

Pui-Ling Tan, Phaik-Eem Lim*, Showe-Mei Lin*, Siew-Moi Phang, Stefano G.A. Draisma and Lawrence M. Liao

Foliose *Halymenia* species (Halymeniaceae, Rhodophyta) from Southeast Asia, including a new species, *Halymenia malaysiana* sp. nov.

Abstract: Despite the large number of species discovered in *Halymenia*, many remain poorly known due to the scarce information available. In order to facilitate species discrimination of foliose *Halymenia* species in Southeast Asia, molecular analysis and morphological studies were made on *Halymenia* collections from Malaysia, the Philippines, and Indonesia. The *rbcL* phylogenetic analyses showed that there are at least six taxa of foliose *Halymenia* occurring in Southeast Asia. Among the six taxa, a new species, *Halymenia malaysiana* P.-L. Tan, P.-E. Lim, S.-M. Lin et S.-M. Phang, is proposed based on both *rbcL* sequence analyses and morphological observations. *Halymenia malaysiana* is characterized by thalli possessing oblong or suborbiculate blades with a supple cartilaginous structure and gelatinous (slimy) texture, arising from a small discoid holdfast without a stipe, abruptly expanding into a broad blade and having a smooth surface with sinusoidally undulated margins. The phylogenetic analyses also revealed that *Halymenia* is a polyphyletic genus, which requires further taxonomic studies.

Keywords: *Halymenia malaysiana* sp. nov.; red algae; Southeast Asia; taxonomy.

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Introduction

The red algal genus *Halymenia* C. Agardh, comprising 69 currently accepted species, is one of the largest genera in terms of species within the family Halymeniaceae (De Smedt et al. 2001, Guiry and Guiry 2014). It is mostly distributed in tropical and subtropical regions (Gargiulo et al. 1986, Kawaguchi and Lewmanomont 1999, Hernández-Kantun et al. 2009). The genus is mainly characterized by gelatinous thalli, presence of anticlinal filaments and refractive ganglionic cells in the medulla, stellate cells in the inner cortex, and auxiliary cell ampullae with branched secondary filaments (Balakrishnan 1961, Abbott 1967, Chiang 1970, De Smedt et al. 2001).

Halymenia was established by C. Agardh (1817) and the generitype is *Halymenia floresii* (Clemente) C. Agardh collected from Cádiz, Spain. Chiang (1970) used the architecture of auxiliary cell ampullae as a primary feature to group species at the generic level in the Halymeniaceae. According to Chiang's generic concept, simple or once or more branched secondary ampullar filaments may emerge from long and slender primary ampullary filaments in *Halymenia*-type auxiliary cell ampullae. The auxiliary cell ampulla of *Halymenia* is flattish, expanded when mature, and is intermediate between the *Grateloupia*-type and the *Cryptonemia*-type of ampulla based on its shape and the degree of branching (Chiang 1970). Several attempts have been made to study foliose *Halymenia* species in Southeast Asia. Kawaguchi and Lewmanomont (1999) made a detailed morphological study of *Halymenia dilatata* Zanardini by comparing the vegetative and reproductive features of the material from Vietnam and

*Corresponding authors: **Phaik-Eem Lim**, Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia; and Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia, e-mail: phaikem@um.edu.my; and **Showe-Mei Lin**, Institute of Marine Biology, National Taiwan Ocean University, Keelung 20224, Taiwan, R.O.C., e-mail: linsm@ntou.edu.tw

Pui-Ling Tan and Siew-Moi Phang: Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia; and Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia

Stefano G.A. Draisma: Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia; and Faculty of Science, Department of Biology, Prince of Songkla University, Hatyai, Songkhla, 90112 Thailand

Lawrence M. Liao: Graduate School of Biosphere Science, Hiroshima University, 1-4-4 Kagamiyama, Higashi-Hiroshima 739-8528, Japan