



HOKKAIDO UNIVERSITY

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Abstract of Doctoral Dissertation

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Title of Doctoral Dissertation

Taxonomic and molecular phylogenetic studies in the Scytosiphonaceae (Ectocarpales, Phaeophyceae)

【カヤモノリ科（褐藻綱シオミドロ目）の分類学および分子系統学的研究】

The systematics of the brown algal family Scytosiphonaceae poses an interesting question due to the inconsistencies between the taxonomies and molecular phylogenies of its members. The complexity of the Scytosiphonaceae is also highlighted in the discovery of several new species possessing morphological characters that were intermediate to at least two genera, consequently blurring generic boundaries. As such, it has been widely accepted that traditional characters used to define genera in the family (e.g., thallus morphology, thallus construction, and shape and nature of plurangial sori) were unreliable.

In this study, I attempted to resolve some of the glaring problems in the taxonomy and molecular phylogeny of several genera in the Scytosiphonaceae by integrating information on their morphologies, molecular phylogenies, and life histories. I focused my studies on the relatively under-examined representatives from tropical to subtropical regions of the Indo-Pacific as most studies have been conducted on the subtropical to temperate members of the family.

I assessed the taxonomy, molecular phylogeny, and distribution of the circumtropical genus *Hydroclathrus* using samples collected from its known distribution range. I confirmed the independence of all known *Hydroclathrus* species especially that of *Hydroclathrus stephanosorus* as well as described two new species, *Hydroclathrus minutus* sp. nov. and *Hydroclathrus rapanuii* sp. nov., based on morphological and molecular phylogenetic criteria. A putative new species from Western Australia, which closely resembles the Hawaiian species *Hydroclathrus tumulis*, is also described. Despite sampling bias in the western Pacific, the distribution limits of *H. stephanosorus* and *H. tenuis* were expanded in this study, the former being the most widely distributed throughout my study areas. Species distributions also showed some distinct biogeographic patterns between species despite some regions of overlap.

Based on multi-gene phylogenies and by comparing their morpho-anatomies and life histories, I also attempted to resolve the taxonomy and classification of several genera in the Scytosiphonaceae. Aside from the discovery and description of *Tronoella ryukyuana* gen. et sp. nov. from southern Japan, I have also introduced several taxonomic revisions including the proposal to recognize two new genera, *Pseudochnoospora* gen. nov. and *Dactylosiphon* gen. nov. The former was erected to accommodate the species previously known as '*Chnoospora implexa*' [= *Pseudochnoospora implexa* comb. nov.], while the latter was established for species with finger-like thalli that were previously circumscribed under the genus *Colpomenia* [= *Dactylosiphon bullosus* comb. nov., *D. durvillei* comb. nov., *D. wynnei* comb. nov.]. I also suggested the transfer of *Scytosiphon tenellus* to the genus *Petalonia* due to its molecular and life history similarities with other *Petalonia* species as well as proposed the transfer of *Petalonia filiformis* to the newly established genus *Planosiphon* [as *Planosiphon filiformis* comb. nov.] based on morphological and life history criteria. I have also expanded the descriptions of *Petalonia* and *Planosiphon* to account for the characters of the newly transferred species. Two tribes, *Hydroclathreae* trib. nov. and *Scytosiphoneae* trib. nov., were also newly proposed for the two phyletic groups that are unified primarily by their similarities in the type of reproductive structures that are borne by their sporophytic thalli.

Finally, I provided a synthesis of the current classification of the Scytosiphonaceae in light of the taxonomic revisions I have proposed. As the relationships among the different taxa in the tribe *Hydroclathreae* is yet to be resolved, I also underscored the need to examine further several genera in the tribe that were not covered in this study (i.e., *Colpomenia*, *Rosenvingea*, and *Iyengaria*).