



UNIVERSITI PUTRA MALAYSIA

**HABITAT AND MORPHOLOGICAL CHARACTERISTICS OF
HALOPHILA OVALIS IN MALAYSIA**

ANNALETCHUMY LOGANATHAN

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**HABITAT AND MORPHOLOGICAL CHARACTERISTICS OF *HALOPHILA*
OVALIS IN MALAYSIA**

By

ANNALETCHEMY LOGANATHAN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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Science**

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**MASTER OF SCIENCE
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Work on this thesis is dedicated to my beloved mother **Mrs. Alameloo**

I LOVE YOU Amma



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

HABITAT DAN MORFOLOGI BAGI *Halophila ovalis* DI MALAYSIA

By

ANNALETCHUMY LOGANATHAN

Mac 2007

Pengerusi : Profesor Madya Japar Sidik Bujang, PhD

Fakulti : Sains

Penilaian pada habitat, persekitaran dan ciri-ciri morfologi bagi *H. ovalis* telah dibincang dari 11 lokasi. *Halophila ovalis* didapati tumbuh di pelbagai habitat yang merangkumi 'inter-tidal' terumbu karang (Teluk Kemang, Negeri Sembilan), beting 'sub-tidal' (Merambong, Tanjung Adang Laut dan Tanjung Adang Darat dari Johore), Pulau (Pulau Tinggi dari Johore), 'inter-tidal' danau air masin (Merchang dari Terengganu), 'sub-tidal' terumbu karang yang musnah (Pulau Gaya, Pulau Bakkungan and Pulau Selingan dari Sabah), muara sub-tidal (Teluk Sepinong dari Sabah), dan pantai pasang surut (Punang dari Sarawak). Diantara habitat-habitat ini, Merambong telah dipilih dan kerap dikunjungi untuk kajian yang terperinci pada ciri-ciri habitat dan factor persekitaran. *Halophila ovalis* dijumpai tumbuh pada kedalaman 1.0 hingga 2.7 m MSL di kawasan cetek. Ia tumbuh di atas substrat yang pelbagai di setiap kawasan iaitu batu karang diselaputi pasir i.e. Teluk Kemang, pasir berlumpur berkalsium i.e. Merambong, Tanjung Adang Laut,



Tanjung Adang Darat, pasir halus i.e. Pulau Tinggi, pasir berlumpur i.e. Merchang, Punang, pasir terumbu i.e. Pulau Gaya, Pulau Bakkungan, Pulau Selingan, loam berlumpur i.e. Teluk Sepinong. *Halophila ovalis* boleh bertoleransi dengan saliniti dalam lingkungan 9.41-35 psu. Ia tumbuh dengan suhu air disukat diantara 24-34 °C. Ia juga boleh hidup di bawah keamatan cahaya yang pelbagai dari 40-10 % dari permukaan air iaitu 2647 $\mu\text{mol m}^{-2}\text{s}^{-1}$. Keamatan cahaya merupakan faktor primer yang boleh mengubah morfologi *H. ovalis* (i.e. saiz daun) untuk menyerap cahaya maximum dari permukaan.

Berdasarkan pada dimensi saiz daun; panjang daun, lebar daun dan bilangan pasangan urat daun, *H. ovalis* dapat dikategorikan sebagai *H. ovalis* daun besar, sederhana dan kecil. *Halophila ovalis* daun besar dijumpai di kawasan sub-tidal contohnya Merambong di kawasan terdedah dan Teluk Sepinong. Manakala *H. ovalis* daun sederhana dan kecil didapati di kawasan pasang surut yang tak terdedah pada udara selama 3 hingga 4 jam setiap hari semasa air surut dan kawasan terumbu karang musnah contohnya Teluk Kemang, Merambong di kawasan terdedah, Pulau Tinggi, Merchang, Punang, Merchang, Pulau Gaya, Pulau Bakkungan, Pulau Selingan and Punang. Daun juga menunjukkan kepelbagaian dimensi dan bentuk iaitu bujur, obovat, bujur panjang, memanjang dan spathulat. Walaupun dimensi daun berlainan (besar-, sederhana- dan kecil-), *H. ovalis* dari 8 kawasan menunjukkan bentuk sel permukaan dan morfologi dalaman yang sama. Walau bagaimanapun, lacunae udara menunjukkan variasi dalam bilangan dari 8 lacunae udara yang besar disusun dengan ruang seimbang dalam daun kecil), 10 besar dan 2 kecil lacunae udara dalam daun sederhana dan 11 besar dan

4 kecil lacunae udara dalam variasi daun besar dibezakan oleh sel-sel parenkima dengan ketebalan satu sel dalam bentuk radial.

Kepelbagaian variasi pada morfologi *H. ovalis* dari semua lokasi didapati boleh dikenalpasti dengan penilaian dibuat pada variasi morfologi melalui kajian kultur untuk rumput laut seperti *H. ovalis*. Walau bagaimanapun, *H. ovalis* dari pelbagai lokasi di bawah keadaan kultur juga menunjukkan variasi morfologi. *Halophila ovalis* memang mempunyai variasi yang besar pada dimensi struktur vegetatif khususnya pada bentuk daun dan bilangan pasangan urat daun dan variasi ini adalah berkaitan dengan pengubahsuaian terhadap ekologi di habitat yang berbeza dan keadaan persekitaran.

Abstract of thesis presented to Senate of the Universiti Putra Malaysia in fulfilment of the requirement for the degree of Masters of Science

HABITAT AND MORPHOLOGICAL CHARACTERISTICS OF *Halophila ovalis* IN MALAYSIA

By

ANNALETCHEMY LOGANATHAN

March 2007

Chairman : Associate Professor Japar Sidik Bujang, PhD

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An assessment on habitat, environment and morphological characteristics of *Halophila ovalis* are described for the 11 locations. *Halophila ovalis* grew in variable habitats encompassing inter-tidal degraded coral reef platform (Teluk Kemang), sub-tidal shoal (Merambong, Tanjung Adang Laut, Tanjung Adang Darat of Johore), off-shore island (Pulau Tinggi), Inter-tidal lagoon (Merchang), sub-tidal degraded coral reef (Pulau Gaya, Pulau Bakkungan, Pulau Selingan of Sabah), sub-tidal estuary (Teluk Sepinong of Sabah) and inter-tidal beach front (Punang of Sarawak). Amongst these habitats, Merambong was visited at regular basis to obtain habitat characteristics and environmental factors. *Halophila ovalis* are found occurring at the depth ranging from 1.0 to 2.7 m MSL in shallow water. They grew on substrate; sand covered coral e.g. Teluk Kemang, calcareous muddy sand e.g. Merambong, Tanjung Adang Laut, Tanjung Adang Darat, fine sand e.g. Pulau Tinggi, muddy sand e.g. Merchang, Punang, corraline sand e.g Pulau Gaya, Pulau Bakkungan, Pulau Selingan,



muddy loam e.g. Teluk Sepinong. *Halophila ovalis* tolerates salinity ranging from 9.41-35 psu. It grew in water temperature of 24-34 °C. They thrive under great light variability of 40-10% of surface irradiance of 2647 $\mu\text{mol m}^{-2}\text{s}^{-1}$ of daylight attenuation. Light is found to be the primer factor that affects the morphology structure of *H. ovalis* (e.g. leaf size) to attain maximum surface irradiance.

Based on leaf size dimensions, leaf length, leaf width and numbers of paired cross-veins three variants were distinguished, big-, intermediate- and small-leaved *H. ovalis*. The big-leaved occurred at sub-tidal areas e.g. Merambong unexposed and Teluk Sepinong, while intermediate-leaved and small-leaved variants are those from inter-tidal areas, exposed and degraded coral reef platforms e.g. Teluk Kemang, Merambong exposed, Pulau Tinggi, Merchang, Pulau Gaya, Pulau Bakkungan, Pulau Selingan and Punang. Leaves also showed diversity in dimension and shapes from ovate, obovate, oblong, elongated to spatulate. Although leaf dimensions are different (big-, intermediate- and small-leaved), *H. ovalis* from the 8 locations showed similar surface cells patterns and internal morphology. However the observed air lacunae varied in number from 8 evenly spaced large air lacunae in small-leaved variants, 10 large and 2 small air lacunae in intermediate-leaved variants and 11 large and 4 small air lacunae in big-leaved separated by radial partitions one cell thick of parenchymatous cells.

Variations observed in *H. ovalis* from all locations suggest that culture studies can help in assessing the variations of morphology characteristics for

seagrass such as *H. ovalis*. Cultured *H. ovalis* from different locations also showed variation in morphology. *Halophila ovalis* has a wide range of variability in vegetative structure dimensions particularly the shapes of leaves and paired of cross veins counts and this variability explains their ecological adaptation to different habitats and environmental conditions.

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I certify that an Examination Committee has met on 8 March 2007 to conduct the final examination of Annaletchumy Loganathan on her Master of Science Thesis entitled “ Habitat and Morphological Characteristics of *Halophila ovalis* in Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

ANNALETCHUMY LOGANATHAN

Date: 7 MAY 2007



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