光強度及水質因子對藻類成長之試驗研究
—以麟山鼻漁港之人工潮池為例

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摘要

本文選擇臺灣東北角麟山鼻漁港旁之人工潮池作為藻類來源的基地，透過實驗室模擬光環境來瞭解藻類之生長條件。本文提出非侵入式的影像技術量測藻類覆蓋度，以探討室內光環境因子與海藻生長特性之關係，並分析現地水質環境、室內光環境及藻類生態特性來探討藻類生長覆蓋度及葉長成長特性。

本文進一步應用現地試驗之環境因子與藻類之關係，建立適合藻類之棲地指數模式，以評估藻類之生態環境。現地水質均受到季節與地理因素影響，經由 HSI 評估的結果與藻類覆蓋度相關性高的環境因子為水溫、鹽度、浸水時間，以藻類覆蓋度 25%為下限之 HSI 模式有較佳的相關性，其值為 0.74。

假設室內實驗水質條件恆定下，發現初期(1~40 天)藻類覆蓋度多寡隨透光度而有所影響，且光照度和藻類平均葉長存在正的關係。不同透光度下平均海藻葉長和生長時間呈現指數函數的關係，其藻類葉長大小與生長時間長度有 0.94~0.97 相關性。而海藻生長速率隨時間呈現指數遞減函數關係，二者有 0.92~0.96 的相關係數。海藻生長平均速率隨光照度呈線性關係，有 0.96 的相關係數。本文最後以指數函數模式計算所有狀況之葉長(y_p)與實際葉長(y_m)比較，得二者之迴歸相關係數為 0.95。

Experimental evaluation of light strength and water quality affecting algae growth—A case study at the tidal pool beside Lin-Shan-Bi fishing port

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ABSTRACT

The paper develops a non-invasive image system to measure the cover rate of marine algae on bricks with wavy or coarse surface under different light illumination. The tidal pool beside the Lin-Shan-Bi fishery harbor is chosen as a research base to study the environmental factors affecting algae growth. Habitat suitability index (HSI) is figured out for the environmental factors and is used to establish a habitat suitability model. The proposed model can be applied to estimate the growth of marine algae in the northern Taiwan waters.

The properties of seawater are slightly different from four seasons and all observed positions. High relationship between the cover rate 25% of marine algae and temperature, salinity, and soak time of a brick is connected to establish a habitat suitability model. The cover rate predicted by the proposed HSI model shows accurately agreement with real one by a high correlation coefficient of 0.74.

It is assumed that the water quality conditions in all pools are controlled to be almost invariable by air condition and a circulated system in the indoor experiment. The initial growth of marine algae during the first 1-40 days highly depends on the relative light strength. Therefore, mean leaf length of marine algae can be expressed by the exponential function that can give a high prediction to mean leaf length by a relative correlation coefficient over 0.94. The increase rate of growth of marine

algae exponentially decays with time. The empirical expression in form of negatively exponential function has a good prediction to the increasing rate by a relation coefficient more than 0.92. A linear relationship between mean growth rate of marine algae and relative light strength was obtained to have a correlation coefficient of 0.96. Considering both the light strength and natural growth of marine algae the resulting empirical formula can provide a good calculation on mean leaf length by a correlation coefficient over 0.95.