

Endemism of marine algae in the Hawaiian Islands¹

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Abbott (1995) posed the question of endemism in Hawaiian marine algae in a presentation on the state of systematics of marine algae in Pacific tropical islands. She answered this question by providing examples of algal species described as new in the Hawaiian Islands and collected later from other sites in the world, and algal species which were never found outside the topographic boundaries of the initial topotype collection site. If we are to consider the latter, i.e., species described and only known from the Hawaiian Islands, as Hawaiian endemics, 56 species of Hawaiian marine algae (Chlorophyta, Phaeophyceae and Rhodophyta) fall within this category. The Cyanobacteria and crustose coralline algae (Corallinaceae) of Hawaii were excluded from this analysis.

The numbers of marine algae in the Hawaiian flora were based on the valid and currently accepted species names for the red algae (Abbott 1999) and for the green and brown algae (Abbott & Huisman 2004), published new records (e.g., Bailey-Brock & Magalhães 2010) and 14 subsequently newly described marine algal species in the Hawaiian Islands, i.e., Abbott & McDermid (2001, 2002), Abbott & Huisman (2003), Huisman *et al.* (2004), Kraft *et al.* (2004), Vroom & Abbott (2004a, 2004b), Vroom (2005), Abbott *et al.* (2010), Kogame *et al.* (2011), Kurihara *et al.* (2012), Hernández-Kantún *et al.* (2012) and Kraft *et al.* (2014).

Aside from distributional information in Abbott (1999) and Abbott & Huisman (2004), other distributional records were gleaned from species compilations on Micronesian algae (Lobban & Tsuda 2003), French Polynesian algae (N'Yeurt & Payri 2006, 2007, 2010), Central Polynesian algae (Tsuda & Walsh 2013) and AlgaeBase (Guiry & Guiry 2014). AlgaeBase was also used to substantiate the currently accepted species names for the algae reported from the Hawaiian Islands.

An alphabetized listing is presented below of 56 of 519 species of green, brown and red marine algae described as new from the Hawaiian Islands, but, thus far, have not been reported from other Pacific islands or elsewhere in the world. This listing includes three of 102 species of green algae (Chlorophyta), three of 62 species of brown algae (Phaeophyceae) and 50 of 355 species of red algae (Rhodophyta).

Chlorophyta (3 of 102 recognized species, 2.9% in Hawaiian Islands only)

Boodleopsis hawaiiensis W.J. Gilbert

Codium phasmaticum Setchell

Valonia trabeculata Egerod

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Phaeophyceae (3 of 62 recognized species, 4.8% in Hawaiian Islands only)*Newhousia imbricata* Kraft, G.W. Saunders, I.A. Abbott & Haroun*Petalonia tatewakii* Kogame & Kurihara*Sporochnus dotyi* Brostoff**Rhodophyta** (50 of 355 recognized species, 14.1% in Hawaiian Islands only)*Acrochaetium dotyi* I.A. Abbott*Acrosymphyton brainardii* Vroom & I.A. Abbott*Callidictyon abyssorum* J.N. Norris & I.A. Abbott*Centroceras corallophiloides* R.E. Norris*Ceramium cingulum* Meneses*Ceramium dumosertum* R.E. Norris & I.A. Abbott*Ceramium tranquillum* Meneses*Ceramium womersleyi* R.E. Norris & I.A. Abbott*Corallophila ptilocladioides* (R.E. Norris & I.A. Abbott) R.E. Norris*Dasya atropurpurea* Vroom*Dasya kristeniae* I.A. Abbott*Dotyophycus pacificum* I.A. Abbott*Dudresnaya babbittiana* I.A. Abbott & K.J. McDermid*Dudresnaya littleri* I.A. Abbott*Euptilocladia magruderii* I.A. Abbott & R.E. Norris*Ganonema yoshizakii* Huisman, I.A. Abbott & A.R. Sherwood*Gelidium pluma* Bornet ex N.H. Loomis*Gelidium reediae* N.H. Loomis*Gracilaria dawsonii* M.D. Hoyle*Gracilaria dotyi* M.D. Hoyle*Grateloupia corymbifera* (I.A. Abbott) S. Kawaguchi & A.W. Wang*Grateloupia hawaiiiana* E.Y. Dawson*Halymenia chiangiana* I.A. Abbott & Kraft*Halymenia cromwellii* I.A. Abbott*Halymenia hawaiiiana* J.J. Hernández-Kantún & A.R. Sherwood*Hawaiiia trichia* Hollenberg*Helminthocladia rhizoidea* Doty & I.A. Abbott*Hypoglossum wynnei* I.A. Abbott*Janczewskia hawaiiiana* K.E. Apt*Laurencia mcdermidiae* I.A. Abbott*Liagora donaldiana* I.A. Abbott & Huisman*Liagora julieae* I.A. Abbott & Huisman*Lophocladia kipukaia* K.E. Schleich*Lophocladia kuesteri* I.A. Abbott, D.L. Ballantine & O'Doherty*Macrocarpus perennis* (I.A. Abbott) S.-M. Lin, S.-Y. Yang & Huisman*Micropeuce setosus* I.A. Abbott*Naccaria hawaiiiana* I.A. Abbott*Neosiphonia profunda* (Hollenberg) M.-S. Kim & I.A. Abbott*Parviphycus womersleyanus* (Kraft & I.A. Abbott) B. Santelices

Rhodophyta (continued)*Pleonosporium intricatum* R.E. Norris*Polyopes hakalauensis* (Tilden) I.A. Abbott*Polysiphonia tuberosa* Hollenberg*Pterocладиella bulbosa* (H.N. Loomis) B. Santelices*Rhodachlya hawaiiiana* A. Kurihara, J.A. West, K.Y. Conklin & A.R. Sherwood*Scinaia furcata* Zablackis*Scinaia huismanii* Vroom & I.A. Abbott*Spirocladia hodgsoniae* I.A. Abbott*Tylotus laqueatus* Kraft, K.Y. Conklin & A.R. Sherwood*Ululania stellata* K.E. Apt & K.E. Schlech*Wrangelia elegantissima* R.E. Norris

As previously published world distributional records applicable to Hawaiian algal species are discovered and more taxonomic studies are conducted on other Pacific Island algae, the overall endemism of 10.8% for Hawaiian marine algae should decrease based on past trends. Abbott (1999:11) included 343 species of red algae in her flora and, at that time, recognized 67 species which were not found elsewhere in the world, i.e., an endemism of 19.5%. Today, this percentage is 14.1% for the red algae in Hawaiian waters. Endemism for the green algae (Chlorophyta) and brown algae (Phaeophyceae) are substantially lower at 2.9% and 4.8%, respectively.

Molecular sequence data (O’Kelly et al. 2010) in Hawaiian species of the green alga *Ulva* (including “*Enteromorpha*”) suggested that many specimens were unique and should not be associated with names of temperate and boreal European and North American species. The eventual renaming of these specimens will increase the endemism of Hawaiian algae. There is a stronger tendency of more endemics being recognized through molecular studies since cryptic algal species abound in the Hawaiian Islands (Alison R. Sherwood, University of Hawaii, personal communication, 26 March 2014). The overall percentage of endemism for marine algae in Hawaiian waters is low at 10.8% when one considers that endemism of the 371 marine shore fishes in the Hawaiian Islands is 25% (Randall 2010:2).

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