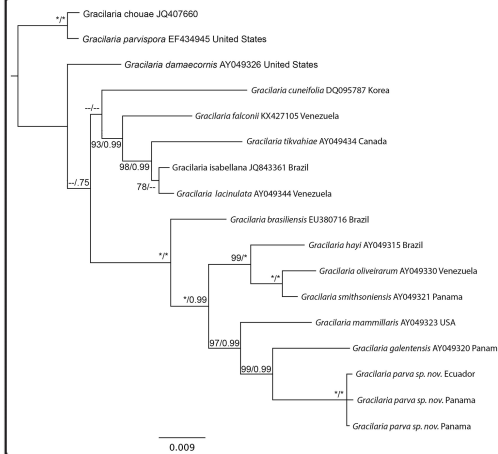


Figure 3. Maximum likelihood tree of rbcL sequences for *Gracilaria* species including our novel species. Bootstrap support and Bayesian posterior probability values are shown in branches when $>75\%$ and >0.75 , respectively. Additionally, * indicates 100% support.

Based on both Maximum Likelihood and Bayesian analysis, we have discovered a novel species of *Gracilaria* in both Ecuador and Panama, as seen at the bottom of figure 3. Additionally, this species is most closely related to *Gracilaria galetensis* with 99% support from Maximum Likelihood and Bayesian analysis. Though the upper clades from *Gracilaria chouae* to *Gracilaria lacinulata* garner relatively strong support, the bottom clades from *Gracilaria brasiliensis* to our novel species have extremely strong support, with the lowest support being 97%.



Figure 4. Image of *Gracilaria parva* with a ruler for size comparison.

Discussion

Based on its small size as shown in Figure 4, we have tentatively named our species *Gracilaria parva*. Surprisingly, the most closely related species, *Gracilaria galetensis*, is typically between 8 and 16 cm in contrast to *Gracilaria parva*'s small size of less than 2 cm.⁵

Additionally, as shown in Figure 5, *Gracilaria parva* was collected in two locations in Panama

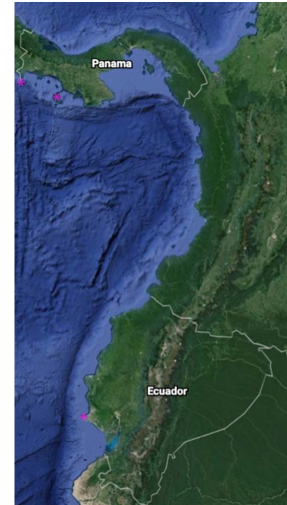


Figure 5. Google earth image with pink *'s representing collection localities of our novel species, *Gracilaria parva*.

and one location in Ecuador, all of which were in the Pacific ocean. In contrast, *Gracilaria galetensis* has been found ranging from North Carolina to Atlantic Panama.^{5,8} As these species inhabit entirely different oceans, we propose that their speciation must have occurred as the Panama isthmus closed sometime between 3 and 18 million years ago.⁹

References

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