

ความหลากหลาย สายพันธุ์กรรม และสารพิษของสาหร่ายสีเขียวแกมหน้าเงิน
ที่สร้างสารพิษในประเทศไทย

**Diversity, phylogenetic criteria and cyanotoxins of
toxic blue-green algae in Thailand**

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Cyanobacterial diversity study was conducted in 120 reservoirs in Thailand during October 2002 to December 2005. Twenty-one species of cyanobacteria in ten genera were found. The dominant species are *Cylindrospermopsis raciborskii* (Wolosz.) Seenayya et Subba Raju and *Microcystis aeruginosa* Kütz. The water quality of the sampling sites based on trophic level were classified as oligotrophic-mesotrophic status to eutrophic status. Fifty-six cultures of cyanobacteria were isolated. *Microcystis* spp. and *Oscillatoria* spp. tend to be better cultivated in the lab condition than other genera. RAPD technique produced distinct banding pattern of DNA. It tended to be showed that genetic variation of *Microcystis* spp. For the detection of cyanotoxins, microcystins were detected in reservoirs which had blooming of *Microcystis* spp. and Cylindrospermopsins were detected in reservoirs which had blooming of *Cylindrospermopsis* spp.

วิจัยและพัฒนาผลิตภัณฑ์อาหารจากสาหร่าย “เห็ดดลาบ” (*Nostoc commune*, Cyanophyta)

Research and development on food products from “Hed Lap” alga

(*Nostoc commune*, Cyanophyta)

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“Hed Lap” alga (HLA, *Nostoc commune* Voucher) is an edible blue-green alga (cyanobacterium) which was discovered on saline soil of “Dun Lampan Forest”, Na Chuak district, Maha Sarakham province. The objective of this research is to study on basal data, optimal cultivation medium, development of food products and long-term preservation of this vulnerable HLA. The HLA was found on sandy-loam soil. It contained 20% protein, 0.02% fat and up to 43% dietary fiber. The HLA could produce bioactive compound which expressed a good inhibition on gram + bacteria, *Bacillus subtilis* TISTR 008. Optimal cultivation medium of HLA was modified from BGA agar medium by no adding of NaCl, increasing the concentration of K₂HPO₄ and MgSO₄·7H₂O to 0.9 and 0.095 mg/l, respectively and starting with the initial pH of 7.5-8. This modified BGA medium increased the final HLA biomass up to 34-fold from the initial while only 12-fold was obtained from the basal BGA medium. More than 10 kinds of food products (meal, sweet, snack and beverage) were developed from HLA. Long-term preservation of HLA could be obtained by cryopreservation technique at -85°C using dimethyl sulfoxide as a cryoprotectant.

ความผันแปรลักษณะทางสัณฐานวิทยาและการสร้างเซลล์สืบพันธุ์ของสาหร่ายทะเล

Acanthophora spicifera และ *Chondrophyucus tronoi*

Variations in morphology and reproduction of *Acanthophora spicifera* and *Chondrophyucus tronoi*

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Branching patterns and reproduction of *Acanthophora spicifera* and *Chondrophyucus tronoi*, two common algae, at Sirinat Marine National Park, Phuket province, Thailand, were investigated from January 2004 to November 2004. The shore was divided into 3 sites according to degree of wave exposure: sheltered, semi-exposed and exposed area. Five hundred and forty plants of each species were examined. The results showed that plants in the exposed area were significantly smaller than those in the sheltered area ($P < 0.05$). Reproductive structures (spores, cystocarps and spermatangia) of neither species were not found in this study. Fragmentation might be an adaptation for reproduction of *Acanthophora spicifera* which cause greater distribution both in this study and worldwide.

โครงสร้างประชากรของสาหร่ายชนิด *Padina australis* Hauck บริเวณพื้นที่
จังหวัดภูเก็ต ตอนใต้ของประเทศไทย

Population structure of *Padina australis* Hauck (Dictyotales, Phaeophyta) in two locations in Phuket Province, Thailand

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The genus *Padina*, a brown alga (Phaeophyta), has a worldwide distribution in tropical and subtropical climate zones. All species of *Padina* have a fan-shaped blade, an infurled apical row of meristematic cells and alternate lines of calcification and reproduction. *Padina* attaches to hard substrate and may be partially or wholly buried in sand periodically. Because of the broad distribution of this genus, we posed the question: How does *Padina* increase the number of individuals and what factors support its reproduction? The hypothesis includes the idea that characteristic patterns of growth, reproductive cell formation and recruitment in the natural habitats will determine the distribution of particular phases of the life history, the numbers of each phase and the annual cycle of growth, maturation, death and then recruitment of new individuals. The two populations at the contrasting habitats of Nai Yang Beach and Tang Khen Bay, undoubtedly show similarities and differences over the year of study. The research started in September 2005 and it will be finished in August 2006. The preliminary results presented here on reproductive potential and recruitment for eight months. They help describe the distribution of the life history stages and the different strategies in the two locations. Growth rates at the two sites are also compared.

การเปลี่ยนแปลงมวลชีวภาพ ปริมาณคลอโรฟิลล์ สารอาหารในเนื้อเยื่อ และการสืบพันธุ์ตามฤดูกาล และความสัมพันธ์กับปัจจัยทางกายภาพของสาหร่ายทะเลที่สร้าง green tides ในประเทศไทย, *Ulva reticulata* Forsskal และ *Enteromorpha intestinalis* L.

Seasonal fluctuation in biomass, chlorophyll content, tissue nutrient content, nutrient uptake and reproduction of two green tides-forming macroalgae of Thailand, *Ulva reticulata* Forsskal and *Enteromorpha intestinalis* L.

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“Green tides” are vast accumulations of unattached green macroalgae associated with eutrophication which have the strong ecological and economic impacts. However, little is known about the causes, extent or history of the macroalgal blooms that occur in eutrophic areas in Thailand. This project is to investigate seasonal fluctuations of bloom-forming green macroalgae, *Ulva reticulata* at Pa Klok and *Enteromorpha intestinalis* at Tung Ken, Phuket and the relationship between the macroalgal blooms and the physical and environmental conditions. The sampling will be done monthly using quadrat sampling to assess seasonal changes in biomass. Macroalgal reproduction, chlorophyll content and tissue nutrient concentrations will be investigated by collecting and bringing back samples to the laboratory for further investigations continue. Physical parameters: temperature, salinity, water column and sediment nutrients concentration will also be observed to establish the relationship between those factors and macroalgae. Moreover, the studies of nutrients uptake, growth rates and nutrients-exchange across sediment-water interface will be conducted in the laboratory twice during rainy season and summer. This study will be finished in July, 2007.

ผลของการกินของสัตว์กินพืชและฤดูกาลของการเปิดพื้นที่ว่างต่อองค์ประกอบชนิดและการเปลี่ยนแปลงแทนที่ของสาหร่าย ณ อุทยานแห่งชาติสิรินาถ จังหวัดภูเก็ต

Effects of herbivory and season of clearing on species composition and algal succession at Sirinat Marine National Park, Phuket Province, Thailand

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The effects of herbivory and season of clearing on species composition and algal succession were experimentally tested on a tropical intertidal shore, Phuket Island, Thailand. To determine the effect of season of clearing on algal succession, dead coral patches were cleared, and cages were set up to exclude fish herbivory. The experimental design comprised 1 gap size of clearing (20 cm × 20 cm), 2 seasons of clearing (January and July 2004) and 2 categories of herbivory: five fully caged (25 cm × 25 cm × 20 cm, mesh size was 2 cm × 2 cm) and five uncaged plots for both experimental and control plots. The results indicated that the pattern of algal community development during succession was in the middle stage and algal succession followed 'an inhibition model'. In this succession process, an ephemeral alga, *Ulva paradoxa* was the early colonist which inhibited the settlement of the later species, *Polysiphonia sphaerocarpa* and *Dictyosphaeridia* stage of *Padina*. Seasons of clearing influenced the abundances in the algal succession. Algal abundance was not influenced by grazing. It might be a result of resident herbivorous damselfishes excluding other herbivores from their territories and maintaining algae as algal farms. Unexpectedly, the *Ulva* cover in the caged plots had a lower algal coverage. These fish excluding plots might allow smaller grazers to feed on the newly colonized algae, thus reducing the algal cover within the cages. Further experiments on the roles of herbivory on algal succession are still needed for a better understanding in this tropical intertidal shore.

ความหลากหลาย การกระจายในแนวตั้งและนิเวศวิทยาเชิงประชากรของแพลงก์ตอน เพื่อการ
ติดตามตรวจสอบคุณภาพน้ำในอ่างเก็บน้ำดอยเต่า จังหวัดเชียงใหม่

Diversity, vertical distribution and population ecology of planktons for water quality monitoring in Doi Tao Reservoir, Chiang Mai Province

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A study on diversity, vertical distribution and population ecology of planktons for water quality monitoring in Doi Tao Reservoir, Chiang Mai Province, was conducted during the period, October 2003 to September 2004. Three sampling sites were selected namely inflow, outflow and the deepest point and the samples were collected once a month. At the deepest point, water samples were collected every 2 m in vertically from the water surface. Physicochemical and some biological parameters and plankton in each sampling sites were studied. One hundred and sixty-five species representing seventy-two genera in six divisions of phytoplankton were found. Sixty species of thirty-five genera in three phyla of zooplankton were also found. Principal Component Analysis (PCA) was used to determine the indicator species for water quality. It was found that the phytoplanktons, *Aphanizomenon gracile*, *Aulacoseira granulata*, *Aulacoseira muzzanensis*, *Fragilaria crotonensis* and *Peridinium* sp.1, could be used indicators of moderate water quality and mesotrophic status, *Cylindrospermopsis raciborskii*, *Euglena* sp.1, *Peridinium* sp.4 and *Oscillatoria* sp.1 could be used as indicators of moderate to moderate-polluted water quality and mesotrophic to meso-eutrophic status, whereas the zooplanktons, *Amoeba guttula*, *Chilodonella uncinata*, *Chrysidella schaudinni*, *Diffugia* sp.3, *Notosolenus apocamptus* and *Pleuromonas jaculans* could be used as indicators of moderate water quality and mesotrophic status. The water quality in the reservoir was in category 3 according to the assessment of water quality by water quality of standards Thailand. The water could be used for household consumption after proper treatment.

ประชาคมแพลงก์ตอนพืชในแหล่งน้ำที่ปนเปื้อนสารหนูในอำเภอร่อนพิบูลย์
จังหวัดนครศรีธรรมราช

**Phytoplankton communities in arsenic contaminated waters at
the Ronphibun district of Nakhon Si Thammarat Province, Thailand**

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Communities of phytoplankton in arsenic contaminated waters at the Ronphibun district, Nakhon Si Thammarat province were analysed at monthly intervals from July 2004 to June 2005. The chosen locations were four in the tin mining areas at Ronphibun and Hintok sub-district and two in dug ponds for community use at Saothong and Khuankoey sub-district. Analysis of the arsenic contents of the water collected from Ronphibun and Hintok sub-district, showed that all were contaminated with high levels of arsenic (10.8-169.5 µg/L) that exceeded the surface water standard of WHO. However, the water samples collected from the Saothong and Khuankoey sub-district had low arsenic levels (0.3-24.6 µg/L). 80 genera with 170 species of phytoplankton were identified. There were 41 genera with 95 species in the class Chlorophyceae; class Cyanophyceae had 19 genera and 33 species; class Bacillariophyceae had 11 genera and 17 species; class Euglenophyceae had 4 genera and 17 species; class Chrysophyceae had 3 genera and 4 species and class Dinophyceae had 2 genera and 4 species. Phytoplankton communities in the tin mining areas were dominated by genera *Phormidium*, *Peridinium*, *Oscillatoria*, *Trachelomonas*, respectively. In addition, the dominant phytoplankton in dug ponds consisted of genera *Peridinium*, *Chroococcus*, *Phormidium* and *Oscillatoria*.