การจำแนกชนิดแบคทีเรียในสกุล *Asaia* Yamada et al. 2000 โดยการวิเคราะห์รูปแบบดีเอนเอที่ได้จากการตัดดีเอนเอบริเวณ 16S rDNA ด้วยเอนไซม์ตัดจำเพาะ

Identification of strains assigned to the genus *Asaia* Yamada et al. 2000 based on 16S rDNA restriction analysis

P. Yukphan[1], T. Malimas [1], M. Takahashi[2], M. Kaneyasu[2], W. Potacharoen[1], S. Tanasupawat[3], Y. Nakagawa[2], M. Tanticharoen[1] and Y. Yamada[1]

[1]BIOTEC Culture Collection, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120, [2]Biological Resource Center (NBRC), Department of Biotechnology, National Institute of Technology and Evaluation, Kisarazu 292-0818, Japan, [3]Department of Microbiology, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Pathumwan, Bangkok 10330

Thirteen representative strains assigned to the genus *Asaia* were examined for restriction analysis of 16S rDNA. On digestion of 16S rDNA PCR products with three restriction endonucleases, *Sty*I, *Bsa*JI, and *Sna* BI, four restriction groups were recognized by combination of the resulting restriction patterns. Of the four restriction groups, eight strains of Group A were identified as *A. bogorensis*. Two strains each of Group B and Group C were respectively identified as *A. siamensis* and *A. krungthepensis*. The exceptional one strain, which was grouped into Group D, was identified as *A. bogorensis*. The 16S rDNA restriction analysis using three restriction endonucleases, which was discussed taxonomically and phylogenetically in comparison with the 16S-23S rDNA ITS restriction analysis using two restriction endonucleases previously reported, was useful for identifying *Asaia* strains at the species level as well.

การศึกษาราน้ำเบื้องต้นจากแหล่งน้ำธรรมชาติที่อุณหภูมิแตกต่างกันในประเทศไทย

Preliminary study of freshwater fungi in natural habitat at different temperature of Thailand

V. Sri-indrasutdhi, S. Sivichai and N. Hywel-Jones
Mycology Laboratory, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120

This project has been undertaken to study and carry on the diversity of freshwater lignicolous fungi in natural habitat at different temperature of Thailand. Two hundred natural submerged woods from four sites (Saphan Yung hot stream; 43˚C, Wang Chumpee waterfall; 25˚C, Klong Ploo waterfall; 27˚C and Than Bokorani waterfall; 25˚C) were collected and incubated in plastic boxes. Their included 112 Mitosporic fungi (70.8%), 33 Ascomycetes (20.8%), 5 Coelomycetes (3.2%) and 8 unidentified (5.2%) of the total taxa. While 158 strains of freshwater fungi were isolated in to pure culture and preserved in BIOTEC Culture Collection for screening of bioactive compound.

ลักษณะทางชีววิทยาบางประการของราน้ำ *Achlya ambisexualis* ที่แยกจากไข่ปลานิล (*Oreochromis niloticus* Linn.)

Some biological characteristics of *Achlya ambisexualis* isolated from Tilapia Eggs (*Oreochromis niloticus* Linn.)

K. Panchai[1] (Student), C. Hanjavanit[1] (Thesis Advisor), N. Kitancharoen[2] (Thesis Co-Advisor)
[1]Applied Taxonomic Research Center (ATRC), Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002, [2]Department of Fishery, Faculty of Agriculture, Khon Kaen University, Muang, Khon Kaen 40002

Fungal infected tilapia eggs (Oreochromis niloticus Linn.) were collected from private fish farms (Kalasin, Khon Kaen and Sakon Nakhon provinces), an Inland Fisheries Station (Kalasin province) and Inland Fisheries Research and Development Centers (Khon Kaen, Mahasarakham and Sakon Nakhon provinces) during June-July, October-November 2005 and March-April 2006. Several fungal species have been isolated and identified. The effects of temperature, pH and NaCl on mycelial growth were studied. Achlya ambisexualis was isolated from fish hatcheries (Khon Kaen and Sakon Nakhon provinces). Biological characteristic examination of the fungus showed that the optimum temperature and pH for mycelial growth were 15-35°C and 4-11, respectively A. ambisexualis could grow on glucose yeast extract agar containing various concentrations of NaCl and it was able to tolerate up to 15 ppt NaCl.

การศึกษาความสัมพันธ์ของราน้ำในสกุล *Hymenoscyphus*

The significance of the anamorph in the mega genus *Hymenoscyphus*

N. Boonyuen, S. Sivichai and N.L Hywel-Jones
Mycology Laboratory, BIOTEC, National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Klong Luang, Pathumthani 12120

The mega genus *Hymenoscyphus* is in the order Helotiales and known from a broad range of substrata and habitats in both terrestrial and aquatic environments. A group of aquatic hyphomycetes as the anamorph stage in *Hymenoscyphus* (*Tricladium* spp. and *Varicosporium* spp.) is included for study of their relationships and classification. The result of a molecular phylogenetic study based on the ITS region of *H. varicosporoides* and their anamorph connections have proven this taxon to be polyphyletic. While rooted in the 18S rDNA in the phylogram, the neighbourhood of their parsimonious clade is a sister taxon to the order Helotiales, and is accommodated within the same Leotiomycetes Class. Hence, it was found that three chosen species, namely *V. giganteum* SS3012, *V. delicatum* SS3008, and *T. terestre* SS3011 are not monophyletic. In addition, other anamorphic stages of *H. varicosporoides* SS76.01 and two strains of *Cudoniella indica* (SS708, SS3005) are clustered together. More related species will be added for further study of this mega genus.

วิวัฒนาการลงสู่ทะเลของรา Dothideomycetes

Multiple invasion of Dothideomycetes (Ascomycota) lineages into the sea

S. Suetrong[1,2], J. Sakayaroj[1], E.B. Gareth Jones[1] and S. Phongpaichit[2],
[1]NSTDA Science Park, Klong Luang, Pathumthani 12120, [2]Department of Microbiology, Faculty of Science, Prince of Songkhla University, Hat Yai, Songkhla 90112

It has been suggested from numbers of studies that the broadly defined fungal group such as halosphaerialean ascomycetes also evolved more than once independently from terrestrial ancestors. Therefore, the lineages of marine Dothideomycetes were of interest, in order to reveal their ordinal assignment and the inter-relationships between marine and terrestrial counterparts. Some genera of marine Dothideomycetes cannot be assigned based on their morphology to an appropriate order with certainty. In the current study, small subunit (SSU) ribosomal DNA of *Aigialus grandis*, *Aigialus parvus*, *Decasinella formosa*, *Julella aviceniae*, *Lineolata rhizophorae*, *Platystomum scabridisporium*, *Massarina velatospora*, *Massarina thalassiae* and *Verruculina enalia* were sequenced and subjected to phylogenetic analysis. These taxa grouped consistently with many terrestrial and freshwater taxa within the Pleosporales. Our study revealed that they have invaded into the sea several times and may have originated from terrestrial ancestors.

สายสัมพันธ์เชิงวิวัฒนาการของราซีโลไมสีส 2 สกุล: *Infundibulomyces* species และ *Satchmopsis brasiliensis* ที่มีลักษณะโคนิดิโอมาตาเหมือนกัน โดยใช้ข้อมูลลำดับเบสดีเอ็นเอ

Phylogeny of two coelomycete genera with cupulate conidiomata based on rDNA sequence analysis: *Infundibulomyces* species and *Satchmopsis brasiliensis*

J. Sakayaroj[1], N. Rungjindamai[1], N. Plaingam[2], S. Somrithipol[1] and E.B. Gareth Jones[1]
[1]Phylogenetics Lab, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120, [2]Chandrakasem Rajabhut University, Chatuchak, Bangkok 10900

This project sets out to make a major contribution to the classification of the anamorphic fungi, coelomycetes, which produce asexual spores (conidia) and play an important role in terrestrial ecosystems. Three species of interest comprising 2 genera presented in this poster are *Infundibulomyces cupulata, Infundibulomyces* sp. SFC 981 (a new species) and *Satchmopsis brasiliensis*. The genus *Infundibulomyces* resembles *S. brasiliensis* in its nidulariaceous-like conidiomata but differs in having holoblastic conidiogenesis and appendaged conidial morphology. Our phylogenetic analyses based on small subunit and large subunit ribosomal DNA sequences revealed that *I. cupulata* and *Infundibulomyces* sp. SFC 981 are monophyletic with high bootstrap support, and well placed (100%) within the Chaetosphaeriales (Sordariomycetes). Although these two species are congeneric they differ in conidial morphology: *I. cupulata* with longer narrower conidia, while the new taxon has shorter conidia. Moreover, the genus *Infundibulomyces* is distantly related to *S. brasiliensis*, which positioned in the discomycete order Helotiales (Leotiomycetes) with moderate support (64%). Therefore, this molecular result suggests that the nidulariaceous-like conidiomata have arisen more than once because *Infundibulomyces* and *Satchmopsis* are distantly placed and share few other common morphological features.

งานบริการของห้องปฏิบัติการเก็บรักษาสายพันธุ์จุลินทรีย์ไบโอเทค

BIOTEC culture collection services

S. Chunhametha, S. Saidaengkham, C. Suriyachadkun, T. Sathitkunanon, S. Jindamorakot, P. Yukphan, T. Malimas, W. Ngaemthao, W. Chaipitakchonlatarn, W. Potacharoen and K. Kirtikara
BIOTEC Culture Collection, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120

Major role of BIOTEC Culture Collection (BCC) is to collect and preserve microbial cultures and their relevant data for BIOTEC's in-house research and public. Recently, BCC holds more than 20,000 strains, majority of which is fungi isolated from several sources such as insects, decayed wood, plant seeds, fresh water, soil and leaf litter, lichens and alkaline sources. Almost all strains in the collection are cryopreserved at –80^{o}C waiting for screening of bioactive compounds and enzymes. Freeze-drying or storage in vapor phase of nitrogen is used for safe and for strains with special characteristics such as those that produce bioactive compounds. Strain data as well as data regarding storage and supply of cultures are recorded in BCC's database. Based on data available from BCC's database, some thousand strains are made available for public trough the internet (http://bcc.biotec.or.th). BCC also offers other services including safe deposit, patent deposit, technical service (freeze-drying and freezing), identification service (eubacteria, sporulating *in vitro* fungi and yeasts) and personalized training.

การดำเนินการเก็บรักษาตัวอย่างแห้งราทำลายแมลง

The management of insect fungal herbarium

T. Boonpratuang, P. Puyngain, S . Sivichai and N. Hywel-Jones
The Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Klong Luang, Pathumthani 12120

The BIOTEC Bangkok Herbarium (BBH) was established in 1999 when registered with the New York Botanical Garden (NYBG). In 2004 the BRT (Grant BRT D_547001) and BIOTEC (BT-B-02-XG-BC-4702) provided support for the infrastructure and development of the BBH. During the last two years a standardised system has been developed for the management of the collection. A website and brochure for the collection has also been produced for in-house and outside parties. In the last two years a backlog of 11,000 specimens has been processed. 88% of this collection has been identified at least to genus level. Within this we have five fungal phyla, 12 divisions, 51 orders, 147 families, 525 genera and 1160 species. The collection now contains the holotypes of 61 new species. Within these 61 new species there are four new genera: *Flammispora* U. Pinruan, J. Sakayaroj, K.D. Hyde & E.B.G. Jones, gen. nov. *Infundibulomyces* Plaingam, Somrith. & E.B.G. Jones, (2003) gen. nov., *Phruensis* Pinruan, (2004), and *Unisetosphaeria* Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde, (2003) gen. nov. There is also one new fungal order – the Jahnulales. The BBH collection had 31 recorded depositors during this period.

การจัดจำแนกและความหลากหลายของราเอนโดไฟท์จากพืชสกุล *Garcinia*

Molecular identification and diversity of endophytic fungi from *Garcinia* spp.

N. Rungjindamai[1], S. Phongpaichit[1], V. Rukachaisirikul[2] and J. Sakayaroj[3]
[1]Department of Microbiology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112
[2]Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112
[3]Phylogenetics Laboratory, Klong Luang, Pathumthani 12120

A total of 1,979 endophytic fungi were isolated from leaves and branches of five healthy *Garcinia* plants from southern Thailand; *Garcinia atroviridis*, *G. dulcis*, *G. mangostana*, *G. nigrolineta* and *G. scortechinii*. Three hundred and seventy seven isolates (19.0%) were randomly selected according to colony morphology to screen for their antimicrobial activities against seven human pathogens. Seventy out of 377 isolates (18.6%) demonstrated antimicrobial activity against at least one human pathogen; *Staphylococcus aureus* ATCC29523, methicillin-resistant *S. aureus* (MRSA), *Candida albicans*, *Cryptococcus neoformans*, and *Micrsoporum gypseum*. Molecular identification based on Internal Transcribed Spacers (ITS1-5.8S-ITS2, ITS) ribosomal DNA sequences was performed. Our endophytic fungal sequences were compared and aligned with other related sequences retrieving from GenBank database using BioEdit V. 7.0.5. The phylogenetic trees were constructed using PAUP* V.4.10b. The result showed that selected 22 active endophytes belong to 6 orders 10 genera; *Aspergillus* sp., *Aspergillus aculeatus*, *Penicillium* sp., *Penicillium paxilli* (Eurotiales), *Botryosphaeria* sp., *Fusicoccum* sp., *Guignardia mangiferae*, (Dothideomycetes *et* Chaetothyriomycetes *incertae sedis*), *Curvularia* sp. (Pleosporales), *Fusarium* sp. (Hypocreales), *Phomopsis* sp. (Diaporthales), *Eutypella* sp. and *Xylaria* sp. (Xylariales). The results indicate that endophytic fungi from *Garcinia* spp. are diverse and ITS region is efficient for fungal molecular identification.

ความหลากหลายของเชื้อรากลุ่มซีโลมัยซีทในประเทศไทย

Diversity of coelomycete fungi in Thailand

S. Somrithipol
BIOTEC Central Research Unit, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120

Coelomycete is unique anamorphic fungi, which is poorly surveyed and documented. This group plays an important role in the ecosystem as saprophytes, parasites, endophytes and mutualist organisms. Many species of coelomycetes possess the ability in producing bioactive compounds with pharmaceutical potential and are used in biological control. This study was proposed to isolate coelomycete fungi from the Thai forests and deposit them into the BIOTEC Culture Collection and to determine their ecology. Any new fungi encountered during the study would be described and published. Thirty-nine coelomycetes (21 species) were isolated from 340 samples of fallen leaves, twigs, fruits and seeds. *Chaetospermum camelliae* was the most abundant species and occurred in a wide range of habitats. Eight new fungi were also collected during this study. Three of them have been described, and submitted to publish in the international journals. Further studies are to survey for fungi throughout the rainy months, and to do the ecological analysis.

ความหลากหลายของรากลุ่ม Xylariaceae ในประเทศไทย

Diversity of Xylariaceous fungi in Thailand

P. Srikitikulchai[1], T. Læssøe[2] and S. Sivichai[1]
[1]National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120
[2]Department of Mycology, Botanical Institute, University of Copenhagen, Copenhagen, Denmark

Xylariaceae is known for its ability to produce bioactive compounds and enzymes with some industrial potential. *Xylaria* is the largest genus within the *Xylariales* family and many species have been discovered habitats in all types of forests, including mangroves, due to their ability to degrade various plant materials e.g. wood, twigs, leaves, seeds and also dung. Since 2005, diversity of Xylariaceous fungi in Thailand have been surveyed and isolated into axenic culture, we found total of 260 samples some of which have been categorized into 10 genera, *Annulohypoxylon, Biscogniauxia, Daldinia, Entoneama, Hypoxylon, Kretzschmaria, Nemania, Stilbohypoxylon, Xylaria* and *Whalleya*. *Xylaria* remain a dominant genus. All cultures were collected and preserved at BIOTEC Culture Collection (BCC). They were meant for the screening of many useful bioactive compounds under the bioresources utilization programe.

ความหลากหลายของราบนปาล์ม

Biodiversity of fungi on palms

E.B.G. Jones[1], R. Choeyklin[2], A. Pinnoi[3] and U. Pinruan[4]
[1]BIOTEC Central Research Unit, Klong Luang, Pathumthani 12120, [2]Biological Science Program, Faculty of Science, Burapha University,Muang, Chonburi20131, [3]Department of Microbiology, Faculty of Science, Prince of Songkhla University, Hat Yai, Songkhla 90112, [4]Biotechnology Program, Faculty of the Graduate School, Chiang Mai University, Muang, Chiang Mai 50200

The biodiversity of fungi on selected palms: *Calamus* sp., *Licuala spinosa*, and *Elaeis guineensis* were studied. Four field collections were made for saprophytic fungi: September, October, and November 2005 and January 2006; and one for endophytic (November 2005). On *Elaeis guineensis* a total of 118 taxa including 28 Ascomycota, 28 anamorphic fungi and 62 Basidiomycota were recorded. *Annulatascus velatispora*, *Stilbohypoxylon* sp., *Falciformispora* sp. and *Vanakripa* sp. were common on this palm. On *Calamus* sp. a total of 78 taxa (176 records), including 40 Ascomycota, and 38 anamorphic fungi were recorded. Samples were collected from 4 parts of the palm: with 61% of the fungi recorded from petioles; 37.5% from rachis and 1.5% from the trunk. Palm material collected from different habitats were also sampled: dry aerial material yielded 66% of the fungi and damp/moist material 34%. On this palm, a number of species: AOM 318, *Morenoina palmicola* and *Diaporthe* sp., were common. In this work we document the occurrence of endophytic fungi within petioles and leaves of the fan palm, *Licuala spinosa* from Khuan Khang Hotspring, Trang Province. One thousand two hundred and twenty nine isolates were made. Cultures on PDA and CMA were examined periodically for reproductive structures and identified as they sporulated. Many cultures did not sporulate but their distinctive colony morphology and production of sterile stromata, suggested they were xylariaceous species, with 75 morpho types. Two hundred and nineteen axenic morpho strains were characterised and deposited in the BIOTEC Culture Collection (BCC).

การหาสภาวะที่เหมาะสมของเชื้อรา ในการผลิตไซลาเนสโดยใช้แหล่งคาร์บอนจากเศษวัสดุเหลือทิ้งทางการเกษตร

Optimization of conditions for xylanase production of fungi from agricultural waste

W. Ruangtaweesin[1] (Student), D. Thanaboripat[1] (Thesis Advisor),O. Sukcharoen[2] (Thesis Co-Advisor)
[1]Department of Applied Biology, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, [2]Department of Biotechnology, Faculty of Science, Ramkamhaeng University, Bangklapi,Bangkok 10310

Aspergillus foetidus TISTR 3159 and *Fusarium moniliforme* TISTR3175 were studied for xylanase production. The results showed that *F. moniliforme* TISTR3175 produced higher amounts of xylanase and activity than *A. foetidus* TISTR 3159. When rice straw, rice bran, narrow-leaved cattail and water hyacinth were used as carbon sources, it was found that *F. moniliforme* TISTR3175 and *A. foetidus* TISTR 3159 produced the highest activity of xylanase at 917 and 908 units/g substrate on rice straw, respectively. Pretreatment of rice straw with 1% sodium hydroxide for 0.5 h at room temperature before growing *F. moniliforme* TISTR3175 on it yielded xylanase at 1,480 units/g substrate. When ammonium sulphate and urea were compared as nitrogen sources, *F. moniliforme* TISTR3175 produced higher xylanase yield on ammonium sulphate than urea..Some properties of xylanase production from *F. moniliforme* TISTR3175 were studied. After xylanase was precipitated with ammonium sulphate (40-50% saturation), and undergone dialysis and ultrafiltration, the xylanase enzyme was more pure (57.5 times) and the specific activity was 938 units/mg protein. The optimum temperature and pH were 40^{o}C and 7.0, respectively. The xylanase was stable at temperatures of 30-40^{o}C with relative xylanase activity at 100 %. The K_m and V_{max} values of xylanase with oat spelt xylan were 14.88 mg/ml and 212.22 ug/ml/min, respectively.

Bipolar Budding Yeasts สายพันธุ์ใหม่จำนวน 4 สายพันธุ์ ในจีนัส *Hanseniaspora* และ anamorph *Kloeckera* ที่คัดแยกได้ในประเทศไทย

Four new species of bipolar budding yeasts of genus *Hanseniaspora* and its anamorph *Kloeckera* isolated in Thailand

S. Jindamorakot[1], W. Potacharoen[1], H. Kawasaki[2] and T. Nakase[3]
[1]National Center for Genetic Engineering and Biotechnology,Klong Luang, Pathumthani 12120
[2]The International Center for Biotechnology, Osaka University, Suita, Osaka, Japan, [3]Biological Resource Center (NBRC), Department of Biotechnology, National Institute of Technology and Evaluation, Kisarazu, Chiba, 292-0818, Japan

Among yeast strains isolated from the natural environment of Thailand, 15 strains proliferated by bipolar budding. In the phylogenetic tree based on the D1/D2 domain sequencesof 26S rDNA, they were located in the cluster where species of the genus *Hanseniaspora* and its anamorph counterpart *Kloeckera* were located. Based on the morphological, physiological characteristics, and sequences of D1/D2 domain, 7 strains of bipolar budding yeasts are considered to represent 4 new species namely, *Hanseniaspora thailandica* sp. nov. (ST-250 and ST-306), *Kloeckera siamensis* sp. nov. (ST-464, ST-493 and ST-613), *Kloeckera songkhlaensis* sp. nov. (ST-476) and *Kloeckera tradensis* sp. nov. (ST-391).

การศึกษาจุลินทรีย์ในกระบวนการผลิตปุ๋ยอินทรีย์ขององค์การบริหารส่วนตำบลท่าข้าม อำเภอหาดใหญ่ จังหวัดสงขลา

Study on microorganisms involving in organic fertilizer production processes from biofertilizer plant at Takam subdistrict administration organization Amphoe Hat Yai, Songkhla province

D. Wasoontarakul (Student), N. Intrasungkha (Thesis Advisor), S. Intasuwan (Thesis Co-Advisor)
Department of Biology, Faculty of Science, Thaksin University, Muang, Songkhla 90000

The objectives of this work are to study the microbial diversity involving to the organic fertilizer production processes from pilot plat of biofertilizer at Takam subdistrict, Amphoe Hat Yai. The production mainly rely on their own agricultural waste materials such as chicken manure and rice coat residue which are augmented with various microbial inocula, such as “Por Dor 1” (from office of Land development) and fermented juice that mixed microbial inocula “Por Dor 2”. These raw materials are processed in pellet form. From this study, we used both culture and non-culture-based techniques to investigation the presence of useful microorganisms and their roles from different production processes. The isolation of actinomycetes was conducted and it was found some potential strains that can inhibit the growth of some fungi causing plant disease. In addition, the 16S rRNA clone library analysis technique has being conducted to obtain the bacterial community structure from various steps of fertilizer production.

การประยุกต์ใช้คุณสมบัติการต้านยาปฏิชีวนะในการตรวจสอบผลกระทบของการปนเปื้อนโลหะหนักต่อความหลากหลายของจุลินทรีย์จากน้ำทิ้งชุมชนและการเพาะเลี้ยงสัตว์น้ำ

Application of antibiotic resistance to monitor heavy metal contamination impacts to microbial diversity from domestic and aquaculture wastewaters

L. Chanthahom[1] (Student), N. Intrasungkha[1] (Thesis Advisor), N. Sukrakanchana[1] (Thesis Co-Advisor), H. Phetmung[2] (Thesis Co-Advisor)

[1]Department of Biology, Faculty of Science, Thaksin University, Muang, Songkhla 90000

[2]Department of Chemistry, Faculty of Science, Thaksin University, Muang, Songkhla 90000

This led to the objective of the present study which aims to isolate various bacteria to use as indicators of heavy metal contamination by using antibiotic resistance characteristics in conjunction with chemical analysis method. Water samples were collected from 4 sites of domestic hospital aquaculture and old tin mines during September 2005 and April 2006. It was found that the percentage of antibiotic resistance was significantly correlated with metal resistance, namely in Kanamycin and Zn and Kanamycin and Fe ($P<0.05$). It was found that the bacterial strains isolated from domestic hospital wastewater and aquaculture ponds had a high resistance to antibiotics and heavy metals. However, there was a very low diversity among those bacterial strains which were found resistant to the heavy metals and it showed a positive relationship with heavy metal contamination Analyses by Inductively Coupled Plasma Optical Emission Spectrometry method (ICP-OES). In September 2005, it was found that some samples contained higher heavy metals concentrations than surface water quality standards (WHO). From this study we conclude that antibiotic resistance characteristics can be used to monitor heavy metal contamination which affects the microbial diversity in other environments.

นโยบายของประเทศไทยเรื่องสิ่งมีชีวิตดัดแต่งพันธุกรรม

National policy for Thailand on genetically modified organisms

S. Wannakrairoj[1], C. Tontiwasdakarn[2], P. Pochnukul Suzuki[2], J. Donavanik[3] and B. Srethasirote[4]
[1]Faculty of Agriculture, Kasetsart University,Chatuchak, Bangkok 10900, [2]Faculty of Economic, Thammasart University, Bangkok 10200, [3]Jade Donavanik Law Firm, Chatuchak, Bangkok 10900, [4]Resource Base Policy Project, Pathumwan, Bangkok 10330

Genetically Modified Organisms have a tremendous potential in the national economic development. However, the global market acceptance is presently yet quite limited. Intellectual property, ecological risk, organization, rule and regulation as well as economic analyses indicated that there is no scientific evidence confirmed that GMOs do not pose higher risk to human and ecosystem than their ordinary counterpart. Moreover, patents owned by foreign entities may protect each transgenic plant variety. Thus, the use of GMOs would affect the national ecosystem as well as the national food security. Thailand should then impose the so-call “Safe Use of Forefront Technology” policy on GMOs issue. Prior to the acceptance of the technology for the enhancement of the country competitiveness in an open system, the enacting process to have a complete legal system on biosafety must be urgently executed. To effectively implement the law, a regulating organization on biosafety must be established evaluate and monitor the impact of GMOs. This will give an assurance to Thai society. In addition, capacity building on biosafety management and on the GMOs technology that not cause genetic pollution must be immediately implemented. Labeling must be performed on all goods (except pure chemical) produced from GMOs. The responsibility for strict liability and redress are the burden of the applicant for the GMOs public release.

ความหลากหลาย สายพันธุกรรม และสารพิษของสาหร่ายสีเขียวแกมน้ำเงิน ที่สร้างสารพิษในประเทศไทย

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

Y. Peerapornpisal and J. Pekkoh
Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

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 “เห็ดลาบ” (*Nostoc commune,* Cyanophyta)

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

(*Nostoc commune,* Cyanophyta)

A. Mahakhant[1], U. Klinhom[2], M. Tungthananuwat[1], C. Thippayasuksri[2], W. Kunyalung[1], W. Pathomyothin[1], P. Srinorakutara[1], P. Bunyaphak[1], K. Sae-khow[1], S. Srisawas[1], V. Arunpairojana[1] and S. Nuthalai[1]
[1]Thailand Institute of Scientific and Technological Research (TISTR), Klongluang, Pathumthani 12120
[2]Faculty of Science, Mahasarakham University, Kantharavichai, Mahasarakham 44150

“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 K_2HPO_4 and $MgSO_4 \cdot 7H_2O$ 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^{o}C using dimethyl sulfoxide as a cryoprotectant.

ความผันแปรลักษณะทางสัณฐานวิทยาและการสร้างเซลล์สืบพันธุ์ของสาหร่ายทะเล *Acanthophora spicifera* และ *Chondrophycus tronoi*

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

P. Thongroy[1] (Student), A. Prathep[1] (Thesis Advisor), L. Liao[2] (Thesis Co-Advisor)
[1]Seaweed and Seagrass Research Unit, Centre for Biodiversity of Peninsular Thailand Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, [2]Marine Biology Section, Department of Biology, University of San Carlos, 6000 Cebu City, Philippines.

Branching patterns and reproduction of *Acanthophora spicifera* and *Chondrophycus 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 บริเวณพื้นที่จังหวัดภูเก็ต ตอนใต้ของประเทศไทย

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

B. Wichachucherd[1] (Student), A. Prathep[1] (Thesis Advisor), L.B. Liddle[2] (Thesis Co-Advisor)
[1]Seaweed and Seagrass Research Unit, Centre for Biodiversity of Penisular Thailand, Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, [2]Southampton College of Long Island University, Southampton, NY 11968 USA.

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 ปริมาณคลอโรฟิลด์ 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.

P. Buapet[1], R.J. Ritchie[2] and A. Prathep[1]
[1]Seaweed and Seagrass Research Unit, Centre for Biodiversity of Penisular Thailand, Department of Biology,Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112, [2]School of Biological Sciences, University of Sydney, NSW 2006, Australia

"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 quadrate 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 ffurthure 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

J. Mayakun[1] (Student), A. Prathep[1] (Thesis Advisor), J. Ha Kim[2] (Thesis Co-Advisor)
[1]Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112
[2]Department of Biological Science Sungkyunkwan University Suwon, S. Korea

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 *Dictyerpa* 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 การกระจายในแนวดิ่งและนิเวศวิทยาเชิงประชากรของแพลงก์ตอน เพื่อการติดตามตรวจสอบคุณภาพน้ำในอ่างเก็บน้ำดอยเต่า จังหวัดเชียงใหม่

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

L. Dhitisudh (Student), Y. Peerapornpisal (Thesis Advisor), P. Vacharapiyasophon (Thesis Co-Advisor)
Department of Biology, Faculty of Science, Chiang Mai University, Muang,Chiang Mai 50200

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*, *Difflugia* 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

W. Meeinkuirt.[1] (Student), P. Pholpunthin[1] (Thesis Advisor), W. Sirinawin[2] (Thesis Co-Advisor), S. Augsupanich[3] (Thesis Co-Advisor)

[1]Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, [2]Department of Chemistry, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112, [3]Department of Aquatic Science, Faculty of Natural Science, Prince of Songkla University, Hat Yai, Songkla 90112

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.*

การศึกษาทบทวนมอสส์วงศ์ Sematophyllaceae ในประเทศไทย

Taxonomic revision of Sematophyllaceae (Musci) in Thailand

T. Boonkerd[1], R. Pollawatn[1] and J.P. Frahm[2]
[1]Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Nees-Institute for Biodiversity of Plants, Bonn University, Germany.

The Sematophyllaceae has been firstly studied by V.F. Brotherus since 1908. Circumscription and affinities of the genera and family have been carried out by many bryologists since then. However, these taxonomic treatments were often weakly defined mainly due to the small differences in the peristomial structure, leaf papillosity, and the degree of alar differentiation. Up to now the most accepted scheme was proposed by Brotherus (1925). His classification based on variation in characters of alar organization. These collective characters were also used to subdivided the family into four subfamilies, viz. Clastobryoideae, Heterophyllioideae, Macrohymenioideae, and Sematophylloideae. There are about 53 genera and over 600 species worldwide at present. In Thailand a taxonomic treatment of the Sematophyllaceae was carried out based on 1,634 specimens. These specimens were on loan from the main herbaria in U.S.A. and Europe and also included additional collections by authors. The intensive morphological studies were carried out in all organs of each specimen. An enumeration of this moss family included 24 genera, 95 species and 7 varieties. Among these 15 species are new records for Thailand and 3 species are probably new to science.

ความหลากหลายของเฟิร์นและพืชใกล้เคียงเฟิร์นบริเวณเขาเขียว อุทยานแห่งชาติเขาใหญ่

Diversity of ferns and fern allies at Khao Khiao Area in Khao Yai National Park

W. Khwaiphan (Student), T. Boonkerd (Thesis Advisor)
Department of Botany, Faculty of Science, Chulalongkorn University, Patumwan, Bangkok 10330

Diversity of pteridophyte at Khao Khiao, Khao Yai National Park was explored from December 2003 to May 2005 at elevations ranging from 600 to 1,300 m above mean sea level. Two hundred and nineteen specimens were collected from their natural habitats and were determined into 113 species and 2 varieties, in 59 genera within 25 families. Among these, 22 families, 55 genera, 105 species and 2 varieties were ferns, while 3 families, 4 genera and 8 species were fern allies. Three families of ferns namely, Polypodiaceae, Thelypteridaceae, Dryopteridaceae, were among the common families which included 17, 13 and 12 species, respectively. As regard to habitat, there were 58 species of terrestrials, 30 species of epiphytes and 7 species and 2 varieties of lithophytes. However 18 species of ferns and fern allies could be found in more than one habitat. In addition, it can be concluded that 53 species and 2 varieties were found in tropical evergreen forest. While 34 species were found in hill evergreen forest and 6 species were found in grassland and secondary forest. However, 20 species grew in more than one forest types.

ความสัมพันธ์ด้านวิวัฒนาการชาติพันธุ์และฟีนิติกของเฟิร์นสกุล *Lepisorus* (J. Smith) Ching (Polypodiaceae) และสกุลใกล้เคียง

Phylogenetic and phenetic relationships of the fern genus *Lepisorus* (J. Smith) Ching and related genera

W. Chatan.[1] (student), T. Boonkerd[2] (Thesis Advisor), B.R. Baum[3] (Thesis Co-Advisor)
[1]The Biological Science Ph.D. Program, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330 [2] Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[3]Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, Canada

Lepisorus (J. Smith) Ching is a genus of the family Polypodiaceae, consisting of about 40 to 70 species, naturally occurs in tropical Africa and Asia, extending to Korea and Japan. At present, there are different in taxonomic treatments, which included or excluded the species of some genera from *Lepisorus* and its related genera. The objective of this research is to study morphological, anatomical and spore characters and also used these characters in investigating the phylogenetic and phenetic relationships of these genera. So far, fifty-six characters from 600 specimens have been examined including morphological, anatomical and spore characters. Up to now the most variation features were observed in rhizome scales and lamina morphology. All characters will be further used in multivariate analyses.

ทบทวนอนุกรมวิธานของเฟิร์นชนิดเชิงซ้อน *Microsorum punctatum* (L.) Copel. (polypodiaceae)

Taxonomic revision of fern, *Microsorum punctatum* (L.) Copel. Complex (polypodiaceae)

S. Petchsri[1] (Student), T. Boonkerd[2] (Thesis Advisor), B.R. Baum[3] (Thesis Co-advisor)
[1]The Biological Science Ph.D.Program, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, [2]Department of Botany, Faculty of Science, Chulalongkorn University,Pathumwan, Bangkok 10330 [3]Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, Canada

Microsorum punctatum (L.) Copel. occurs naturally in various forest types. It is found from sea level to about 2,800 m altitudes and has its distribution in the palaeotropics and subtropics. At present, the taxonomic status and boundary of this species is still dubious due to its great variations in leaf form, leaf size and venation patterns. There are some species, for example *M. musifolium* Copel. and *M. glossphyllum* Copel, were treated as synonyms of *Microsorum punctatum*, but however they were recognized by some workers as distinct species. Moreover, cultivated plants have rather variations in frond forms. Some of these forms have been described as cultivars, i.e. *M. punctatum* cv. *grandiceps* Piggot. These variations do not match with the previous recognized systematic treatments. So, this species group was proposed as a species complex and worth investigating. From the study of 679 herbarium specimen deposited at BCU, BKF, K, B, L and P, it seems likely that more than one specie were clumped into a single species *M. punctatum* by some authors. So, the taxonomic status of this species will be re-investigated by using both classical, numerical and Molecular taxonomy.

ความหลากหลายของกล้วยไม้บริเวณเขาเขียว อุทยานแห่งชาติเขาใหญ่

Diversity of orchids at Khao Khiao Area in Khao Yai National Park

A. Buakhlai (Student), T. Seelanan (Thesis Advisor)
Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Khao Khiao of Khao Yai National Park occupies about 60 square kilometers and situated between 600-1,292 meters above the mean sea level. The area is comprised of grassland and secondary forest, tropical rain forest and hill evergreen forest. The hill evergreen forest has high humidity and cool temperature all year round which results in high diversity of orchids. Thus the aim was to access orchid diversity in Khao Khiao area. Exploration and orchid collection in the field was carried out during December, 2003 to August, 2005. One hundred and fifty-five specimens were collected. They were identified to 106 species in 59 genera and five subfamilies. The subfamilies Epidendroideae and Vandoideae are found 65 and 29 species, respectively. The genera with highest number of species included *Dendrobium* (10 species), *Eria* and *Oberonia* (seven and six species respectively). It was found that four species were endemic to Thailand, of which three are rare orchids, namely *Calanthe hirsuta* Seidenf., *Dendrobium ciliatilabellum* Seidenf. and *Gastrochilus rutilans* Seidenf. In addition, a new record of orchids to Thailand was also found, *Bulbophyllum angustifolium* (Blume) Lindl. With respect to habits, the majority of orchids are epiphytic and terrestrial; for the latter, three mycotrophic orchids were included. With regard to distribution in Khao Khiao, 47 species grows in the hill evergreen forest while 27 species are in the tropical rain forest and only 9 in grassland and secondary forest. Besides, as many as 23 species were found in more than one forest type. The comparison of orchid diversity in Khao Khiao to those in other nearby National Parks, suggested that forest types and their climatic characteristics affect the distribution of orchids.

พืชวงศ์หญ้า (Gramineae) ในเขตอุทยานแห่งชาติภูเรือ จังหวัดเลย

The family Gramineae in Phu Rua National Park, Loei Province

C. Jaroenchai (Student), P. Chantaranothai (Thesis Advisor), A. Prajaksood (Thesis Co-Advisor)
Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

The taxonomic study of the family Gramineae in Phu Rua National Park, Loei Province was examined and studied between July, 2004 and July, 2006. Five subfamilies, 63 genera, 99 species and three varieties are identified. Descriptions, keys to taxa, photographs and line drawings are presented. Quite a few species are distributed in open areas of pine and dipterocarp forests. The most common genus is *Eragrostis*. *Heteropogon* and *Schizachyrium* are distributed in Thailand and all species can be found in the park.

ซิสเต็มมาติกส์ของพืชวงศ์หญ้าเผ่าย่อย Ischaeminae และ Rottboelliinae ในประเทศไทย

Systematics of the subtribe Ischaeminae and Rottboelliinae (Poaceae) in Thailand

P. Traiperm[1] (Student), T. Boonkerd[2] (Thesis Advisor), P. Chantaranothai[3] (Thesis Co-Advisor), D.A. Simpson[4](Thesis Co-Advisor)

[1]The Biological Science Ph.D. Program, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, [2]Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

[3]Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

[4]Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, U.K.

Up to now grasses are the fifth largest family of flowering plants and include 700 genera and 10,000 species worldwide. About 133 genera and 505 species are estimated to occur in Thailand. The economic importance of grasses is well known and play a dominant role in many natural and human-influenced ecosystems. A preliminary taxonomic account of the subtribe Ischaeminae and Rottboelliinae in Thailand is presented here. So far, 14 genera, 50 species and 2 infraspecific taxa have been are enumerated and described. Among these, *Ischaemum* (13 species and 2 infraspecific taxa), *Eremochloa* (12 species) are the two largest genera from this study. It is expected that eight species are newly recorded for the country or probably new to science. Epidermal peels and transverse sections of leaf-blades have also been investigated in 25 species of the 14 genera from the two subtribes. The diagnostic anatomical characters include morphology of epidermal cell wall of the long cells in the intercostal zone, shape of subsidiary cells and silica bodies, macro-hairs, papillae, prickles, position of stomata, midrib and keel bundles, rib and furrows on the adaxial surface, shape and distribution of bulliform and colourless cells, and type of bundle sheath cells. It is evident that leaf anatomical characters are taxonomically useful for classification at the generic level.

กายวิภาคศาสตร์เปรียบเทียบเนื้อเยื่อชั้นผิวของลำต้นเหนือดินของพืชสกุล *Eleocharis* R. Br. และ *Mapania* Aubl. (Cyperaceae) ในประเทศไทย

Comparative anatomy of the culm surface of *Eleocharis* R. Br. and *Mapania* Aubl. (Cyperaceae) in Thailand

S. Pechcoth (Student), A. Thammathaworn (Thesis Advisor)
Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

The culm epidermis of ten taxa of *Eleocharis* and five taxa of *Mapania* was studied and compared using epidermal scrapes and light microscopy in order to investigate anatomical variations of potential for species identification. *Eleocharis* was characterized by 3-6 groups of silica bodies per cell. Each group was composed of large conical silica body with satellites, where as the crystals were absent in *Mapania* culm. The studied taxa were classified into 3 groups based on the presence or absence of silica bodies: 1. presence of conical silica bodies with satellites in the costal area *Eleocharis acutangula, E. congesta* var. *japonica, E. dulcis* var. *tuberosa, E. dulcis* var. *dulcis, E. ochrostachys, E. retroflexa* ssp. *chaetarina, E. spiralia* and *E. tatraquetra* ; 2. presence of conical silica bodies with satellites in the costal area and a wedge-shape crystal in the intercostals area *E. macrorrhiza* and *E. geniculata*; and 3. absence of silica bodies: *Mapania cuspidata, M. enodis, M. kurzii, M. palustris* and *M. tenuiscapa*. In addition, stomatal distribution in the intercostal area of the culm surface was provided for identification of the studied taxa.

กายวิภาคศาสตร์เปรียบเทียบพืชเผ่า Scleriae (Cyperaceae) ในประเทศไทย

Comparative anatomy of tribe Scleriae (Cyperaceae) in Thailand

S. Boriboonwat (Student), A. Thammathaworn (Thesis Advisor), P. Chantaranothai (Thesis Co-Advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

The comparative anatomy of eighteen species of the Tribe Scleriae were investigated by epidermal peel, clearing and transverse sections of leaves, bracts and culms; and transverse of fruits. Morphological study of the fruits were performed under scanning electron microscope. The anatomical characters of leaves and bracts could be used for identification of the studied species are: presence or absence of trichomes, hypodermis, fibre strand in the margins of leaves and bracts, secretory cells in the outer layer of bundle sheath and air cavity in the mesophyll; the trichome types, distribution of stomata: connection of bulliform cells and the bundle sheath; and the mesophyll cells type; The presence or absence of the culm trichome, fibre bundle at the culm angles and cauline air cavities; the trichome types; and distribution of vascular bundles in the culms are useful for the species identification. The studied species are classified into two distinct group based on their pericarp surfaces: the smooth pericarp group composed of *S. corymbosa, S. lithosprema, S. oblata, S. poaeformis* and *S. tonkinensis* and the rough pericarps element are *D. caricinum, S. benthamii, S. biflora subsp. biflora, S. ciliaris, S. kerrii, S. levis, S. mikawana, S. neesii, S. purpurascens, S. rugosa, S. scrobiculata, S. sumatrensis* and *S. terrestris*. The pericarp of all species are comprised of small vascular bundles with two layers of parenchymatous bundle sheath, parenchyma and sclerenchyma ground tissues, and stoma lacking epidermis.

ความหลากหลายทางพันธุกรรมของพืชสกุลกระชาย (วงศ์ขิง) ในประเทศไทยจากข้อมูลลายพิมพ์เอเอฟแอลพี

Genetic variation of *Boesenbergia* (Zingiberaceae) in Thailand as revealed by AFLP Fingerprints

J. Techaprasan[1], C. Ngamriabsakul[2], T. Jenjittikul[3] and S. Klinbunga[1,4]

[1]National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120, [2]Institute of Science, Walailak University, Thasala, Nakhonsrithammarat 80160, [3]Department of Plant Science, Faculty of Science, Mahidol University, Rajhevee, Bangkok 10400, [4]Center of Excellence for Marine Biotechnology, Chulalongkorn University, Pathumwan, Bangkok 10330

Genetic variation and interspecific relationships of 14 *Boesenbergia* species (17 taxa) found in Thailand were evaluated using AFLP technique. *Kaempferia parviflora*, a closely related species was included in the analysis. Four primer combinations generated a total of 704 fragments with 100% polymorphism. Mean distances calculated using Nei and Li distance were ranged from 0.4407 (*B. rotunda* 'Kraichai Dang' and *B. rotunda* yellow rhizome) to 0.9609 (*B. curtisii* and *B. prainiana*). The phylogram generated by Neighbor-Joining analysis revealed two separated lineages of *Boesenbergia* and the evolutionary radiation in *Boesenbergia*.

การสำรวจและรวบรวมพันธุ์พืชวงศ์ Gesneriaceae ในประเทศไทย

Survey and collection of Gesneriaceae in Thailand

P. Palee and V. Anusarnsunthorn
CMU Herbarium, Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

Surveys and collections of Gesneriaceae in Thailand were performed as well as examination of herbarium specimens from various herbaria in Thailand. Their distributions are throughout Thailand. One hundred and four species with twenty-one genera were identified. Among these, 18 species and one variety of *Didymocarpus* Wall. have been revised. Two new species and one new variety have been recognized *viz*. *Didymocarpus jaesawnensis* Palee & Maxw., *Didymocarpus inflatus* Maxw. & Palee, and *Didymocarpus insulsus* Craib var. *payapensis* Palee & Maxw..One species of *Trisepalum* (*Trisepalum prazeri* Burtt) was a new record for Thailand. Further collection in the future should result more new species. However, many of previously recorded genera: *Calcareoboea, Corallodiscus, Cyrtandromoea, Damrongia, Didissandra, Orchadocarpus, Ridleyandra* still have not been found. Forest destruction, changing of ecosystem may result in declining number of species. Palynological study of 30 more species of Gesneriaceae was also performed by scanning electron microscope (SEM). Pollen morphology of some genera proved to have a significant taxonomic value.

ซิสเต็มมาติกระดับโมเลกุลของพืชสกุลปาหนันช้างและสกุลใกล้เคียงในเอเชียตะวันออกเฉียงใต้

Molecular systematics of the genus *Goniothalamus* and related genera in South-East Asia

M. Nakkuntod[1] (Student), T. Seelanan[1] (Thesis Advisor) R.M.K. Saunders[2] (Thesis Co-Advisor)
[1]Department of Botany, Faculty of Science, Chulalongkorn University, Pathunwan, Bangkok 10330
[2]Department of Ecology and Biodiversity, The University of Hong Kong, Hong Kong

The genus *Goniothalamus* Hook. f. & Thomson is one of the largest genera of the family Annonaceae. Its members are widespread in tropical and subtropical Asia. Little is known of the phylogenetic relationships within the genus. Thus, to evaluate evolutionary history and relationships among its members and to understand the evolution of selected morphological characters, the *trnL-F* intergenic spacer and nuclear ITS region markers were employed. The results suggested that *Goniothalamus* is likely to be monophyletic, with the *G. tamirensis-G. elegans* clade being a sister group to the rest of the genus. The larger clade was divided into four recognizable subclades with uncertain relationships. Almost 43 morphological characters when evaluated on the molecular tree were homoplastic. However, as many as 9 characters were partially informative as these may serve as synapomorphic characters for some clades. The phylogeny was highly incongruent with Bân's classification; thus a new classification scheme should be proposed based on new evidence of molecular and morphological analyses.

พรรณไม้วงศ์ไม้ก่อของไทย

Fagaceae of Thailand

C. Phengklai[1], T. Wongprasert[2], T. Boonthavikoon[2], P. Pholsena[2], T. Jonganurak[2]
[1]Fellow of the Academy of Science, Royal Institute of Thailand [2]Office of the Forest Herbarium, National Parks, Wildlife and Plant Conservation Department, Chatuchak, Bangkok 10900

A revision of the family Fagaceae of Thailand, with the financial support from Biodiversity Research and Training program (BRT) has resulted in, the successful cooperation among the researchers and BRT. In conclusion, the Fagaceae of Thailand consists of 119 species, 1 subspecies and 1 varieties. Three species are new to the botanical world, 35 species are new records and 9 species are endemic to Thailand. This showns the vast diversity of Thai plants that can be conserved and utilized. The basic knowledge from this research project should be implemented for economic value to improve the living standard of the people who inhabit the forest and the recovery of natural forest thereafter. Her Majesty the Queen has ever said: “People and Forest can be mutually dependent”.

ภูมิปัญญาท้องถิ่นในการใช้ประโยชน์ไม้วงศ์ก่อ ของชุมชนทางภาคเหนือตอนบนของประเทศไทย

Local knowledge in utilization of the family Fagaceae of communities in Upper Northern Thailand

S. Chunta[1] and M. Wongnak[2]
[1]Wiangkaen Hospital, Wiangkaen, ChiangRai 53710
[2]Queen Sirikit Botanical Garden, The Botanical Organization, Maerim, ChiangMai 50180

This research project entitled “Local Knowledge in Utilization of the Family Fagaceae of Communities in Upper Northern Thailand” that aims to understand local knowledge on the uses of the Family Fagaceae and to gain local knowledge based information on the Family Fagaceae for further conservation strategy development. Data was collected in ChiangRai, ChiangMai and Mehongson Provinces. It found that people in upper northern Thailand have interaction with the Family Fagaceae in various dimensions including; 1) utilization of edible fruits for household consumption such as fruit fly, flour and food soup, and bark of some species is use for chewing with a betel palm, 2) using stems and branches for firewood, for mushroom media, houses’ construction, 3) utilization for financial purposes such as selling fruit, charcoals and flowers, 4) utilization as medicine; example boiling leave and then taking a bath for curing a rash, 5) using plants for ritual traditional and cultural events and, 6) use as associated trees in for a traditional conservation farming of indigenous tea <miang>.

มอโฟรเมทริกซ์และอนุกรมวิธานเชิงโมเลกุลของพืชสกุล *Afgekia* Craib (Fabaceae)

Morphometrics and molecular systematics of the genus *Afgekia* Craib (Fabaceae)

Y. Sirichamorn (Student), T. Boonkerd (Thesis Advisor)
Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Afgekia Craib is a genus of the tribe Millettieae in the family Fabaceae. According to Geesink (1984), there are three species within this genus and all of them are found in Thailand. They are Kan-pai or Tua-pab Chang (*A. sericea* Craib), Kan-pai Mahidol (*A. mahidolae* Burtt et Chermsirivathana) and *A. filipes* (Dunn) Geesink). The first two species are rather similar in some aspects, while the third species, *A. filipes*, is quite remote. This discrepancy leads to uncertain taxonomic status and raises the question of the suitability of the species treatment in this genus. Therefore, this research aims to explore the taxonomic status of the species in the genus *Afgekia* based on morphological and molecular data that will serve as basic information and new additional data for phylogenetic relationship studies in this genus and related genera. The results of the morphological relationship study by means of Morphometrics showed that all 29 morphological characteristics used in Discriminant analysis are significant in separating the genus *Afgekia* into 3 species. Discriminant function 1, the most important function for separating the 3 species, is 99.7% correlated with 19 characters and the varience explained by this function is 88%. It is the most highly associated with "Pod width". The result from scatter plots which presents the group centroids of each species also supports the morphological similarity of Kan-pai (*A. sericea*) and Kan-pai Mahidol (*A. mahidolae*). According to the plots, however, the group centroid of *A. filipes* is apparently remote from the former two. This data shows that it might not be appropriate to place *A. filipes* in the genus *Afgekia*. Therefore, more data from this study are still needed to prove the suitability of species treatment in this genus.

มอร์โฟเมตรีของใบ ความแปรผันทางพันธุกรรม และวงศ์วานทางวิวัฒนาการของกวาวเครือแดงในประเทศไทย

Leaf morphometry, genetic variation, and phylogeny of Red Kwao Krua, *Butea superba,* in Thailand

J. Kaewmuangmoon[1] (Student), C. Chanchao[2] (Thesis Advisor), W. Cherdshewasart[2] (Thesis Co-Advisor)
[1]Program of Biotechnology, Chulalongkorn University, Phathumwan, Bangkok 10330
[2]Department of Biology, Faculty of Science, Chulalongkorn University, Phathumwan, Bangkok 10330

Butea superba (Red Kwao Krua) is a Thai herbal leguminous plant. It's tuberous roots are widely used for increasing sexual vigor in males. Leaves *of B. superba* were collected from 25 locations throughout Thailand. For leaf morphometry, 9 leaf parameters (petiole length – PL; petiole diameter – PD; rachis length – RL; petiolet length – PLL; terminal leaflet length – TLL; terminal leaflet breadth – TLB; stipule length – SPL; angle of first leaf border (AB^o); and number of pairs of primary veins – NPV) were selected. The results indicated variation among cultivars from different locations. For example, in *B. superba*, AB^o of Chacherngsao cultivar is significantly different from those of Chantaburi and Buriram cultivars. For DNA analysis, genomic DNA was isolated from young and fresh leaves. Primers were designed from *rbcL* and *trnLF* genes. Under optimum conditions, product of about 300 bp from *rbcL* and 500 pb from *trnLF* were obtained. Sequences of all cultivars will be obtained and aligned. Then, genetic distance will be calculated for phylogenetic tree construction.

การศึกษาอนุกรมวิธานของพืชสกุลคราม (วงศ์ถั่ว) ในประเทศไทย

A taxonomic study of *Indigofera* L. (Leguminosae) in Thailand

S. Mattapha (Graduate student), P. Chantaranothai (Thesis advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

A taxonomic study of Indigofera in Thailand have been carried out since June 2005. So far, 33 taxa have been recognized: *I.* cf. *aralensis*, *I. atropurpurea*, *I. caloneura*, *I. cassioides*, *I caudata*, *I. colutea*, *I. dosua*, *I. emmae*, *I. galegoides*, *I. glabra*, *I. hirsuta*, *I. kerrii*, *I. lacei*, *I. laxiflora*, *I. linifolia*, *I. linnaei*, *I. nigrescens*, *I. nummulariifolia*, *I. reticulata*, *I. sootepensis* subsp. *sootepensis*, *I. sootepensis* subsp. *acutifolia*, *I. spicata* var. *spicata*, *I. spicata* var. *siamensis*, *I. squalida*, *I. suffruticosa* subsp. *suffruticosa*, *I. tinctoria*, *I. trifoliata* subsp. *trifoliata*, *I. trita* subsp. *trita*, *I. trita* subsp. *subulata* var. *scabra*, *I. wightii*, *I. zollingeriana*., *I.* sp.1 and *I.* sp.2. I. aralensis is expected to be a new record for the country. The last two species are needed for further study.

ชีววิทยาของดอกที่มีความสัมพันธ์กับการถ่ายละอองเกสรและการติดผลของสะตอ *(Parkia speciosa* Hassk.)

The floral biology in relation to pollination and fruit set of Stinkbean (*Parkia speciosa* Hassk.)

S. Wongchana[1] (Student), W. Wunnachit[2] (Thesis Advisor), S. Bumrungsri[2] (Thesis Co-Advisor)
[1]Department of Plant Science, Faculty of Natural Resources, Prince of Songkhla University, Hat Yai Songkhla 90112, [2]Department of Biology, Faculty of Science, Prince of Songkhla University, Hat Yai, Songkhla 90112

The study on floral biology in relation to pollination and fruit-set of stinkbean (*Parkia speciosa* Hassk.) was conducted at Trang Horticultural Research Centre in Trang province and Faculty of Natural Resources, Prince of Songkhla University in Songkhla province during Janurary 2005 and December 2006. The study was designed into 2 aspects : phenological study on leaf flushing, flowering and fruiting and biology in relation to pollination of stinkbean. It was found that leaf flushing during December to January, flowering from March to May and fruiting in April. It's flower was characterised with compound inflorescence, consisting of capitula. A capitulum consists of many small flowers with different floral structure and function that can be divided into 3 types : staminodial flowers at the proximal end, nectar-secreting flowers at the middle, and fertile flowers at distal end. Each flower had 5 sepals and petals, 10-12 stamens. Only single carpel was found in fertile flower. The functional of flower and capitulum depend on size of pistil in fertile flower. The functional male flower had smaller pistil in fertile flower than functional hermaphrodite flower and capitula become male and hermaphrodite, respectively. Fruit set only found in hermaphrodite capitula. The flower opened at night and produced nectar. Cross pollination was necessary. Bat was important pollinator. The percentage of set fruit was 25.37 compare with total flowering.

มอร์โฟเมตรีของใบ ความแปรผันทางพันธุกรรม และวงศ์วานทางวิวัฒนาการของกวาวเครือขาวในประเทศไทย

Leaf morphometry, genetic variation, and phylogeny of White Kwao Krua *Pueraria mirifica* in Thailand

T. Suwonvijitr[1] (Student), C. Chanchao[2] (Thesis Advisor), W. Cherdshewasart[2] (Thesis Co–Advisor)
[1]Program of Biotechnology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Pueraria mirifica (white Kwao Krua) is a Thai herbal leguminous plant. Its tuberous roots are widely used for estrogen-replacement therapy. It has been reported that white Kwao Krua from different locations performs different estrogenic activity. In this study, leaves of *P. mirifica* were collected from many locations throughout Thailand. For leaf morphometry, 9 leaf parameters (petiole length – PL; petiole diameter – PD; rachis length – RL; petiolet length – PLL; terminal leaflet length – TLL; terminal leaflet breadth – TLB; stipule length – SPL; angle of first leaf border – AB°; and number of pairs of primary veins – NPV) were selected. The results indicate variation among cultivars from different locations. For example, AB° of the Maehongsorn cultivar is significantly different from those of Sakonnakorn and Uthaithani cultivars. For indicating genetic variation, genomic DNA was isolated from young and fresh leaves. Primers for the *trnL-F* gene were designed from the gene of other related species. Under optimum conditions, a product of about 400 bp was obtained. The sequence was shown and identity of the *trnL-F* product was 90-99% to recorded sequences in the databank. Sequences of all cultivars will be obtained and aligned. Then, genetic distances will be calculated for phylogenetic tree construction.

นิเวศวิทยาการสืบพันธุ์ของไม้หมีเหม็นและคุณภาพเมล็ดพันธุ์ของไม้เศรษฐกิจบางชนิดในวงศ์อบเชย

The reproductive ecology of *Litsia glutinosa* and seed quality of some economic trees in Lauraceae

S. Ratree
Rajamangala University of Technology Isan, Muang, Nakhon Ratchasima 30000

The study was carried out during the year 2004 – 2005 at Nong Rawiang forest, Nakhon Ratchasima. The objectives were focussed on the phenology and pollinator of *Litsia glutinosa*, and also the pollen efficiency, the reproductive success, seed dispersal, seed germination of *L. glutinosa* in natural site and to test seed quality of *L. glutinosa* and *L. cubeba*.The results showed that growth and development of *L. glutinosa* flower started from the visible size to the time of anthesis was 34 and 30 days in male and female flowers, respectively. The proper time of anthesis was in June. Fruiting occurred in August to September and fell in October. The pollen viability and germination rate were 82% and 39%, respectively. *Eristalis arvorum* Fabr. and *Chrysomya* sp. were the most frequent dominant flower pollinators. The first pollinator species was prefered to male flower while the latter favored to female flower. The peak visitation period in male and female flowers were at 8.00 a.m. and 3.00 p.m., respectively. Reproductive success of *L. glutinosa* was 7.4% and seeds dispersed mostly by birds. *L. glutinosa* and *L. cubeba* had seed viability more than 88%. The standard germination test of *L. glutinosa* with seed stored for 6 months was 72%, and there were no seeds germinating of *L. cubeba* in all experiments. The germination of *L. glutinosa* in the natural site during June 2004 was very high germinated seedling, suggesting seed production had high success in the previous year. However, the survey in June, 2005 did not find any seedlings of this species.

พืชสกุลไทร (*Ficus* L.) ในภาคตะวันออกเฉียงเหนือของประเทศไทย

The genus *Ficus* L. in the Northeast of Thailand

W. Tanming (Student), P. Chantaranothai (Thesis Advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khonkaen 40002

A taxonomic study on the genus *Ficus* L. in the northeast of Thailand was conducted from August 2005 to June 2006. Dried specimens in Thai herbaria and field collections were examined. Six subgenera and 45 species are enumerated: four species in subgenus *Ficus*, two in *Pharmacosycea*, six in *Sycidium*, seven in *Sycomorus*, four in *Synoec*ia and 22 in *Urostigma*. A key to species, descriptions, ecological data, geographical distributions and photographs are provided.

อนุกรมวิธานของมะเดื่อบางชนิดและปฏิสัมพันธ์กับแมลงพาหะถ่ายเรณู

Taxonomy of some figs and their interactions with pollinators

Y. Tarachai[1] (Student), C. Trisonthi[1] (Thesis Advisor), S.G. Compton[2] (Thesis Co-Advisor)
[1]Department of Biology Faculty of Science, Chiangmai University, Muang, Chiangmai 50200
[2]School of Biology, Faculty of Biological Science, University of Leeds, UK

Taxonomic study on some *Ficus* and interaction with pollinators were conducted from June 2005-June 2006 in Chiang Mai. There are 20 species, 8 monoecious and 12 dioecious plants identified. Interaction between figs and their pollinators was investigated by two aspects of the relationship between pollinators and male host plants experimentally. *Ficus montana*, one of dioecious figs, and its pollinator were examined. The first question was whether the pollinator females gain by carrying pollen into a fig and the second question was whether pollinated female flowers in male figs can produce seeds, if the pollinator fails to lay eggs in them. Pollinator progeny were produced in pollen-free figs, but in smaller numbers than in pollinated figs, and often the figs failed to develop at all. When pollinators were allowed to enter male figs, but not lay eggs, all the figs aborted before development was completed.

กายวิภาคศาสตร์เปรียบเทียบของใบพืชสกุล *Polygala* sect. *Polygala* (Polygalaceae) ในประเทศไทย

Comparative leaf anatomy of Thai *Polygala* sect. *Polygala* (Polygalaceae)

N. Piwpuan (Student), A. Thammathaworn (Thesis Advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

Anatomical characters of seven species of the genus *Polygala* sect. *Polygala* were studied using light microscopy and permanent slides which prepared through paraffin embedded sections and whole blade clearing technnique. The plant specimens used in this study were collected from the field between June 2004-November 2005. The objective of the present work was to construct a key based on leaf anatomical characters for the identification of Thai *Polygala* species. The investigated species shared many characters including the amphistomatic leaves with anomocytic stomata which are more on the abaxial surface than on the adaxial one, an undifferentiated hypodermis and dorsiventral mesophyll with the palisade layer towards the adaxial side. Both qualitative and quantitative characters are important for identifation. So, the characters used in the constructed identification key are the presence of druse crystals and lysigenous cavities in mesophyll, trichome type, differences in anticlinal wall of epidermal cells, number of palisade layers and size of stomata. The studied plants were separated into two groups by mesophyll cells. The first group had druse crystals present in the mesophyll cells: *P. chinensis* L., *P. erioptera* DC., *P. logifolia* Poir., *P. persicariifolia* DC. and *P. triflora* L. In the second group the crystals were absent: *P. crotalarioides* Buch.-Ham. ex DC. and *P. polifolia* C. Presl.

การศึกษาอนุกรมวิธานพืชวงศ์ Stemonaceae ที่พบในประเทศไทย

Taxonomic studies of family Stemonaceae in Thailand

P. Inthachub (Student), S. Vajarodaya (Thesis Advisor)
Department of Botany, Faculty of Science, Kasetsart University, Chatuchak, Bangkok 10900

Preliminary study of Stemonaceae in Thailand from the collections of herbarium specimens; The Herbarium of Department of Agriculture (BK), Royal Forest Department (BKF), and Herbarium of Department of Biology, Chiang Mai University (CMU) is presented 2 genera 7 species. These are *Stemona* including *Stemona aphylla* Craib, *S. burkillii* Prain, *S. collinsae* Craib, *S. curtisii* Hook.f., *S. kerrii* Craib and *S. tuberosa* Lour.. *Stichoneuron*, with only one species, *Stichoneuron caudatum* Ridl

ความหลากหลายของพรรณไม้เขาหินปูนในภาคตะวันออกเฉียงใต้ของประเทศไทย

Species diversity of vascular plants in limestones in Southeastern Thailand

P. Phonsena, P. Panyarat and P. Kan-urai
The Forest Herbarium, National Park, Wildlife and Plant Conservation Department, Chatuchak, Bangkok 10900

The first year of a project on the species diversity of vascular plants in limestones in southeastern Thailand was explored from May 2006 in 7 limestone hills. Species diversity, morphological characters, distribution, ecological data and status were examined. Many endemic, rare and endangered species, such as *Wrightia sirikitiae* D.J. Middleton & Santisuk and *Santisukia kerrii* (Barnett & Sandwith) Brummit have been found in this study areas, whilst *Cirromitra* and *Sinobaijana* (Cucurbitaceae) are expected to be new genus. It is expected that numerous new country and regional distributional records will be made, as well as the discovery of many taxa previously unknown to science. Plant inventory data derived from this project will also be used for the Flora of Thailand project and will form an important resource for critical conservation initiatives in Thailand and nearby countries.

ความหลากชนิดของพืชสมุนไพรและแนวทางการใช้ประโยชน์อย่างยั่งยืน ณ อุทยานแห่งชาติภูหินร่องกล้า จังหวัดพิษณุโลก

Species diversity of medicinal plants and its tendency for sustainable use at Phu Hin Rong Kla National Park, Phitsanulok

O. Kudjabnak[1] (Student), D. Wattanachaiyingcharoen[2] (Thesis Advisor), K. Proumtep[1] (Thesis Advisor)
[1]Biology Department, Faculty of Science, Naresaun University, Muang, Phisanulok 65000
[2]Agriculture Natural Resources and Environment, Naresaun University, Muang, Phisanulok 65000

This study focuses on the species diversity and sustainable utilization of medicinal plants in Phu Hin Rong Kla National Park, Phitsanulok during May 2003 – December 2004. The study area is located at Phu Hin Rong Kla near the head office, Mh Huynamyang, Pacutong, Samnakoumnatrat, Kang hospital and Banrongkla undang waterfall, Pacharin base, Lanhinpum,105 species of flowering medicinal plants were collected from Phu Hin Rong Kla National Park. They comprised 63 families and 94 genera. Among these, the Asteraceae were the richest in number of genera and species recorded with 6 species and 6 genera. Full descriptions of the genera and speciess;and keys to genera and a key to species are given together with references for each species. The specimens and material collected are deposited at the Biology Department, Faculty of Science and Faculty of Agriculture Natural Resources and Environment, Naresuan University.

การเร่งการกลับคืนของความหลากหลายทางชีวภาพในพื้นที่ไร่ร้าง บริเวณภาคเหนือของไทยปีที่ 3

Accelerating the recovery of biodiversity in an abandoned agricultural field in Northern Thailand

P. Wangpakapattanawong (Postdoctoral Researcher), S. Elliott (Advisor)
Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

The framework species method of reforestation, developed by The Forest Restoration Research Unit (FORRU) at Chiang Mai University, has been used successfully to restore evergreen forest on degraded former agricultural sites in Doi Suthep-Pui National Park, Chiang Mai. However, this method has never been fully replicated in other areas of northern Thailand. This paper reports results of an attempt to test the FORRU reforestation techniques at Ban Toong Yah, Mae Chaem district, Chiang Mai, at a similar elevation as FORRU's original plots at Ban Mae Sa Mai, Mae Rim district, Chiang Mai. Seventeen species of framework tree seedlings were planted in June 2004. The monitoring of the 22-year old saplings in February 2006 showed that the species with the highest survival rate was *Lithocarpus elegans* (27%). All the seedlings had the survival rates lower than FORRU's acceptable level, which was 50% after 2 growing seasons. The plating area was an open area exposed to strong winds, which likely resulted in the extremely low survival percentages of the seedlings. In addition, FORRU normally prepares the planting sites using chemical herbicides, which is an effective site preparation method. However, chemical herbicides were not used in this research in an attempt to compare performances of the seedlings planted in other planting sites prepared with the FORRU's common method and reduce reforestation cost. The planting site of this research was dominated by *Setaria geniculata* and *Pteridium aquilinum*, with more than 90% cover. Therefore, forest restoration work in the future should carefully consider this factor.

การพัฒนารูปแบบของไม้ดอกหอมในด้านไม้ดอกไม้ประดับและน้ำมันหอมระเหย

Development of fragrant flower plants for the purposes of decoration and essential oils

P. Chalermglin, P. Kengkarj, J. Srithongkul and A. Phiriyaphattharakit
Thailand Institute of Scientific and Technological Research, Klong Luang, Pathumthani 12120

A study of 30 rare and fragrant flower species to develop them for decorating purpose found that *Goniothalamus marcanii*, *Manglietia utilis*, *Magnolia rajaniana*, *Magnolia floribunda* and *Tamilnadia uliginosa* were very suitable using seeding techniques whereas *Friesodielsia desmoides*, *Goniothalamus tapis* and *Schoutenia glomerata* ssp. *peregrine* were very good using cutting techniques. The marcotting technique was a very suitable for *Gardenia thailandica* and grafting was very appropriate technique for *Magnolia sirindhorniae* and *Mitrephora sirikitiae*. The data from seedling cultivation revealed that *Goniothalamus tapis* and *Ixora stellulata* should be treated as pot plants. *Uvaria grandiflora* and *Friesodielsia desmoides* were very good for climbing in the field while *Goniothalamus laoticus*, *Mitrephora maingayi*, *Gardenia thailandica*, *Mitrephora tomentosa, Rothmannia wittii, Schoutenia glomerata* ssp. *peregrine, Manglietia utilis, Magnolia baillonii, Magnolia sirindhorniae, Magnolia rajaniana, Tamilnadia uliginosa, Mitrephora winitii* and *Gardenia sootepensis* were very dominant as outdoor trees. Pruning and maintenance with care trained them to be beautiful decorating plants.

การประยุกต์ภูมิสารสนเทศในการจำแนกพื้นที่ชุ่มน้ำในพื้นที่กรุงเทพมหานครและปริมณฑล

Application of Geo–Informatics for wetland classification in Bangkok and Vicinity

K. Ninlapat (Student), Y. Trisurat (Thesis Advisor)
Department of Forest Biology Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok 10900

Application of Geo–Informatics for Wetland Classification in Bangkok and Vicinity was conducted during July 2005 to June 2006. The objectives of the study were to create a GIS database for classifying and delineating wetland types according to the Wetland Classification System of Thailand, and to assess the status and changes in wetlands between 1998 - 2004. Primary data consisted of 6 layers, viz. land use, river status, water body status, water body size, and irrigation canals. These layers were derived from visual interpretation and digital image processing of Landsat - 5 TM. Secondary data included 4 layers, viz. study area boundary, irrigation area, soil group, and river and stream network. Spatial data were analyzed by GIS software based on Wetlands Classification System of Thailand comprising 5 levels, viz. Type, System, Subsystem, Class and Subclass. The results showed that Bangkok and Vicinity contains both freshwater and saltwater wetlands. They are classified into 5 systems namely marine/coastal, estuarine, riverine, lacustrine and palustrine. Furthermore, these wetlands can be subdivided into 23 subclasses. The coverage of each wetland type is being analyzed.

การพัฒนาระบบฐานข้อมูลสารสนเทศภูมิศาสตร์ความหลากหลายทางชีวภาพ ป่าฮาลา-บาลา ภาคใต้ของประเทศไทย

Database and geographic information system development on biodiversity in the Hala-Bala forest in Southern Thailand

T. Anman, P. Mipokasap, K. Deeudumjan, A. Sritakae and W. Cheunban
National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120

The Hala-Bala Wildlife Sanctuary was considered as one of the most important tropical rain forest in Thailand. This so called Indo-Malaysia rainforest type was recognized as high biological diverse sanctuary. To manage and conserve this invaluable natural resource, Database and Geographic Information Systems (GIS) development has been established. The primary objective of the project is to collect the information about flora and fauna diversity within the sanctuary using database and the recent developed technology, geographic information systems, as a tool of data store and management. According to field survey, it was found that 2,500 individual plants observed along the nature trail comprise **327** species **196** genera and **79** families. All of plant data, consisting of nomenclature, plant classification, morphology and plant habit are stored in the relational database. The spatial distribution of 24 wildlife species, including mammal and bird, were collected and inputted into GIS data layers. In addition, physical geographic and socio-economic data were also included in the GIS database e.g. geology, elevation, slope, watershed quality, and stream aquifer. Under this project, the database of research carried out in Hala-Bala forest was also established in order to enhance the knowledge pool for management and conservation of the area which to date there are 39 topics. Eventually, the graphic user interface of the database and GIS program was developed for the convenience of the end user to be able to input, edit, display, retrieve and analyze both existing data and the new data to be inputted in the future. This study helps us gain more insight into the possibility as well as difficulties when the GIS and database, called as Bala Info, are used for such biodiversity application.

องค์ความรู้เรื่องพืชป่าที่ชาวเขาใช้ประโยชน์ทางภาคเหนือของไทย (ระยะที่ 3)

Current knowledges on wild plants utilized by hilltribes of Northern Thailand (third phase)

S. Areekul
Senior Royal Project Researcher, Kasetsart University, Chatuchak, Bangkok 10900

Further investigation on wild plants in the areas of 36 development centers of the Royal Project revealed that at least an addition of 401 plant species have been utilized by hilltribes for their livings. Among them, 198 plant species have been described in detail which included the information on scientific and vernacular names; plant description, propragation and distribution; hilltribes, native and foreign uses; nutritive, medicinal, plant protective and other properties; and their phytochemical constituents from scientific documents. This study is continuing on the remainder of 203 plant species and expecting to complete within this year.

การประเมินมูลค่าประโยชน์ด้านนันทนาการของอุทยานแห่งชาติภูกระดึง

An evaluation of recreation benefits of Phu Kradueng National Park

S. Rattanataveesopon (Student), S. Bejranonda (Thesis Advisor)
Department of Economics, Faculty of Economics, Kasetsart University, Chatuchak, Bangkok 10900

The objectives of this research were to determine the factors that affect visitors' willingness to pay for recreational services of Phu Kradueng National Park, to measure the recreation benefits of the park, to estimate the changes in recreation demand and recreation benefits in case of a cable car project. The data was collected from 368 visitors by questionnaire during October-December, 2005. The recreation benefits were estimated by using Zonal Travel Cost Method (ZTCM). The research found that at the 0.05 significance level, the only factor affecting the frequency of trips was the travel cost. Recreation benefits of Phu Kradueng National Park were 76,427,964 Baht in 2005. In case of a cable car project, the factors affecting the frequency of trip were travel cost, member of group, income, length of stay and age. Recreation benefits in case of existing of cable car project was 134,895,890 Baht. The recreation demand and recreation benefits will increase if a cable car project exists. Monetary recreation benefits can be used to estimate the effect of cable car project due to recreation demand and recreation benefits changes.

ลักษณะการกระจาย และการอยู่ร่วมกับสิ่งมีชีวิตต่าง ๆ ในแนวปะการังของฟองน้ำที่ผลิตสารเรเนียรามัยซิน (*Xestospongia* sp.) บริเวณอ่าวไทย

Distribution pattern of the renieramycin-producing sponge *Xestospongia* sp. and its association with other reef organisms in the Gulf of Thailand.

U. Darumas[1,3] (Student), S. Chavanich[1] (Thesis Advisor), K. Suwanburirux[2] (Thesis Co-Advisor)
[1]Department of Marine Science, Faculty of Sciences, Chulalongkorn University, Pathumwan, Bangkok 10330,
[2]Bioactive Marine Natural Products Chemistry Research Unit (BMNCU), Department of Pharmacognosy, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Pathumwan, Bangkok, 10330, [3]School of biology, Institute of Science, Walailak University, Tasala, Nakhorn Si Thammarat, 80160

Renieramycin-producing sponge, *Xestospongia* sp., is a coral reef sponge. It can be found along the coral reef in the Gulf of Thailand. Distribution pattern of *Xestospongia* and its association with other organisms were investigated in this study. The result showed that the most frequency coexisting organisms with *Xestospongia* was a massive coral, *Porites lutea* and the colonial palythoa, *Palythoa caesia*. However, *Xestospongia* was found inhibiting on algal patches and dead coral rubble as well. The largest individuals of sponges were found growing on *P. caesia* while the smallest individuals were found inhibiting on the algal patches. In addition, the result showed that concentrations of renieramycins extracted from this sponge were significant differences among sites ($p<0.05$).

ความสัมพันธ์ของดาวเปราะที่อาศัยอยู่ร่วมกับฟองน้ำ บริเวณหมู่เกาะล้าน จังหวัดชลบุรี

The relationships of brittle stars associated with sponges at the Lan Islands, Chonburi province

P. Komkham[1] (Student), N. Gajaseni[1] (Thesis Advisor), S. Putchakarn[2] (Thesis Co-Advisor)
[1]Departmen of Biology, Faculty of Science, Chulalongkorn University,Pathumwan, Bangkok 10330
[2]Institute of Marine Science, Burapha university, Muang, Chonburi 20131

The study of association of brittle stars and sponges was conducted at nine sites in the coral reefs in the Eastern Gulf of Thailand (the Lan Islands, Chonburi province), from March 2005 to February 2006. The sponges collection was out by SCUBA diving during daytime in the coral reefs. Specimens were collected by 50 m strip transect sampling from reef flat and reef slope in each of the site. As a result, 24 species of 275 sponges collected were found in association with brittle stars (*Chondrilla nucula, Chondrilla* sp., *Chondrosia chucalla*, *Spheciospongia congenera*, *Clathria reinwardti*, *Clathria (Thalysias)* sp., *Biemna fortis*, *Coelocarteria singaporensis*, *Mycale gradis*, *Phobas aff.arborescens*, *Iotrochota baculifera*, *Monanchoca grandis*, *Amorphinopsis excavan*, *Dragmacidon australis*, *Haliclona amboinensis*, *Haliclona (Rhizoniera)* sp., *Callyspongia joubini*, *Callyspongia diffusa*, *Neopetrosia* sp., *Xestospongia testudinaria*, *Xestospongia* sp., *Hyrtios erecta*, *Pseudoceratina* sp. and Unknow sp. *Iotrochota baculifera* was the most abundant (37.09%), followed by *Xestospongia testudinaria* (18.54%), *Hyrtios erecta* (7.27%), *Phobas arbirescens* (6.54%) and *Neopetrosia* sp. (5.81%). Brittle stars 6 species were associated with sponges (*Ophiactis savignyi*, *Amphiura luetkeni*, *Ophiothrix exigua*, *Ophiothrix plana*, *Macrophiothrix aspidota* and *Macrophiothrix longipeda*). The most abundant brittle star *O. savingyi*, occurred on all sponges. The small individuals were more frequently observed the recess of sponge tubes and inside tube of sponge than on the sponge surface. The large brittle stars associated with sponge appeared on the surface area.

ผลของแสงและความเค็มต่อการเติบโตและการผลิตสาร Ecteinascidins ของเพรียงหัวหอม *Ecteinascidia thurstoni* Herdman, 1891

Effects of light and salinity on growth and Ecteinascidins production of the tunicate *Ecteinascidia thurstoni* Herdman, 1891

J. Oomaree[1] (Student), S. Chavanich[1] (Thesis Advisor), V. Viyakarn[1] (Thesis Co-Advisor), K. Suwanborirux[2] (Thesis Co-Advisor)
[1]Department of Marine Science, Faculty of Science, Chulalongkorn University, Pathumwan Bangkok 10330
[2]Department of Phamacognosy Faculty of Phamaceutical, Chulalongkorn University Pathumwan Bangkok 10330

Effects of light and salinity on growth of the tunicate *Ecteinascidia thurstoni* Herdman, 1891 found in Phuket Province were studied. This tunicate produces Ecteinascidins, which is a potential drug for curing cancer cells. In the light experiments, different light intensities (100, 75, 50, 25 and 0 % of total hatchery light intensity) were conducted. The results showed that the highest average length of zooids (13.23±1.1 mm.) was found in the 25 % of hatchery light intensity. In addition, the highest numbers of zooids (94±31.9 zooids) was found in the 25 % of hatchery light intensity. In the salinity experiments, five levels of concentrations of salinity, 38, 35, 32, 29 and 26 psu were conducted. Salinity at 32 psu had the highest average length of zooids (11.08±0.8 mm) and the highest numbers of zooids (83±26.5 zooids). Study on the effects of the light and salinity on Ecteinascidins production is still undertaken.

ผลของอาหารต่างชนิดต่อการเติบโตและการผลิต Ecteinascidins ของเพรียงหัวหอม *Ecteinascidia thurstoni* Herdman, 1891

Effects of different food on growth and Ecteinascidins production of the tunicate *Ecteinascidia thurstoni* Herdman, 1891

C. Chamnanraksa[1] (Student), S. Chavanich[1] (Thesis Advisor), V. Viyakarn[1] (Thesis Co-Advisor), K. Suwanborirux[2] (Thesis Co-Advisor)
[1]Department of Marine Science, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Department of Pharmacognosy, Faculty of Pharmaceutical, Chulalongkorn University,Pathumwan, Bangkok 10330

Thai tunicate, *Eceinascidia thurstoni* Herdman, 1891, found around Phuket Island is the first Asian tunicate contained ecteinascidins. This compound exhibits potent cytotoxic activity against cancer cells. Culturing of *E. thurstoni* is one method to increase ecteinascidins productions. However appropriate diets that can maximize both growth and ecteinascidins productions are unknown. In this study, *E. thurstoni* were fed mono or mix of two diets either from *Chaetoceros gracilis*, *Isochrysis galbana*, *Nannochloropsis sp*. or prepared food. Experiments ran for two life cycles and then zooids were collected for ecteinascidins analysis in each diet. The results showed that, colonies fed mono diet of *C. gracilis* had the best growth in zooids number and zooids length probably because *C. gracilis* has the best nutritional requirements for *E. thurstoni*. The highest percents cover of zooids per colony were in mono diet of *C. gracilis* culture, which result from the best growth in zooids number and zooids length. Parts of ecteinascidins analysis of the tunicate fed on different diets are now investigated.

ความหลากหลายของปะการังอ่อน (Alcyoniina) ในน่านน้ำไทย

Soft coral (Cnidaria: Alcyonacea: Alcyoniina) distribution patterns from Thai waters

T. Chanmethakul[1](Student), H. Chansang[1](Thesis Advisor), S. Wattanasit[1] (Thesis Co-Advisor), P. Alderslade[2] (Thesis Co-Advisor)
[1]Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90110
[2]Museum and Art Gallery of the Northern Territory, PO Box 4647, Darwin, Northern Territory 0801, Australia

Two-hundred three survey sites of 29 reef locations in the Thai Waters were surveyed during the period 2004 - 2005. Visual estimates were made of the distribution and abundance. This provides a total of 19 genera of the families Alcyoniidae, Nephtheidae, Nidaliidae and Xeniidae, of which 9 genera are new records for the Thai Waters. The results indicated that soft corals are abundant in both regions; Gulf of Thailand and Andaman Sea coast of Thailand. The total genera occurrence suggests that the AN was more diverse than the GT. There is showing dominated by the 2 families Alcyoniidae and Nephtheidae. The soft coral was strongly related to reef zonation, the percent occurrence of soft coral was greater on the reef slope and lower slope in the AN and GT. This study, suggests the distribution and abundance of soft coral in the Thai Waters was restricted to such degree by visibility. Thus, we speculate that optimal conditions for soft coral community development include clear water, sheltered sites, relatively gentle water motion and low sedimentation.

ชนิด การกระจายพันธุ์ และโครงสร้างประชาคมของปะการังแข็งสกุล *Acropora* ในอ่าวไทย

Species, distribution and community structure of the Scleractinian corals genus *Acropora* in the Gulf of Thailand

A. Chankong[1] (Student), V. Manthachitra[2] (Thesis Advisor)
[1]Eastern Marine and Coastal Resources Research Center, Klang, Rayong 21190
[2]Department of Aquatic Science, Faculty of Science, Burapha University, Muang, Chonburi 20131

Scleractinian corals genus *Acropora* are the dominant group within coral assemblages in the Gulf of Thailand. The purpose of this study was to investigate the abundance, diversity, species composition and community structure of *Acropora*. The three replicates of 1 X30 m.^{2} belt transect (total study area 90 m.^{2}) were employed at 80 stations on 30 islands along the Gulf of Thailand. A total of 37 species were found covering the average of area of 14.9% of sampling area. Ma and Phangan Island had the highest species richness (15 species). Kra Island had the second species richness (14 species). The diversity indices at all stations were 0.5-2.0 while the evenness indices were 0.5-1.0. Species composition of *Acropora* based on area coverage varied significantly on habitats of each locations. Coral community could be divided into 4 groups; the first group had *A. aculeus* and *A. nana* as the dominant species. The second group had *A. formosa* as the dominant species. The third group had *A.* cf. *copiosa*, *A. longicyathus*, *A. tenuis* and *A. microphthalma* as the dominant species and the last group had common species and rare species. In addition, the most abundance colony size was 21-50 to > 100 cm. This study show the recent condition of *Acropora* in the Gulf of Thailand that they had recovery after bleaching phenomenon in 1998.

อัตรารอดและการเติบโตของตัวอ่อนปะการังเขากวาง *Acropora* spp. ในระบบเพาะเลี้ยง

Survival and growth of juvenile Staghorn Corals *Acropora* spp. in a culture system

C. Raksasab (Student), V. Viyakarn (Thesis Advisor), S. Chavanich (Thesis Co-Advisor)
Department of Marine Science, Faculty of Science, Chulalongkorn University, Patumwan, Bangkok 10330

The survival and growth of juvenile staghorn corals *Acropora* spp. in a culture system were investigated. Gametes from parent colonies were collected in natural water and maintained in a land-based culture system. The results showed that at Mu Ko Samae San, Amphor Sattahip, Chonburi Province, the synchronous spawning of *Acropora humilis* occurred 5-6 nights after the full moon and new moon of February and March 2006. Collected gametes were then fertilized and reared on a land-based system. Fertilized eggs developed into a swimming larval stage (planula larvae) within 58 hours, and started seting on the substrates within 4 days after fertilization. The settlement rate on specific substrate was 55.0 ± 23.58 %. However, the larvae that settled on the bottom or side of the tank, sea surface, or did not settle, eventually died. After settlement was completed, the settled larvae were then transferred to the sea (cage) until they were large enough to be used as seed for restoration at of natural reef.

การฟื้นฟูแนวปะการังโดยการนำชิ้นส่วนปะการังมายึดติดกับพื้น บริเวณกลุ่มปะการังในแหล่งท่องเที่ยวของจังหวัดกระบี่

Rehabilitation of coral reef by reattached coral fragments in tourism coral communities of Krabi Province

R. Pettongma (Student), T. Yeemin (Thesis Advisor)
Department of Biology, Faculty of Science, Ramkhamhaeng University, Huamark, Bangkok 10240

Coral fragments derived from natural factors and various human activities are significant for coral reef restoration. A study on coral reef restoration in tourism coral communities by reattachment of coral fragments (*Acroproa* spp.) which had low survivorship in natural reefs at Koh Phi Phi Don (Ao Ling) and Koh Phai in Krabi Province, was investigated from January 2003 to May 2005. Most of corals live were branching and foliate corals. High density of coral fragments was found at 1.5-3 m in depth and mean densities were 4.37±1.19 and 2.46±1.98 fragments.m^{-2}, respectively. The dominant coral fragments were *Acropora* spp., *Montipora aequituberculata* and *Porites nigrescens*. Survival rate of coral fragments (*Acropora* spp. and *Porites nigrescens*) on sand substrate was lower than on rock and rocky-sandy substrates in both areas. The coral fragments were reattached on cement-blocks and dead corals. Approximately 3 months afterwards, the survival rates of reattached branches were 70.37% (n=63) and 94.65% (n=335), respectively. The large coral fragments which were reattached on dead coral substrate had relatively high survival and growth rates. The mean growth rate of coral fragments reattached on hard substrate was 7.90±0.06 cm.yr^{-1}. Data obtained from the present study can be applied for coral reef restoration, management and biodiversity conservation and sustainable uses.

พลวัตประชากรปูม้า *Portunus pelagicus* (Linnaeus, 1758) บริเวณอ่าวคุ้งกระเบน จังหวัดจันทบุรี

Population dynamics of blue swimming crab *Portunus pelagicus* (Linnaeus, 1758) at Khung Krabaen Bay, Chanthaburi Province

C. Kunsook（Student), N. Gajaseni（Thesis Advisor), N. Reankaew（Thesis Co–Advisor）
Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

This study aims to analyse the population dynamics of the blue swimming crab in Khung Krabaen Bay, Chanthaburi Province. This research also investigated growth parameters (L_∞ and K), total mortality and recruitment patterns, relationships between carapace width and body weight of crabs, sex ratio, type of food, and Gonadsomatic Index (GSI) of female crabs. Samples were collected monthly from January to December 2005. The data on the population dynamics of crabs have been processed by the FiSAT programme. The growth parameters of the male crab were L_∞ = 13.23 cm and K = 0.87 per year while the growth parameters of the female crab were L_∞ = 12.95 cm and K = 1.05 per year. Total mortality of male and female crabs were 3.17 and 3.55 per year, respectively. Recruitment occurred all year but it showed two peaks. The first peak occurred during February to March and the second peak occured during July to October. The relationships between carapace width and weight were $W = 0.0002CW^{2.7692}$ and $W = 0.0004CW^{2.6067}$ in male and female crabs, respectively. Sex ratio of male to female was 1 : 1.19.The natural diets of crab is composed of crustaceans, fishes, squids, gastropods, debris and seagrass. The gonadsomatic index (GSI) for females was in the range 0.26 – 2.30%. The highest average GSI was found in January while the lowest was in June.

ความหลากชนิดและการแพร่กระจายของคลาโดเซอราในเขตลุ่มแม่น้ำสงคราม

Species diversity and distribution of Cladocera in Songkhram River Basin

S. Nachai (Student), L. Sanoamuang (Thesis Advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University,Muang, Khon Kaen 40002

The species diversity and distribution of cladocerans from 40 habitats in Songkhram River Basin covering areas of 4 provinces, Udonthani, Sakhonnakhon, Nongkhai and Nakhonphanom were studied. One hundred and twenty qualitative samples were taken during early rainy season (May 2004), late rainy season (August - September 2003) and cold season (February 2004). Fifty-nine species from 33 genera of cladocerans were found, and two (*Armatalona macrocopa* (Sars) and *Macrothrix vietnamensis* Silva-Briano, Dieu & Dumont) of which are new to Thailand. The numbers of cladocerans recorded in early rainy season, late rainy season and cold season were different significantly ($F = 25.35$, $p < 0.001$). The highest species diversity was found in late rainy season with 55 species (93.2 %), followed by cold and early seasons with 35 species (59.3 %) and 25 species (42.4 % of the total species recorded), respectively. Most of the cladocerans recorded in this study are circumtropical species. According to the frequency of occurrence, the most common species were: *Moina micrura* Kurz (95.0 % of the sampled localities), followed by *Diaphanosoma excisum* Sars (90.0 % of the sampled localities), *Ceriodaphnia cornuta* Sars (67.5 % of the sampled localities), *Bosminopsis deitersi* Richard (55.6 % of the sampled localities) and *Ephemeroporus barroisi* (Richard) (55.6 % of the sampled localities), respectively. Rare species were *Alona cheni* Sinev, *A. dentifera* (Sars), *A. intermedia* Sars, *A. exigua* (Lilljeborg), *Armatalona macrocopa* (Sars), *Chydorus farviformis* (Birge), *C. reticulatus* Daday, *C. ventricosus* Daday, *Diaphanosoma volzi* Stingelin, *Guernella raphaelis* Richard, *Leydigia acanthocercoides* (Fischer) and *Pseudosida ramosa* Daday.

ความหลากชนิดและการแพร่กระจายของโคพีพอดกลุ่มคาลานอยด์และไซโคลพอยด์ในเขตลุ่มแม่น้ำสงคราม

Species diversity and distribution of calanoid and cyclopoid copepods in Songkhram River Basin

B. Boonsit (Student), L. Sanoamuang (Thesis Advisor)
Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon kaen University, Muang, Khon kaen 40002

The species diversity and distribution of calanoid and cyclopoid copepods from 199 habitats in the Songkram River Basin were investigated between August 2003 and May 2004. In addition, temperature, conductivity, pH, salinity, phosphate and nitrate concentrations of the water, were measured in each sampling site. Eight genera and 19 species of calanoid copepods were found. One, *Tropodiaptomus* sp., of which is new to science. Species frequently encountered in this study were *Mongolodiaptomus malaindosinensis* (Lai and Fernando, 1978), *Heliodiaptomus elegans* Kiefer, 1935, *M. botulifer* (Kiefer, 1974) and *Eodiaptomus draconisignivomi* Brehm, 1952 (32.1, 30.1, 19.5 and 19.0 % of the sampled localities, respectively). Species infrequently encountered were *Dentodiaptomus javanus* (Grochmalicki, 1915) (0.5%), *M. uenoi* (Kikuchi, 1936)(0.5%), *Tropodiaptomus* sp. (0.5 %), *T. vicinus* Kiefer, 1930 (1%), *T. oryzanus* Kiefer, 1930 (1%), *Phyllodiaptomus christineae* Dumont, Reddy and Sanoamuang, 1996 (1%), *Neodiaptomus songkhramensis* Sanoamuang and Athibai, 2002 (1%) and *M. calcarus* (Shen and Tai, 1965) (1%). Five genera and seven species of cyclopoid copepods were found. Species frequently encountered in this study were *Mesocyclops thermocyclopoides* (Harada, 1931), *M. aspericornis* (Daday, 1906), *Microcyclops varicans* Sars, 1918 (37.1, 14.5 and 8.5 % of the sampled localities, respectively). Species infrequently encountered were *Thermocyclops decipiens* (Kiefer, 1929) (5.52 %), *T. crassus* (Fischer, 1853) (3.01 %), *Cryptocyclops bicolor* Sar, 1963 (2.01 %) and *Eucyclops* sp.(1 %).

อิทธิพลของปัจจัยทางกายภาพและเคมีบางประการที่มีผลต่อความชุกชุมของโรติเฟอร์ในพื้นที่ชุ่มน้ำบึงโขงหลง จังหวัดหนองคาย

The influence of some physical and chemical parameters on the abundance of rotifers in Bueng Khong Long, Nong Khai Province

J. Teeramaethee[1] (Student), L. Sanoamuang[1] (Thesis Advisors), A. Trevanich[2] (Thesis Co-Advisors)
[1]Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002, [2]Department of Statistics, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

The abundance of rotifers in Bueng Khong Long, Nong Khai Province was studied for two years from June 2002 to April 2004. Quantitative samples were collected at bimonthly intervals in the first year, but at 4-month intervals in the second year, using a Schindler Plankton Trap. The first year average maximum and minimum abundances of 695±398 and 110±61 individuals/litre were recorded in August 2002 and February 2003, respectively, and the most abundant species were *Polyarthra vulgaris* (Carlin) and *Lepadella patella* (Müller). On the other hand, in the second year the average maximum and minimum abundances of 502±312 and 291±45 individuals/litre were recorded in August 2003 and April 2004, respectively, and the most abundant species were *P. vulgaris* and *Trichocerca bidens* (Lucks). The statistical analyses indicated that the abundance of rotifer species was positively and negatively correlated ($p<0.05$).

การเปลี่ยนแปลงในรอบปีของประชาคมแพลงก์ตอนสัตว์ขนาดต่าง ๆ ในทะเลน้อย จ.พัทลุง

Annual changes of zooplankton communities of different size fractions in Thale-Noi, Phatthalung Province

R. Inpang[1] (Student), P. Pholpunthin[1] (Thesis Advisor)
Department of Biology, Faculty of Science, Prince of Songkla University,Hat Yai, Songkla 90112

A study of seasonal changes of different sizes of zooplankton in Thale-Noi was conducted. The duration of study was divided into three periods, moderate rainy period (from July to August 2004), heavy rainy period (from November to December 2004), and dry period (from March to April 2005). Zooplankton were divided into two nominal size fractions (20-200 μm and > 200 μm). Quantitative samples were taken twice a month to investigate the variation of zooplankton in different size fractions in relation to environmental parameters and different habitats of the Thale-Noi in 4 areas: close to peat swamp area, close to small inlets, close to residential areas and pelagic areas. Ten major groups of microzooplanktons occurred during the rainy period namely Protozoans, Rotifers, Gastrotrichs, Cladocerans, Copepods, Copepodite copepods, Ostracod juveniles, Crustacean nauplii, Shrimp larvae, and Watermites. Protozoans were the most abundant (1,244.0 ind.l^{-1}) in the rainy period, followed by Rotifers (309.40 0 ind.l^{-1}) and Crustacean nauplii (24.94 0 ind.l^{-1}). Abundance of microzooplankton was found to be highest in the area close to small inlets, followed by peat swamp areas, pelagic areas and resident areas, respectively. In addition, multivariate analysis revealed that salinity, conductivity and total solids were significantly correlated *($P < 0.01$)* with dominant species, such as *Euglena* spp., *Phacus* spp., *Hexathra* sp., *Keratella* spp., *Lecane obtusa, Polyarthra* spp., *Trichocerca* spp. and *Bosminopsis deitersi*. With regard to Chlorophyll *a* (20-200 microns), only *Euglena* spp. and *Bosminopsis deitersi* showed significant positive correlations. Zooplankton communities in the dry period are under investigation.

การศึกษาการกระจายของขนาดอนุภาค ปริมาณสารอินทรีย์ และสัตว์ในชั้นตะกอนใน ลำธารต้นน้ำที่อุทยานแห่งชาตินำ้หนาว

Grain size distribution, organic matter content and subsurface sediment metazoans in headwater streams of Nam Nao National Park

C. Boonyanusith[1] (Student), N. Sangpradub[2] (Thesis Advisor)
[1]Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002
[2]Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

The investigation was conducted in Phromsong and Phromlaeng streams, Nam Nao National Park, Petchabun province during October 2004 to Febuary 2005. Within 2 month intervals, in each stream, subsurface sediment was sampled from two depth levels (0-5 and 5-10 cm.) with 4 cm. diameter PVC stand-pipe.Grain size distribution, organic matter content, distribution of subsurface sediment metazoan were studied and some physico-chemical parameters of water. The results in each occasional sampling showed that diameter of median particle size and faunal density at 0-5 cm. were greater than those of 5-10 cm. in both streams. Where as sediment from Phromsong stream was larger and more poorly sorted. Accumulation of organic matter was higher in Phromlaeng stream but it did not differ in both layers. It was also found that total taxa and insect taxa richness in Phromsong were more diverse. In addition, chironomids larva, bdelloid rotifers and nematodes were frequently more abundance than other groups in both streams. Dissolved oxygen in porewater was lower than surface water but neither total disolved solid nor pH were different. It could be concluded that more diversity of metazoan fauna occupied in large particle size at the upper layer in these streams. However, organic matter content in both layers was not different and dissolved oxygen in porewater was lower than in surface water.

การพัฒนาดัชนีชีวภาพสำหรับการประเมินคุณภาพลำธารแบบเร็วในลุ่มน้ำโขง 2

Development of biotic index for rapid bioassment in Mekong 2 basin

P. Getwongsa (Student), N. Sangpradub (Thesis Advisor)
Department of Biology, Faculty of Science, Khon Kaen University, Muang, Khon Kaen 40002

Rapid biological monitoring of freshwater is currently important method as a supplement or even an alternative method to chemical analysis in many developed and some developing countries. We purposed a research aimed to develop standard rapid bioassessment procedure for streams in Thailand by followed the Rapid Bioassessment Protocol of USEPA (Barbour et al, 1999). The study areas were conducted in 20 streams of Mekong 2 Basin. Spatial and temporal structure and composition of macroinvertebrates community were considered. Environmental and physicochemical parameters were measured. Twelve reference and 8 test sites were classified by location and surrounding of streams. Some physicochemical parameters of water and total score of habitat assessment in reference sites were higher than those of test sites. In cool 2005, number of orders, families, genera, and individuals of macroinvertebrates in reference sites were also higher than those in test sites. Otherwise, in hot 2006, the number of order, family, and genera of reference sites were lower than test sites, but the abundance in reference was higher than those of test sites. Total number of taxa and percentage of intolerance taxa were the potential candidate metrics. The study will be carried on for 2 years, in order to construct a standard monitoring method for streams in Mekong 2 Basin.

ความหลากหลายทางชีวภาพของไบรโอโซนน้ำจืดและการประยุกต์ใช้ไบรโอโซนน้ำจืดเป็นดัชนีชี้วัดคุณภาพน้ำในแม่น้ำสงคราม

Biodiversity of freshwater bryozoans and the applications of freshwater bryozoans as bioindicators in assessing water quality in Songkram River

Anurakpongsatorn[1], J. Mahujchariyawon[1], T. Satapanajaru[1], P. omsamak[1], P.Pengthumkeerati[1], P. Chairattanamanokorn[1] and T.S. Wood[2]

[1]Faculty of Science, Kasetsart university, Chatuchak, Bangkok 10900

[2]Wright StateUniversity , USA

Biodiversity is one of major indicators for sustainability of aquatic environment. Assessing and monitoring of water quality is essential for sustainable utilization and conservation of water resources. Though water quality assessment can be accomplished using either physical, chemical, or biological methods, the physical and chemical assessment indicates water quality at specific time and place that samples are collected. In contrast, biological assessment is based on the cumulative responses of certain organisms to changes of environmental conditions. Combination of biological indicators with physical and chemical measurements should provide time- and cost-saving means to accurately and precisely assess water quality. Organisms suitable for serving as 'indicators' should be able to thrive and live in specific range of water quality for details and continuity of assessment. In this proposed study, bryozoans will be used as bioindicators. The study of bryozoans is relatively new in Thailand.

รูปแบบการกระจายของหอยต้นไม้สกุล *Amphidromus* Albers, 1850 บนเทือกเขาภูพาน ภาคตะวันออกเฉียงเหนือของประเทศไทย

Distribution pattern of the tree snails genus *Amphidromus* Albers, 1850 on the Phu Phan mountain range, Northeastern Thailand

C. Tumpeesuwan (Student), S. Panha (Thesis Advisor)
Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

We have surveyed the distribution pattern of tree snail genus *Amphidromus* Albers, 1850 on the Phu Phan mountain range, Northeastern Thailand in April, May, and October 2004, March, April, May, and October 2005 and March and April 2006. *Amphidromus (Amphidromus) schomburgki dextrochlorus* Sutcharit and Panha, 2006, *A. (A.) givenchyi* Geret, 1912 and *A. (Syndromus) zebrinus* Pfeiffer, 1861 were found in different forest types. *A. (A.) schomburgki dextrochlorus* were found only in mixed deciduous forest and a home garden in the village from the central of mountain to the western part of the mountain range and were found in 4 of 42 localities surveyed covered the mountain range. *A. (A) givencyi* were found in dry dipterocarp forest and dry dipterocarp with mixed deciduous forest in the central to the eastern of the mountain range, and were found in 13 of 42 localities surveyed. And *A. (Syndromus) zebrinus* occurred in dry dipterocarp forest and dry dipterocarp with mixed deciduous forest and was recorded at 2 surveyed sites in the eastern of the mountain range. *A. (A.) givencyi* and *A. (S.) zebrinus* were found co-existing in two localities.

การเชื่อมโยงตัวอ่อนแมลงชีปะขาว อันดับย่อย Baetioidea Caenoidea และ Ephemeroidea ในลำธารห้วยหญ้าเครือ อุทยานแห่งชาติน้ำหนาว

Association of nymph with adult stages of mayflies in the suborder Baetioidea, Caenoidea and Ephemeroidea (Ephemeroptera:Insecta) in Yakruae Stream, Nam Nao National Park

S. Sawipak (Student) , N. Sangpradub (Thesis Advisor)

Department of Biology, Faculty of Science and Applied Taxonomic Research Center, Khon Kaen University, Muang, Khon Kaen 40002

It is necessary to rear the nymphal stage of mayflies in order to associate them with adults. Eight methods combining different conditions for rearing the final nymphal stage of mayflies were conducted in the laboratory. The results revealed that rearing nymphs in stoneware at ambient room temperature was the appropriate method. With this method, nymphs survived and successfully emerged as adults. Therefore, this method was used throughout the study period. Final instar nymphs of the suborder Baetioidea, Caenoidea and Ephemeroidea were explored twice per month in all microhabitats of Huay Yakraue, Nam Nao National Park, Petchabun province during March 2004 to May 2005. The final instar nymphs were collected and brought back to rear both in the laboratory and in Yakruae stream. All 224 of 611 reared nymphs were successful in the association of nymphaadult with stages. The 166 female and 58 male nymphs consisted of 3 families. 6 genera and 12 species. They comprised *Baetis* sp.1, *Cloeodes* sp.1, *Cloeon* sp.1, *Cloeon* sp.2, *Cloeon* sp.3, *Procloeon pennulatum*, *Procloeon* sp.1, *Caenis* sp.1, *Caenis* sp.2, *Caenis* sp.3, *Caenis* sp.4 and *Ephemera rufomaculata*. The details on the distributions of nymphs in microhabitats were as follows: bed rock, cobble, pebble with gravel and sand, sand, pool and submerged root. In conclusion, only two species, *Ephemera rufomaculata* and *Procloeon pennulatum* were identified. In addition, keys to morphospecies of the final nymphs are also provided.

ความหลากหลายทางชีวภาพของแมลงหนอนปลอกน้ำตัวเต็มวัยบริเวณริมฝั่งพื้นที่ชุ่มน้ำในเชียงใหม่เพื่อการติดตามตรวจสอบสภาพแวดล้อม

Biodiversity of adult Trichoptera on fringing wetlands in Chiang Mai for environmental monitoring

P. Cheapudee (Student), P. Chantaramongkol (Thesis Advisor)
Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

The assessment of water quality on fringing wetlands in Chiangmai Province used Trichoptera adult's biodiversity. The physico–chemical parameters and Trichoptera adults were collected monthly from December 2004 to November 2005 at 7 wetlands, Huay Thung Tao Reservoir, Mae Jok Luang Reservoir, Nong Huay Yuak Reservoir, Mae Yuak Noi Reservoir, Ang Kaew Reservoir, Lotus Fields and Paddy Fields. Trichoptera adults were collected by light traps. The 5,421 male Trichoptera adults were identified into 10 families, 21 genera, 55 species and probably 2 new species. Leptoceridae and Hydropsychidae had the highest species diversity, respectively. The classification of study sites based on the number of males and number of species of Trichoptera adults which were classified into 4 groups. *Potamyia alleni* and *Setodes argentiguttatus* were closely correlated with Huay Thung Tao Reservoir, Mae Jok Luang Reservoir, Nong Huay Yuak Reservoir, Mae Yuak Noi Reservoir and Ang Kaew Reservoir, These study sites had similar of numbers male Trichoptera adults and distribution of 2 species. Lotus Field and Paddy Field were lowest correlated with *Potamyia alleni* and *Setodes argentiguttatus,* which had the lowest of number of individual. Permanent sites had higher biodiversity of Trichoptera adults than temporary sites. The correlation between the number of male Trichoptera adults and physico-chemical parameters were analyzed by PATN. *Potamyia alleni* and *Setodes argentiguttatus* correlated significantly with air temperature, conductivity, alkalinity, turbidity, ammonia-nitrogen and sulfate concentration.

ความหลากหลายและการกระจายตัวของแมลงปอในเขตอุทยานแห่งชาติดอยอินทนนท์ อำเภอจอมทอง จังหวัดเชียงใหม่

Diversity and distribution of Odonata species in Doi Intanon National Park Jomthong district, Chiang Mai Province

S. Malithong (Student), C. Phalaraksh (Thesis Advisor)
Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

During this survey, the specimens of odonate adult had been collected at all sites in each elevation was totally 79 species (47 genera in 15 families). Those families were Libellulidae, Corduliidae, Gomphidae, Aeshnidae, Cordulegastridae, Coenagrionidae, Platycnemididae, Protoneuridae, Calopterygidae, Euphaeidae, Chlorocyphidae, Lestidae, Chlorolestidae, Megapodagrionidae and Caliphaeidae. The family that contained the highest number of species was Libellulidae (20 species in 13 genera). Statistic program, ordination method of multivariate analysis (MVSP), was applied to calculate the correlation of each parameter; using physical chemical and biological data. It showed that they were clustered into five groups. The first group indicated Chlorocyphidae, Calopterygidae and Corduliidae, which related to pH, total dissolved solid (TDS) and conductivity. The second group indicated Chlorolestidae and Euphaeidae, which related to biochemical oxygen demand (BOD). The third group indicated Aeshnidae, which related to velocity and dissolved oxygen (DO). The fourth group indicated Cordulegastridae, which related to elevation and ammonia nitrogen (NH_3 – N). The last group indicated Macromiidae Protoneuridae Platycnemididae Libellulidae and Gomphidae, which related to orthophosphate phosphorus (Ortho – P) and nitrate nitrogen (NO_3 - N).

การวิเคราะห์ความหลากหลายทางพันธุกรรมของผึ้งมิ้มเล็ก *Apis andreniformis* ในประเทศไทย และ Tenom ประเทศมาเลเซีย

Genetic variation of small dwarf honeybee *Apis andreniformis* in Thailand and Tenom, Malaysia revealed by polymorphism of cytochrome b

A. Rattanawannee (Student), S. Wongsiri (Thesis Advisor), C. Chanchao (Thesis Co-Advisor)
Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Eighteen colonies of small dwarf honeybee, *Apis andreniformis*, were collected from four parts of Thailand (2 colonies from the north, 1 colony from the northeast, 6 colonies from the east and 9 colonies from the west). In addition, 5 colonies from Tenom, Sabah, Malaysia were sampling. Genetic variation was determined into 2 means. First, genetic variation was analyzed by using Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP). After amplification of cytochrome b (*cytb*) of mitochondrial DNA (mtDNA), the products were restricted by *Dra*I and *Alu*I. It reveals that there is no variation of digestion by *Dra*I and *Alu*I detected among *A. andreniformis* population in various parts of Thailand. In addition, by comparing different restriction patterns of samples from Thailand and Tenom, Malaysia, there is no variation among all samples after restriction by *Alu*I but two different patterns were found after digestion by *Dra*I. Second, *cytb* of mtDNA of *A. andreniformis* was amplified and sequenced. Based on nucleotide sequences, DNA polymorphism was indicated but not significantly different. A phylogenetic tree was constructed by a Neighbor-joining program. The tree is based on the percentage of nucleotide divergence between pairs of samples. The result reveals distinguishingly genetic difference between *A. andreniformis* in Thailand and Tenom, Malaysia but reveals a little of genetic difference among bee samples within Thailand. At present, more 17 colonies were collected from other parts of the country. They are under the process of doing experiments. Also, in the future, the above data will be analysed together with morphometric variation.

การสำรวจชนิดและอนุกรมวิธานของแมลง Infraorder Aculeata (Hymenoptera; Apocrita) ในภาคเหนือของประเทศไทย

Species survey and taxonomy of the infraorder Aculeata (Hymenoptera; Apocrita) in the North of Thailand

T. Jongjitvimol (Student), W. Wattanachaiyingcharoen (Thesis Advisor)
Department of Biology, Faculty of Science, Naresuan University, Muang, Phitsanulok 65000

Insect in the infraorder Aculeata (bees, ants and wasps) mainly feed on pollen and/or nectar from flowers. This insect group is found throughout the world and large numbers are reported in tropical areas. Several genera (i.e. *Apis* and *Trigona*) are distributed in Southeast Asia, especially in Thailand. They play an important role in pollination of flowering plants and economic crops. The numbers of these insects have been reduced by heavy hunting for honey (honey bees and stingless bees), and also for as supplementary foods by local people.In the northern region of Thailand, there are differences in geography and climate resulting in a diversity of living creatures. This study aims to study the species diversity and taxonomy of members in the infraorder Aculeata in the northern region. The knowledge will provide information for future study and sustainable conservation of the infraorder Aculeata in Thailand.

ความหลากหลายและเซลล์พันธุศาสตร์ของแมลงริ้นดำ (Diptera: Simuliidae) ในประเทศไทย

Diversity and cytogenetics of black flies (Diptera: Simuliidae) from Thailand

C. Kuvangkadilok, P. Pramual and V. Baimai
Department of Biology, Faculty of Science, Mahidol University, Rajhevee, Bangkok 10400

A total of 41 known *Simulium* species collected from 58 locations in north, northeast and central Thailand were identified based on external morphologies of larvae and pupae. All species are placed into 6 subgenera of the genus *Simulium* Latreille s.l. One known species namely *S.* (*G.*) *tahanense* was described in Malaysia but newly recorded for the first time from Thailand. Larval polytene chromosomes of 465 gonodally sexed individuals of *S.* (*S.*) *chiangmaiense* collected from eight locations in five northern provinces, i.e., Mae Hong Sorn, Chiangrai, Chiangmai, Lumpang and Tak, were examined. *Simulium* (*S.*) *chiangmaiense* has three pairs of chromosomes (N=3) which are arranged from the longest chromosome I to the shortest chromosome III. Chromosomes I and II are metacentric whereas chromosome III is submetacentric. The nucleolar organizer is situated near the heavy centromeric band on chromosome arm IS. The Balbiani ring and the double bubbles are located near the tip of chromosome arm IIS. The positions of these landmarks are species specific and can be used for identification of this species. Most larvae of *S.* (*S.*) *chiangmaiense* are monomorphic. However, six paracentric inversions, i.e., IS-1, IL-1, IIS-1, IIL-1, IIL-2 and IIIL-1, were detected in a few larvae from four natural populations. The present study shows no evidences of a sibling species complex in this taxon. For ecological studies, the larvae and the pupae of *S.* (*S.*) *chiangmaiense* were found on the surface of fresh and dead leaves and stalks of trailing grasses in the large, slow to moderate flowing lowland streams (width 2.4-8.0 m, depth 0.1-0.4 m, altitude 250-650 m above sea level, velocity 0.6-5.4 m/sec). This species was found together with other species such as *S.* (*S.*) *nakhonense*, *S.* (*S.*) *nodosum* and *S.* (*G.*) *siamense*.

การประเมินผลกระทบจากการท่องเที่ยวแบบโฮมสเตย์ต่อประชากรหิ่งห้อย ณ บ้านโคกเกตุ จังหวัดสมุทรสงคราม

Impact assessment of home stay tourism on the firefly population at Ban Khog Kad Village, Samut Song Khram Province

P. Lerdsuchatavanich[1] (Student), D. Sitthicharoenchai[2] (Thesis Advisor), A. Lewvanich[2] (Thesis Co-Advisor), K. Thirakhupt[2] (Thesis Co-Advisor), V. Thirakhupt[3] (Thesis Co-Advsor)

[1]Inter-department of Environmental Science, Graduate School, Chulalongkorn University, Pathumwan, Bangkok 10330, [2]Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330, [3]Department of Biology, Faculty of Science, Mahidol University, Rajhevee, Bangkok 10400

From December 2004 to December 2005, firefly diversity observations at Ban Khog Kad village showed that *Pteroptyx malaccae* (Gorham) and *Pteroptyx valida* Olivier were the only two species found along the survey transect. Both firefly species were found in high populations from July to December 2005. The adults commonly and non-specifically lived on thirty species of trees alongside the canal. In addition, nine species of birds and four species of snails that might be natural enemies of the fireflies and the food for firefly larvae, respectively, were observed. The impact of home stay tourism on the firefly population was assessed by using many indices. In the present time, the firefly population has been indirectly affected by home stay tourism in the study area because of the levels of tourists and tourism activities. From questionnaires, 68.75% of villagers said that the noise of tourist long-tailed motorboats annoyed some villagers. Last year, at least three Lum poo trees, the major habitat of fireflies, were cut down. The questionnaire and observation data also showed that some travelers' and local people's behaviors irritated and damaged the firefly population because of the lack of knowledge and understanding of firefly biology. To summarize, home stay tourism might have impact long-term impacts on firefly populations.

ความสัมพันธ์ระหว่างความชุกชุมของสัตว์เลี้ยงลูกด้วยนมกับความหลากชนิดและการกระจายของเห็บแข็ง (Acari: Ixodidae) ในอุทยานแห่งชาติเขาใหญ่

Relationships between mammal abundance and diversity and distribution of Hard Ticks (Acari: Ixodidae) in Khao Yai National Park

P. Ariyakulwong (Student), D. Wiwatwittaya (Thesis co-Advisor)
Department of Forest Biology, Faculty of Forestry, Kasetsart Universityg, Chatuchak, Bangkok 10900

The relationships among mammal abundance, diversity and distribution of hard ticks (Acari: Ixodidae) was studied at Khao Yai National Park during November 2004 to October 2005. The objectives were to determine the relationship between diversity and distribution of hard ticks and mammal abundance in different kinds of plant communities in the park. The 50 sampling plots, each of size 1 x 10 m, were placed along 500 meters of 2 line transects in dry evergreen forest, savanna and secondary growth, hill evergreen forest, mixed deciduous forest and tropical rain forest. Mammal track were identified and hard ticks were collected every 2 months. The relationships of hard ticks and mammal abundance were analysed using Spearman's Rank Correlation, and the hard ticks group were ordinated by CCA (Canonical Correspondence Analysis).Results of this study showed a total of 12 species of mammal belonging to 10 genera in 8 families in this National Park. Among them, Samba deer had the highest abundance. Most mammals were found in savanna and secondary growth. A total of 12,311 hard ticks were classified into 8 species in 3 genera. *Haemaphysalis lagrangei* was the most abundant. Hard ticks were mostly found in tropical rain forest. Hill evergreen forest had the highest species number of hard ticks. Hard tick species occurred in tropical rain forest and were also found in dry evergreen forest. The pattern of distribution of hard tick was clumped. Mammal abundance and distribution of hard tick showed no clear relationships. Numbers of hosts, temperature, understory growth, litter cover and leaf litter depth had no effect on hard tick species diversity in this National Park except for relative humidity.

ชนิดและการแพร่กระจายของลูกปลาวัยอ่อนบริเวณปากแม่น้ำแม่กลอง จังหวัดสมุทรสงคราม

Species composition and distribution of fish larvae at Maeklong Estuary, Samut Songkram Province

P. Rukaewma (Student), N. Veeravaitaya (Thesis Advisor)
Department of Fishery Biology, Faculty of Fisheries, Kasetsart University, Chatuchak, Bangkok 10900

Species composition and distribution of fish larvae at Maeklong Estuary, Samut Songkram Province were studied in July 2004 to June 2005. Nine sampling station were operated every months, The total of 41,180 fish larvae were found. The results showed that the fish larvae composed of 19 families in the study area which were consisted of 10 economic families. The highest and most distribution of fish larvae is Gobiidae. The next highest of fish larvae is Clupeidae Ambassidae Blenniidae and Engraulidae. Highest density of fish larvae was found in January 2005 with a density of 125,770 larvae/ 1,000 m^3 of seawater, while the lowest abundance of fish larvae was recorded in September 2005 with a density of 2,616 larvae/ 1,000 m^3 of seawater

ขนาดหวอด ความชอบของปลากริมเพศเมีย และการต่อสู้ของปลากริมเพศผู้

Bubble nest size, female preference and male-male competition in croaking gourami (*Trichopsis vittata*)

S. Liengpornpan[1,2] (Student), M. Jaroensutasinee[1] (Thesis Advisor), K. Jaroensutasinee[1] (Thesis Co-Advisor)
[1]Institute of Science, Walailak University, Thasala, Nakhon Si Thammarat 80160
[2]Department of Biology, Faculty of Science, Thaksin University, Muang, Songhkla 90000

This study examined how bubble nests affected female preference and male-male competition in croaking gourami (*Trichopsis vittata* Cuvier, 1831). We divided our study into three treatments: (1) two-bubble-nest treatment, (2) one-bubble-nest treatment and (3) no-bubble-nest treatment. We found that females preferred small bubble nest males over large ones and preferred males with no bubble nest over males with bubble nests. Comparing female preferences among the three treatments, females spent more time with males in the no-bubble-nest treatment than in the two-bubble-nest treatment. Large bubble nest males and males with bubble nests did not win more fights than either small bubble nest males or males without bubble nests respectively. Large bubble nest males performed more chasing and less escaping behaviour than small bubble nest males. There were no differences in the total antagonistic behaviour and each antagonistic behaviour between males with and without bubble nests. Males from the two-bubble-nest treatment performed the highest number of surfacing behaviour and males from no-bubble-nest treatment displayed the highest amount of biting behaviour. Winners in all treatments performed a higher number of adherence and chasing behaviour than losers. There was no significant difference in fighting duration between the three treatments.

การแปรผันและการแพร่กระจายของปรอทในเนื้อเยื่อสัตว์น้ำที่จับจากทะเลสาบสงขลา

Variation and distribution of mercury in the tissues of aquatic organisms catching from Songkhla Lake

S. Sukapan[1](Student), P. Sompongchaiyakul[1] (Thesis Advisor), S. Khokiattiwong[2] (Thesis Co-Advisor)
[1]Biogeochemical and Environmental Change Research Unit (BENCH), Faculty of Environmental Management, Prince of Songkla University, Hat Yai, Songkla, 90112, [2]Phuket Marine Biological Center (PMBC), Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, Muang, Phu Ket, 83000

Songkhla Lake (SKL) is a largest semi-enclosed lagoon system in Southeast Asia. The lake is economical important to fisheries, both natural and artisan. It receives water, combining agricultural sector and new industrial settlement, from its surrounding watershed. The changing of landuse and landcover may lead to higher discharge of polluted water to the water body. Contamination of mercury (Hg) in fishery resources causes a toxicity risk to consumers via food chain. In this study 47 species of fishes (3 herbivores, 10 omnivores and 34 carnivores) and 8 species of shrimp were collected (from local piers, markets and fishermen around SKL). The samples were collected from 6 surveys during August 2004 to July 2005. Edible tissues of 218 samples were analyzed for Hg using cold vapor atomic absorption spectrometry. Average (range) concentration of Hg in carnivoral fish, omnivoral fish, herbivoral fish and shrimp were 0.095±0.108 (0.011-0.625), 0.036±0.022 (0.012-0.033), 0.033±0.032 (0.012-0.070) and 0.015±0.007 (0.007-0.026) mg/kg wet weight, respectively. It was found that Hg contents in tissues of most aquatic organisms in SKL did not yet exceed the maximum residue limit as recommended by WHO and Ministry of Public Health of Thailand (0.5 mg/kg wet weight). Only one specimen, archerfish (*Toxotes chatareus)*, contained Hg at 0.625 mg/kg wet weight. The results provide information to be used to calculate a safety factor for consuming fisheries resources from SKL, and are basics information to develop an environmental management guideline for controlling of Hg contamination in SKL region.

สัณฐานวิทยาผลึกแก้วหูของปลาจากชายฝั่งทะเลตอนใต้ของไทย

Otolith morphology of fishes from the Southern Coasts of Thailand

S. Jitpukdee[1] (Student), N. Thanee[2] (Thesis Advisor)
[1]Rajamangala University of Technology Srivijaya, Faculty of Sciences and Fisheries technology, Sikao, Trang 92150, [2]Suranaree University of Technology, School of Biology, Institute of Sciences, Nakhon Ratchasima 30000

Fish specimens were collected from June 2002 to May 2003 from fishing piers and markets along the southern coasts of Thailand. Taxonomic classification was classified according to Bone, Marshall and Blaxter, (1995). The sagittal otoliths were removed from the skull of the fish. Length and height of each otolith was measured. The morphology of each otolith was studied and imaged by scanning electron microscope. Termonology for each part of an otolith was according to Smale, Wastson and Hecht, (1995).The sagittal otoliths of 211 fish species, 2 sub-families 60 families, and 14 orders from the southern coasts of Thailand show distinctive morphology, which is species-specific, i.e. for shape, sulcus acusticus, ostium, cauda, rostrum and antirostrum. Other morphological features of sagittal otoliths, such as dorsal depression, ventral depression, crista superior, crista inferior are also species-specific. The shape displays 17 types, whereas the sulcus acusticus shows 4 types and the sulcus opening manifests 4 characters. The margin sculpturing of these otoliths have 8 characters. However, the otolith sizes are less correlated to taxonomic groups and more correlated to habitat, which shows 5 habitats: pelagic, bottom, demersal, bathypelagic, benthopelagic. The distinctive morphology and size of the sagittal otoliths of each species are due to many factors. The main factor is the environmental and biological mechanisms that the fish live in. This research represents a pioneer study designed to investigate shapes and sizes of fish otoliths from coastal Thailand. The results of this research will be useful for future study of the fish biology of Thailand.

ความหลากชนิดและการแพร่กระจายตามระดับความสูงของสัตว์สะเทินน้ำสะเทินบกบริเวณลำห้วยลำตะคองในอุทยานแห่งชาติเขาใหญ่

Species diversity and altitudinal distribution of amphibians along Lam Ta Klong Watered Area in Khao Yai National Park

W. Kongjaroen[1] (Student), J. Nabhitabhata[2] (Thesis Advisor)
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University, Chatuchak, Bankok 10900.
[2]Ecology and Environment Centre, National Science Museum, Technopolis, Klong Luang, Pathumthani 12120.

This species diversity was carried out at 7 elevations along Lam Ta Klong stream in Khao Yai National Park at 400, 500, 600, 700, 800, 900, 1,000 MSL. It revealed that 17 amphibian species classified in 1 order, 5 families and 10 genera. The comparison of individuals, species numbers and diversity indices at all elevations. It was found that the 700 MSL site had the highest individuals, the 400 MSL site the highest species numbers and the 1,000 MSL site the highest diversity index. The statistical analyses of individuals, species numbers and diversity indices of amphibian againt the seasons, revealed that the individual numbers and species numbers of amphibian in dry season significantly differing from those of wet season at 0.01; while the diversity index was non significant. Dealing with the relationship between amphibians and environmental factors, it was found that the individuals showed positive relationship to monthly average precipitations, monthly average temperatures and the relative humidities at 0.01, species numbers showed positive relationship to monthly average precipitations and monthly average temperatures at 0.01, but negative relationship to the relative humidities. The diversity indices showed negative relationship to monthly average precipitations, monthly average temperatures and the relative humidities.

วงศ์วานวิวัฒนาการของกะท่างน้ำในประเทศไทย โดยใช้ลำดับเบสของไมโตคอนเดรียลดีเอ็นเอ

Phylogenetic relationships of Thai Newts assessed by mitochondrial DNA sequences

P. Pomchote (Student), W. Khonsue (Thesis Advisor), P. Pariyanonth (Thesis Co-Advisor)
Amphibian and Reptile Research Unit, Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Newts (Genus *Tylototriton*) as are classified amphibians in the Order Caudata (Urodela); Family Salamandridae; Genus *Tylototriton. Tylototriton verrucosus* is the only species known from Thailand. Its distribution is in Northern mountain ranges and Northeastern mountain ranges with the elevation of their locations are over 1,000 m. above mean sea level. Their habitats are the mountain pools or hill stream with shade of plants above the pools and litter at the bottom of the pools. Porrawee Pomchote (2004) found that newts in Thailand may be divided into 2 types based on difference in morphometry, body colouration and distribution. Type I (orange to yellow body colouration) distributes in Northern mountain ranges, while Type II (dull body colouration) distributes in Northeastern mountain ranges. It is thus possible that newt population in Thailand may comprise of more than one species. In order to compare difference between populations of newt in Thailand, molecular biology techniques and bone morphology should be studied. We thus propose this research project to gain molecular basis of genetic difference and construct a phylogenetic relationship between populations. These data could be useful for further taxonomic evaluation and conservation of this animal in the future.

การประเมินวิวัฒนาการของความหลากหลายของเต่าในกลุ่ม Testudinoid ในสมัยโอลิโกซีนและนีโอจีนของประเทศไทย

Appraisal of the evolution of Testudinoid turtles diversity from the Oligocene and Neogene of Thailand

W. Naksri[1] (Student), J. Claude[2] (Thesis Advisor), K. Thirakhupt[3] (Thesis Co-Advisor), C. Talubmook[1] (Thesis Co-Advisor)

[1]Department of Biology, Faculty of Science, Mahasarakham University, Kantaravichai, Mahasarakham 44150

[2]Department of Evolutionary Biology, Institute of Science, Montperlier University, France

[3]Department of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

The main purposes of the present study were to prepare a comparative catalogue of osteology of living testudinoid turtles in Thailand and to review turtle diversity from the Oligocene and Neogene in Thailand, which are poorly reported in literature. The catalogue consists of shell, skull, humerus, femur, girdle and pelvic girdle. It will be a tool for studying comparative anatomy of living and fossil turtles. The resulting keys will be useful and convenient for identification of living testudinoid turtles in Thailand. Comparison of fossil specimens with the catalogue indicated that they are not living ones. Some fossils are related to species in Southeast Asia. Therefore, it will provide important data about the evolutionary relationships of the Southeast Asian turtle, and the origin of turtle diversity in this group. It will also provide the patterns of extinction, migration, and endemicity that occurred in the history of fossil testudinoid turtles since the Oligocene. The identification, systematics, phylogeny and palaeobiogeography of fossil turtles are still in the process of study.

ความหลากหลายทางชีวภาพของนกที่อุทยานแห่งชาติทุ่งแสลงหลวง จังหวัดเพชรบูรณ์

Biodiversity of birds at Tung Salang Luang, National Park, Phetchabun Province

A. Nakwa (Student), N. Sitasuwan (Thesis Advisor)
Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai 50200

A survey of birds diversity was carried out at Tung Salang Luang National Park in three habitats type; dry evergreen forest, dry dipterocarp forest and ecotone forest (dry evergreen forest mixed with dry dipterocarp) during the period of March 2004 to February 2005 was a part of Biodiversity of Birds at Tung Salang Luang, National Park, Phetchabun Province research. The surveys revealed 6,696 birds in 142 species 34 family 11 order occurring in dry evergreen forest , dry dipterocarp forest and ecotone forest were as follows: 100 species, 103 species and 107 species respectively. The dominant species in dry evergreen forest were Black-crested Bulbul (*Pycnonotus melanicterus),* Puff-throated Bulbul (*Criniger pallidus*) and Grey-eyed Bulbul (*Hypsipetes propinquus*). In dipterocarp forest, Rufescent Prinia (*Prinia rufescens*), Sooty-headed Bulbul (*Pynonotus aurigaster) and* Hill Myna (*Gracula religiosa*) were dominant species. Whereas, in ecotone forest, Grey-eyed Bulbul (*Hypsipetes propinquus*), Puff-throated Bulbul (*Criniger pallidus*) Black-crested Bulbul (*Pycnonotus melanicterus*) and Hill Myna (*Gracula religiosa*) were dominant species. The similarity index was used to investigate the similarity of bird species between forest types (Montford,1962). It was found that, ecotone forest and dry evergreen forest was similar more than ecotone forest and dry dipterocarp forest. Ecotone forest gave the highest the Shannon diversity index, followed by dry dipterocarp and dry evergreen forest, respectively. The interesting that, two species of bird were found in this area. The first, Jerdon' Baza (*Aviceda jerdoni*) was the winter visitor with few record. The second, Javan Cuckooshrike (*Coracina javensis*) was the resident with few record and it was found in Hala-Bala Wildlife Sanctuary, the south of Thailand.

ลักษณะสภาพภูมิประเทศของอ่าวไทยตอนในที่มีผลต่อความหลากชนิด และจำนวนของนกชายเลน

Effects of landscape characteristics on diversity and abundance of migratory shorebirds in the Inner Gulf of Thailand

S. Sripanomyom (Student), G.A. Gale (Thesis Advisor)
Conservation Ecology Program, Division of Natural Resources Management, School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok 10140

The objectives of this study are to characterize landscape characteristics of migratory shorebird stopover sites in the Inner Gulf of Thailand and to investigate the effects of landscape characteristics on diversity and abundance of migratory shorebirds using the area. The project will be conducted during 2 migration seasons between years 2006-2007. The study areas are coastal shorebird habitats along the Inner Gulf of Thailand, 1 km radius of 38 sample points will be placed systematically along the study area. Two major methods will be applied; first, a combination of GIS techniques will be used to extract thematic data from high resolution satellite images to delineate habitat configurations and analyze the landscape metrics in each sample point using program FRAGSTATS. Second, simple count of birds will be conducted in every sample point in southward migration season (Aug. 06 - Oct. 06) and northward migration season (Feb. 07 - Apr. 07). The relationship between the abundance and diversity of the birds and landscape metrics will be examined using stepwise multiple regressions, as well as suitable shorebird habitat can be predicted by modeling from GIS technique. The benefits of this study will be to provide an overview of shorebird habitat characteristics in the Inner Gulf of Thailand and the relationship between shorebird numbers and diversity which can be used as a baseline for future studies, conservation plans, and land-use management both at the national and the international level. Furthermore, it will lend scientific support for developing legal protection, and facilitate in raising public awareness of the most distinctive wetland and most important site for shorebirds in the entire country.

การสำรวจสถานภาพสัตว์เลี้ยงลูกด้วยนมเฉพาะถิ่นของไทยที่อาศัยอยู่นอกพื้นที่อนุรักษ์ในเขตที่ราบภาคกลางของไทย

Intensive survey of the current status of Thai endemic mammals and their habitats outside the protected areas in Central Thailand

S. Waengsothorn[1], J. Nabhitabhata[2], T. Moonchan[1], K. Muangkham[1]

[1]Environment, Ecology and Energy Department, Thailand Institute of Scientific and Technological Research, Chatuchak, Bangkok 10900, [2]Thailand Natural History, National Science Museum, Technopolis, Klong Luang, Prathumthani 12120

Three species of Thai endemic mammals, the Thailand roundleaf bat (*Hipposideros halophyllus*: Rhinolophidae), the limestone rat (*Niviventer hinpoon*: Muridae), and the Neil's rat (*Leopoldamys neilli*: Muridae), have not been reported inexistence in their own type localities for at least 31 years since their first discoveries. The type localities are now being continuously disturbed by human activities, which can be strongly resulted in driving them to the blink of extinction. Intensive surveys were conducted to uncover the present existences of these endemics mammals in 7 areas using live trapping and mistnetting techniques. The results reveal the existences of three endemics mammals. The Thailand roundleaf bats, an insectivorous species, were found in two areas; the Khao Samorkhon, Amphoe Tha Wung, Changwat Lop Buri (14°54'38" N, 100°30'02" E) – its type locality, and the Khao Singto, Amphoe Muang district, Changwat Sa Kaeo (13°54'34" N, 102°03'46" E). The limestone rat was encountered in 2 areas, the Khao Dondung, Amphoe Ban Mi, Changwat Lop Buri (15°08'35" N 100°36'44" E), which was the first record of its occurrence outside the known distributional range, and the Wat Tham Prathat, Amphoe Muang, Changwat Lop Buri (14°48'15" N 100°49'30" E). The Neill's rat was found living at the Wat Tham Prabhothisat, Amphoe Kaenhkoi, Changwat Sara Buri (14°34'31" N 101°08'43" E), its type locality which is the same place as that of the limestone rat. The results indicated that all endemic mammals are very extremely low numbers of populations and very restricted distributional ranges.

ความสัมพันธ์เชิงวิวัฒนาการของสัตว์วงศ์กวางในประเทศไทย

Molecular phylogenetic relationships among the Cervidae in Thailand

K. Ouithavon (Student), A. Jondeung (Thesis Advisor), S. Trakulnaleamsai (Thesis Co-Advisor), N. Bhumbhakpun (Thesis Co-Advisor)
The Graduate School (Bioscience), Kasetsart University, Chatuchak, Bangkok 10900

The study of molecular phylogenetic relationships among the Cervidae in Thailand will be determined by mitocondrial DNA sequences of cytochrome *b*, control region and 16S rRNA genes from 5 cervid species in Thailand, namely Barking deer (*Muntiacus muntjak*), Fea's muntjac (*Muntiacus feae*), Sambar deer (*Cervus unicolor*), Eld's deer (*Cervus porcinus*) with the aim to study the genetic diversity and phylogenetic relationships among deer in Thailand. Tissue and hair samples (10-25 samples per species) will be collected from wildlife research stations under the responsibility of the National Park, Wildlife and Plant Conservation Department. Molecular marker genes will be amplified by polymerase chain reaction (PCR). PCR products will be purified using QIAquick PCR purification Kit, bidirectionally sequenced and analysed on an ABI 377 automated DNA sequencer. From the sequence data, three types of phylogenetic tree, i.e., neighbour-joining (NJ), maximum parsimony (MP) and maximum-likelihood (ML) will be constructed to investigate evolutionary relationships among deer. Haplotype and nucleotide diversity will be calculated for assessing the distribution of genetic variation within and between populations. These molecular study will provide genetic diversity and phylogenetic information about Thailand's cervids and will give some insight into strategies for deer genetic conservation especially for vulnerable species both of extant captive stocks and wild populations in Thailand.

บทบาทของชะนีต่อการฟื้นตัวของป่า จากการศึกษาการกระจายเมล็ดและการเกิดใหม่ของเงาะป่า *Nephelium melliferum* Gagnep. (Sapindaceae) ในแปลงศึกษาความหลากหลายทางชีวภาพมอสิงโต อุทยานแห่งชาติเขาใหญ่

The role of gibbons in forest regeneration: seed dispersal and regeneration of *Nephelium melliferum* Gagnep. (Sapindaceae) on the Mo Singto Plot, Khao Yai National Park

W.Y. Brockelman, A. Nathalang and K. McConkey
BIOTEC Central Research Unit, Klong Luang, Pathumthani 12120

The Mo Singto Forest Dynamics Plot in Khao Yai Park, with its trees individually mapped and identified, is an ideal site for the study of the effects of gibbon foraging and seed dispersal on tree recruitment. Current studies focus on the effects on individual species consumed by gibbons as well as on the entire forest community. The fruiting tree *Nephelium melliferum* (Sapindaceae) is consumed by a variety of mammals but gibbons are the only dispersers that carry seeds far from the parent trees. Fruit consumption and seed fate were studied by sampling fruit-fall under the tree and by direct observation of frugivores in the trees. Squirrels dropped about 55% of the seeds of ripe fruit unharmed under the tree and pig-tailed macaques picked about 9% of the fruit, dropping most of it under the tree, whereas gibbons consumed about 20% of the fruits, swallowing the seeds. Gibbons disperse *Nephelium* seeds over virtually the entire home range, which occupies about ¾ of the plot. Nevertheless, examination of the distribution of *Nephelium* trees in the tree census indicates that while large trees (>10 cm in diameter) are distributed over the whole plot, smaller trees (1–9.9 cm) are mostly restricted to east and north-facing slopes. This suggests that very recent climate change may be restricting recruitment of the species to relatively moist areas. Further research is needed to test this idea.

การประเมินมูลค่าทางเศรษฐศาสตร์ในการอนุรักษ์และการจัดการช้างป่าในประเทศไทย

Economic valuation for conservation and management of wild elephants in Thailand

B. Budka (Student), P. Jankankit (Thesis Advisor)
Resource Management, Interdisciplinary Graduate Program, Kasetsart University, Chatuchak, Bangkok 10900

This study aimed to investigate the opinion and awareness of Thai people regarding wild elephant conservation and management and to assess the benefits of conservation and management of this species to Thailand. The study employs a “choice modeling” method to estimate the willingness to pay for wild elephant conservation of people living in urban areas of Thailand and to examine the optimal management level. Findings from the study will provide information on the awareness and concern of urban people towards wild elephant conservation and management, the benefits of conservation estimated from the willingness to pay and the factors affecting willingness to pay, optimal management alternatives, direct expenses related to the species’ conservation and management, as well as damage values from wild elephants encroaching on rural agricultural areas. This information is significant for the concerned agencies in designing policy measures related to conservation and management of wild elephants in order to help protect these species from extinction in Thailand.

ความหลากหลายของไบรโอไฟต์ในอุทยานแห่งชาติทองผาภูมิ จังหวัดกาญจนบุรี

Diversity of bryophyte in Thong Pha Phum National Park, Kanchanaburi Province

T. Boonkerd[1], R. Pollawatn[1], S. Chantanaorrapint[2] and M.-J. Lai[3]
[1]Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Department of Biology, Faculty of Science, Prince of Songkha University, Hat Yai, Songkha 90112
[3]Department of Landscape Architecture, Tunghai University, Taichung, Taiwan

Thong Pha Phum National Park is a mountainous area, ranging in elevations from 200 to 1,100 m. This area has a wide variation in ecological diversity. Therefore, the aim of this study is to explore bryophyte diversity in diverse habitats. Field collections were made from July 2004 to October 2005. Three hundred and fifty specimens have been collected in total. They were determined into 110 species, 77 genera and 40 families, which included 3 species of hornwort, 64 species of mosses and 43 species of liverworts. Eight species of these are new records for Thailand: *Aneura pinguis* (L.) Dumort., *Asterella khayana* (Griff.) Pande et al., *Cyathodium cavernarum* Kunze, *Dicranolejeunea javanica* Steph., *Fissidens flaccidus* Mitt., *Folioceros weistei* (Khanna) Bharadwaj, *Notothylas javanicus* (Sande Lac.) Gottsche and *Weissia controversa* Harv.

การศึกษาทางอนุกรมวิธานของหญ้า (วงศ์ Gramineae) ในพื้นที่ทองผาภูมิตะวันตก อำเภอทองผาภูมิ จังหวัดกาญจนบุรี

Taxonomic study on grasses (family Gramineae) in Western Thong Pha Phum, Thong Pha Phum District, Kanchanaburi Province

S. Sirimongkol[1] (Student), K. Chayamarit[2] (Thesis Advisor)
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok 10900
[2]The Forest Herbarium, National Park Wildlife and Plant Conservation Department, Chatuchak, Bangkok 10900

A taxonomic study of grasses (Family Gramineae) in Western Thong Pha Phum, Thong Pha Phum District, Kanchanaburi Province was conducted. As a first step, data on grasses were compiled from both literature and herbarium specimens kept in the Forest Herbarium, National Park, Wildlife and Plant Conservation Department (BKF) and Bangkok Herbarium of the Department of Agriculture (BK). Then additional field surveys and plant collections in Western Thong Pha Phum were conducted. Morphological and ecological data of plants were recorded and photographs were taken. All plant specimens were identified by consulting literature and comparing with specimens named in both herbaria. Nomenclatural problems were solved. From the study of grasses found in Western Thong Pha Phum, keys to 5 subfamilies, 40 genera and 67 species were constructed. Full descriptions and ecology of species, supported by line drawings and photographs of grasses are provided. In this study *Paspalum canarae* (Steud.) Veldkamp var. *fimbriatum* (Bor) Veldkamp was recognized as a new record for Thailand.

การศึกษาอนุกรมวิธานของพรรณไม้วงศ์ถั่ว – อนุวงศ์ราชพฤกษ์ในพื้นที่ป่าทองผาภูมิ จังหวัดกาญจนบุรี

Systematic studies of the Leguminosae – Caesalpinioideae in Thong Pha Phum forest, Kanchanaburi Province

T. Putthai (Student), D. Sookchaloem (Thesis Advisor)
Department of Forest Biology, Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok 10900

Systematic studies of the Leguminosae-Caesalpinioideae in Thong Pha Phum Forest, Kanchanaburi Province are focused on morphological characters, ecology, distribution, diversity of species and habitats and to produce taxonomic keys.This study was conducted by surveying and collecting plants from various vegetation types in Thong Pha Phum Forest. Photographs including morphological and ecological data were recorded for each plants species. Specimens were identified using morphological characters and compared with identified specimens deposited at the Forest Herbarium, National parks, Wildlife and Plant Conservation Department, and the Siridhorn Herbarium, Department of Agriculture. Keys to genera and species with full descriptions supported by line drawings were provided. As surveying in the area for period of twelve month, the plant specimens were found for twelve genera as follows, *Afzelia, Bauhinia, Caesalpinia*, *Cassia*, *Chaemaecrista*, *Cynometra*, *Gymnocladus*, *Peltophorum*, *Pterolobium*, *Saraca*, *Sindora*, *Senna*. The plants were identified in species level as follows, *Afzelia xylocarpa* (Kurz) Craib, *Bauhinia bracteata* (Graham ex Benth.) Baker, *B. malabarica* Roxb. *Caesalpinia cucullata* Roxb., *C. mimosoides* Lam., *Cassia fistula* L., *Chamaecrista pumila* (Lam.) K. Larsen, *Gymnocladus burmanicus* C.E. Parkinson, *Peltophorum dasyrachis* (Miq.) Kurz, *Senna siamea* (Lam.) Irwin & Barneby and *S. timorensis* (DC.) Irwin & Barneby. And *Cynometra beddomei* Prain is a newly recod for the Western Thong Pha Phum Forest.

โครงการพัฒนาการใช้ประโยชน์อย่างยั่งยืนของพืชที่มีท่อลำเลียงและการถ่ายทอดเทคโนโลยีสู่ชุมชนในเขตทองผาภูมิตะวันตก

Development of sustainable utilization of vascular plants and rural technology transfer in West-Thong Pha Phum

P. Kengkarj, P. Chalermglin, J. Srithongkul and A. Phiriyaphattharakit
Thailand Institute of Scientific and Technological Research (TISTR), Klong Luang, Pathumthani 12120

The first year of a project on the development of sustainable utilization of vascular plants and rural technology transfer in West-Thong Pha Phum was undertaken to collect data on vascular plants which were found in West-Thong Pha Phum by BRT researchers. Twenty species were evaluated for ornamental potential, namely *Mitrephora keithii*, *Anaxagorea luzonensis*, *Asplenium nidus* var. *nidus*, *Donax grandis*, *Tacca chantrieri*, *Gardenia sootepensis*, *Melastoma malabathricum* subsp. *malabathricum*, *Dracaena loureiri*, *Tamilnadia uliginosa*, *Trevesia palmata*, *Caryota maxima*, *Angiopteris evecta*, *Magnolia liliifera*, *Schima wallichii*, *Magnolia liliifera* var. *liliifera*, *Paphiopedilum parishii*, *Clerodendrum wallichii*, *Dillenia parviflora*, *Dendrobium puchellum* and *Dendrobium scabrilingue*. Five species namely *Gardenia sootepensis*, *Tamilnadia uliginosa*, *Magnolia liliifera* var. *liliifera*, *Asplenium nidus* and *Dendrobium scabrilingue* were propagated and cultivated for conservation and sustainable uses, demonstration plants and rural technology transfer to West-Thong Pha Phum area.

ความหลากชนิดและการแพร่กระจายของไรน้ำนางฟ้าใน ต.ห้วยเขย่ง อ.ทองผาภูมิ จ.กาญจนบุรี

Species diversity and distribution of fairy shrimps in Huay Khayeng, Thong Pha Phum, Kanchanaburi Province

N. Saengphan and R. Chusing
Department of Fisheries, Suphanburi College of Agriculture and Technology, Danchang, Suphanburi 72180

The species diversity and distribution of fairy shrimps in Huay Khayeng, Thong Pha Phum District, Kanchanaburi Province was studied during the dry season. Two replications of 2-4 kilograms of soil samples in dry temporary pools were collected in the study area and then incubated in the laboratory of Suphanburi College of Agriculture and Technology. A kilogram of soil sample was immersed in 20 litres of water in plastic containers. Hatched fairy shrimps were recorded and removed to new containers at 24 hour intervals for 5 days. Fairy shrimps were reared until reaching maturity before identifying the species. Incubations were repeated 2 more times by draining used water and drying the soil samples for 3 days before the next immersion. Twenty six localities for soil sampling in temporary pools were found with suitable habitats, i.e. roadside pools, natural drainage ditches, low areas in rice fields, natural pools, shallow and deep ponds. Fairy shrimps were found in only two localities of the first immersion. However, their numbers increased on the second and third immersions. Of the 3 immersions, fairy shrimps were found in a total of 19 localities (73.08% of the sampled localities) of every pool characteristic. Two species of fairy shrimps were identified; *Branchinella thailandensis* Sanoamuang, Saengphan and Murugan, 2002 and *Streptocephalus sirindhornae* Sanoamuang, Murugan, Weekers and Dumont, 2000. This study indicated that *B. thailandensis* and *S. sirindhornae* are able to colonize temporary pools at high altitude, 162-286 metres above sea level and have hatching characteristics different from lower area groups.

ผีเสื้อหนอนม้วนใบ 2 ชนิดใหม่ของโลกในสกุล *Eucoenogenes* Meyrick และ 1 ชนิดที่พบครั้งแรกในประเทศไทยจากอุทยานแห่งชาติทองผาภูมิ

Two new species and a new record of *Eucoenogenes* Meyrick (Lepidoptera: Tortricidae) from Thong Pha Phum National Park

N. Pinkaew[1](Student), A. Chandrapatya[1](Thesis Advisor), R.L. Brown[2](Thesis Co-Advisor)
[1]Department of Entomology, Faculty of Agriculture, Kasetsart University , Chatuchak, Bangkok 10900
[2]Mississippi Entomological Museum Box 9775, Mississippi MS39762 USA

Two new species of *Eucoenogenes* Meyrick (Lepidoptera: Tortricidae: Eucosmini), *E. bicucullus* Pinkaew, 2005 and *E. vaneeae* Pinkaew, 2005, are described and illustrated that collected with blacklight from hill evergreen forest in the survey of Olethreutinae during 2001-2004 in Thong Pha Phum National Park, Kanchanaburi Province, Thailand. *Epinotia munda* Diakonoff, described from a female collected in Sumatra, is transferred to *Eucoenogenes* (n. comb.) based on male and female specimens collected and recorded as the first time for Thailand.

การป้องกันกำจัดไรฝุ่นด้วยวิธีการรมสารสกัดจากพืช

Control of house dust mites by fumigation with plant extracts

A. Insung, V. Mahakittikun, B. Chankaewmanee and A. Chalearnvattanachaikul
Department of Plant Pest Management Technology, Faculty of Agicultural Technology,King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520

Fumigation by ethanolic extracts obtained from 21 selected plants were applied to house dust mite, *Dermatophagoides pteronyssinus* (Trouessart). Ethanolic extracts at various concentrations of 0 (ethanol 95%), 0.1, 0.5 and 1% with volume of 3 cm^3 were applied within $2.5x10^4$ cm^3 knockdown chamber. The fumigation period was 1 hour, and mortality of house dust mite was observed at 24 hours after fumigation periods. It was found that *Eugenia caryophyllata* Thunberg and *Cinnamomum iners* Blume extracts were extremely toxic to the mite which resulted in 10, 95, 100 and 100% as well as 10, 30, 62.5 and 92.5% mortality, respectively. By the same method, those two plant extracts could completely control *Blomia tropicalis* Bronswijk. However, the extracts showed less toxicity to the egg of *D. pteronyssinus*, Therefore, egg hatching of 57.5 and 65% were found, comparing to 77.5% was observed from control. Fumigation bag(KIL 1) sized 200x200x32 cm^3 was designed and tested with *D. pteronyssinus.* It was found that application with 3% *Eugenia caryophyllata* extract at the volume of 100 cm^3 with fumigation period of 4 hours could completely control the house dust mite. The extract at 100, 200 and 300 cm^3 also applied in 3x3x2.5 m close bedroom for 6 hours and showed that it cloud control the mite of 51.6, 61.6 and 68%, respectively. The house dust mite kept in mattress and fumigated with 5% extract at 50 and 100 cm^3 for 6 hours by using KIL1 bag, then 38 and 65% mortality was found. Shelf life of both extracts was good for 6 months either they were kept in refrigerator or in a room temperature. This botanical fumigation method is very promising in order to control house dust mite in Thailand.

การศึกษาภูมิปัญญาชาวบ้านที่เกี่ยวข้องกับความหลากหลายและการเกิดของเห็ดโคน ในสวนป่าทองผาภูมิ จังหวัดกาญจนบุรี

A study of local people knowledge on diversity and formation of *Termitomyces* spp. in Thong Pha Phum plantation, Kanchanaburi Province

J. Terakunpisut
Faculty of Liberal Arts and Science, Kasetsart University Kamphaeng Saen Campus, Kamphaeng Saen, Nakorn Patom 73140

Termite mushroom (genus *Termitomyces*) is the most famous non – timber forest product from Thong Pha Phum plantation. Termite mushroom has a mutual relation with termite (symbiosis mutualism) which both derives some degree of benefit from each other. Moreover *Termitomyce* has the economical importance (Jeng *et al*., 2004). The aim of research is to improve local knowledge on termite mushroom appearance of Thong Pha Phum plantation. The data collection is to investigate the opinion and knowledge that is a local knowledge on termite mushroom appearance and assess the economic value of termite mushrooms, the dependence of local people on forest resource, by using questionnaires in data collection. Chi – square is a statistic technique is used in data analysis and statistical significance is set at 0.1. There are three study areas located in Tumbon Hua kha yeng, Thong Pha Phum District, Kanchanaburi province on three villages, Ban Tha Madeau, Ban Raipa and Ban Rai. Each village is a representative of Thai, Karen and Burmese, respectively. The result of this study found that the main occupation of each nationality is significantly different from each other that is Thais always work as the governmental officers, while most Karens search for the forest goods for sell and employee and Burmeses almost work as the employees. It is also found that the net incomes of these three groups are not different as well as the knowledge of each nationality about origin of Termite mushroom and ways to pick up them. The consideration of ways in picking up Termite mushroom of Banrai community indicated that male and female are significantly different. The survey result in the area of Suan Pa Thong Pha Phoom in March to May found two types of Termite mushroom which can be classified as *T. albuminosus T. striatus* and the other two types which cannot be indicated.

ความหลากหลายของลิเวอร์เวิร์ตบริเวณยอดเขานัน อุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Liverworts diversity at the summit of Khao Nan, Khao Nan National Park, Nakhon Si Thammarat Province

P. Sukkharak[1] (Student), T. Seelanan[1] (Thesis Advisor), Ming-Jou Lai (Thesis Co-Advisor)
[1]Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Department of Landscape Architecture, Tunghai University, Taiwan

Liverworts are nonvascular plants belonging to the class Hepaticopsida. Liverworts usually grow in high humidity and in shaded areas, especially in tropical rain forest at altitudes higher than 1,000 meters. The summit of Khao Nan of Khao Nan National Park, Nakhon Si Thammarat Province, is situated around 1,400 meters above mean sea level. This peak is classified as cloud forest because the forest vegetation is covered with mist and cloud nearly all year round. Therefore, this research aims to investigate the diversity of liverworts at the summit of Khao Nan. Exploration and liverwort collection in the field was carried out at elevations ranging from 1,000 to 1,400 meters above mean sea level from January 2006 to July 2006. In total, 319 specimens were collected, belonging to 33 genera and 18 families. With regard to their habitat, it was found that there were epiphytic, terrestrial, and lithophytic liverworts. Of all liverworts, those with the highest relative abundance are members of *Bazzania* found at elevations from 900 meters above mean sea level to the summit of Khao Nan. In view of species richness, Lejeuneaceae was the richest in diversity with 12 genera being found including *Acrolejeunea*, *Archilejeunea*, *Ceratolejeunea*, *Cheilolejeunea*, *Cololejeunea*, *Drepanolejeunea*, *Lejeunea*, *Leucolejeunea*, *Lopholejeunea*, *Mastigolejeunea* and *Schiffneriolejeunea*. From our preliminary sorting of liverwort specimens, it seems likely that there may be new records of liverworts for Thailand.

ความหลากหลายของเทอริโดไฟต์ในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Diversity of pteridophytes in Khao Nan National Park, Nakhon Si Thammarat Province

T. Boonkerd[1], S. Chantanaorrapint[2] and W. Khwaiphan[1]
[1]Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330
[2]Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkla 90112

Diversity of pteridophytes at Khao Nan National Park was explored from March to July 2006 at elevations below 600 m mean sea level. Up to now 225 specimens were collected and 17 families, 38 genera, 66 species were determined. Among these, 3 families, 3 genera and 3 species are fern allies, while 14 families, 35 genera, 63 species are ferns. All the collected species were found in both disturbed and undisturbed forests. The disturbed areas include rubber and fruit-tree plantations scattering around the park. Some abandon mines and an active quarry also found in the park area. Among undisturbed forests Bua Chake Nature Trail is the most suitable forest trail for promotion of ecotourism. Since this nature trail is rich in plant diversity, especially pteridophytes. It is expected that new data of pteridophytes can be gain and they can be used as basic data for park management.

ความหลากหลายของชนิดกล้วยไม้ที่ระดับต่ำในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Diversity of orchids in low altitude of Khao Nun National Park, Nakhon Si Thammarat Province

C. Khunwasi[1], P. Darumas[1], M. Kidyue[1] and P. Rintajak[2]
[1]Plant of Thailand Research Unit, Department of Botany, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330 [2]Khao Nun National Park, Tha Sala, Nakhon Si Thammarat 80160

Field exploration and data collection in natural orchids has been conducted at the altitude 60-600 m above sea level of Khao Nun National Park, during March to May 2006. All 37 specimens was identified and kept and Kasin Suvatabhandhu Herbarium, Department of Botany, Faculty of Science, Chulalongkorn University. Twenty seven species of epiphytic orchid, seven species of terrestrial orchid and three species of saprophytic orchids were recognized approximately in sixteen genera. Among epiphytic orchid, the *Bulbophyllum* and *Dendrobium* were the two richest genera of 6 species each while the terrestrial genera contained only one species each. *Dendrobium lobatu*m (Bl.) Miq. was found to be a new recorded species to Thailand.

ความหลากหลายของพืชวงศ์ขิงในเขตอุทยานแห่งชาติเขาหลวง และอุทยานแห่งชาติเขานัน

Zingiberaceae diversity in Khao Luang and Khao Nan National Parks

N. Kitipanangkul (Student), C. Ngamriabsakul (Thesis Advisor)
Science School, Walailak University, Thasala, Nakhon Si Thammarat 80160

Twenty-five samples in eight genera were found in a rapid pilot study of Zingiberaceae diversity in Khao Nan National Park from January to June 2006. This study was conducted at 0-400 meters altitude from the mean sea level in the National Park area. Ten species were identified in the genera *Alpinia, Amomum, Boesenbergia, Curcuma, Etlingera, Globba, Kaempferia,* and *Zingiber.* Descriptions of the genera and species are provided together with GPS data, altitude, soil and water characterization, ecological data, distributional, ornamental and macro-pictures of flower.

ความหลากชนิดของพรรณไม้สกุลมะเดื่อ-ไทร ในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Species diversity of *Ficus* L. (Moraceae) in Khao Nan National Park, Nakhon Si Thammarat Province

B. Chantarasuwan
Natural History Museum, National Science Museum, Klong Laung, Pathumthani 12120

The diversity of fig (*Ficus*) species at Khao Nan National Park was investigated with the main objectives to investigate and evaluate species richness, as well as their beneficial values for local people by interviewing the surrounding people. Five transect lines were set up for data collection with a total distance of about 40 kilometers. The transect lines were designed to cover all the main habitat types, hill evergreen forest, moist evergreen forest and disturbed areas. The specific identification followed the monumental works of Berg (2003a, 2003b, 2003c, 2003d, 2004), Berg & Corner (2005), Corner (1959, 1965), King (1969) and Ridley (1924) and collected materials were also compared with labelled materials in many herbaria. The results showed that 37 *Ficus* species were determined and these were divided into 6 subgenera; *Urostigma* with 14 species, *Pharmcosycea* with 2 species, *Sycomorus* with 9 species, *Sycidium* with 5 species, *Synoecia* with 4 species and *Ficus* with 3 species. Concerning human uses, 5 fig species were used as local native food and other uses.

ความหลากหลายของแมงมุมในสภาพป่าเมฆ อุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Assessment of diversity and abundance of spider of cloud forest, Khao Nan National Park, Southern Thailand

S. Sonthichai and A. Hasalem
Terrestrial Arthropod Research Unit, Department of Biology, Faculty of Science, Chiang Mai University, Muang, Chiang Mai, 50200

The diversity of spiders was investigated along a nature trail of Bua-Chag-Yai, Khao Nan National Park during February and April 2006. The study sites were tropical rain forests at altitudes of 140 and 240 meters above sea level. A total of 513 spiders, comprising 22 families were collected by pitfall trap, leaf litter sifting and sweep nets. The survey desing for three types of method was a Completely Random Designed (CRD). The following spider families were collected and identified: Araneidae, Clubionidae, Corinnidae, Ctenidae, Dictynidae, Gnaphosidae, Hexathilidae, Liocranidae, Lycosidae, Ochyroceratidae, Onopidae, Psechridae, Salticidae, Scytodidae, Sparassidae, Stenochilidae, Tetrablemmidae, Tetragnathidae, Theridiidae, Thommisidae, Uloboridae and Zodariidae. The most abundant spider families collected belong to the Salticidae (12.5%), Araneidae (10%) and Zodariidae (8%). Of all three sampling techniques, the leaf litter sifting was the most effective which yield 56% of individuals examined.

ความหลากหลายของมด (Hymenoptera : Formicidae) ณ อุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Diversity of ants (Hymenoptera : Formicidae) at Khao Nan National Park, Nakhon Si Thammarat Province

S. Watanasit, N. Sireepong, N. Noon-anant and A. Plapplueng
Department of Biology, Faculty of Science, Prince of Songkla University, Hat Yai, Songkhla 90112

This study was done to investigate the diversity of ants at Bua Chak Yai Natural Trail of Khao Nan National Park (KNNP), Nakhon Si Thammarat. Three study sites were randomly selected and a permanent plot of 30X30 m was established in each study site which were 500 m apart. Honey bait (HB), Pitfall traps (PT), Hand collection (HC), Leaf litter sifting (LL), Soil samples (SS) and Winkler Bags (WB) were applied for ant collection bimontly from June 2005 – January 2006. The results showed 135 species that belong to 35 genera under 6 subfamilies: Cerapachyinae, Dolichoderinae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmecinae. The subfamily Myrmicinae had the highest number of species and the genus *Pheidole* had the highest proportion of species.

การสำรวจผีเสื้อหนอนม้วนใบวงศ์ย่อย Olethreutinae ในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Survey of Olethreutinae (Lepidoptera: Tortricidae) in Khao Nan National Park Nakhon Si Thammarat Province

N. Pinkaew
Department of Entomology, Faculty of Agriculture, Kasetsart University Kamphaeng Saen Campus, Kamphaeng Saen, Nakorn Patom 73140

Olethreutine moth is one of the largest group among microlepidoptera, small to medium in size 0.6-5.0 cm, that widely distributed in agricultural and forest area. The diversity study of Olethreutinae in Khao Nan National Park is started from May, 2006 until August, 2006, 20 nights totally. Collecting sites were selected in different areas belonging to the Khao Nan National Park Protection Units. Blacklight was used for olethreutine moths attractive that operated with 12-volt car battery. One hundred and fifty specimens of olethreutine moth were found, of which 65 morphospecies were identified initially. Of those will be identified precisely, including published new record or new species.

ความหลากหลายทางชีวภาพของผีเสื้อกลางวันในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Biodiversity of butterfly fauna in Khao Nan National Park, Nakhon Si Thammarat Province

J. Nabhitabata, W. Jaitrong and T. Jeenthong
Natural History Museum, National Science Museum, Khlong Luang, Pathumthani, 12120

This investigation of the biodiversity of the butterfly fauna in Khao Nan National Park, Nakhonsritammarat Province, upper Peninsular Thailand, was conducted in archer to gain preliminary knowledge on the species diversity, local distribution, abundance status and some relevant ecological data of the butterfly fauna dwelling in the southern rain forest ecosystem, which comprising lowland up to the hilly regions, emphasizing on the cloud forest sub-ecosystem, including those affected by human activities. Two collecting techniques had been employed, i.e. the thorough searching along the selected survey lines of 1000 m. long and 10 m. wide, between 8 a.m. to 5 p.m.; and line trapping at 6 points each along the same survey lines. Species identification was done by using key for identifying butterfly species of the Malay Peninsular in partionlar and of Thailand in general; together with the comparison to the labeled specimens deposited in many insect collections. The initial result of the 2 previously-conducted surveys revealed as 151 butterfly species in 5 families, i.e. the Papilionnidae, Pieridea, Nyphalidae, Lycaenidae and Hesperiidae. The majority are the southern subspecies of the known Thai fauna. Rare and uncommon species include *Neorina lowii*, *Enispe intermedia*, *Tanaecia jahnu*, *Prothae franck*, *Heliophorus epicles* and *Choaspes subsavdatus*. Onlyone legally protected butterfly species, *Troides amphrysus*, was found in this study area.

คุณภาพน้ำและชนิดของปลาน้ำจืดที่พบบริเวณน้ำตกคลองผด น้ำตกคลองปาวและน้ำตกกรุงนาง อุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Water quality and freshwater fishes of Klongpod, Klongpaw and Kungnang Waterfalls, Khao Nan National Park, Nakhon Si Thammarat Province

S. Sutin[1,2] (Student), M. Jaroensutasinee[1] (Thesis Advisor), K. Jaroensutasinee[1] (Thesis Co-Advisor)
[1]Institute of Science, Walailak University, Thasala, Nakhon Si Thammarat 80160
[2]Faculty of Science, Ratchaphat Nakhonsithammarat University, Thasala, Nakhon Si Thammarat 80280

This study examined water quality and freshwater fish diversity at Klongpod, Klongpaw and Kungnang Waterfalls, Khao Nan National Park, Nakhonsithammarat Province. We collected water samples and fish species from 3 stations at each waterfall with 3 replications per station. The average of water quality measurements from 3 waterfalls were as follows: alkalinity 46.48 mg/l, hardness 48.33 mg/l, water temperature 25.85 °C, air temperature 27.88 °C, pH 7.52, nitrite and nitrate 0.01 mg/l, ammonia 0.09 mg/l, acidity 3.62 mg/l and dissolved oxygen 8.2 mg/l. Water quality from these waterfalls was in good condition. Eleven fish species were found from 3 waterfalls: Soro brook carp *(Neolissochilus soroides)*, Soro brook carp *(Tor tambroides)*, two species of Blue danio *(Danio regina* and *D. aequipinnatus)*, Silver rasbora *(Rasbora argyrotaenia)*, T-barb (*Puntius lateristriga*), Horse-face loach (*Actinopterygii* sp.), Round-tail garfish (*Xenantodon cancilla*), *Garra taeniata*, Sumatran tiger barb (*Puntius partipentazona*) and Barb (*Puntius binotatus*).

ลักษณะความผันแปรทางสัณฐานวิทยาของปลาพลวง (*Tor tambroides*) บริเวณอุทยานแห่งชาติเขานัน จังหวัด นครศรีธรรมราช

Morphological variation of *Tor tambroides* at Khao Nan National Park, Nakhon Si Thammarat Province

M. Pollar (Student), M. Jaroensutasinee (Thesis Advisor), K. Jaroensutasinee (Thesis Co-Advisor)
Institute of Science, Walailak University, Thasala, Nakhon Si Thammarat 80160

The Greater Brook Carp (*Tor tambroides*) is in the family Cyprinidae and typically inhabits waterfalls in Thailand. This fish has a long large flat torso with green brown colors, small head, and large scales and is 15-20 cm in body length. Khao Nan National Park, Nakhon Si Thammarat Province is composed of a large tropical rainforest, wildlife habitats and many waterfalls. This study aims to examine the homogeneity of populations and the variability of morphometrics of the Greater Brook Carp between waterfalls within National Park. At each waterfall, the Greater Brook Carp will be collected from three elevations with three replicates per elevation and 50 Greater Brook Carp males and 50 females collected per replicate. Both meristic (e.g. the number of scales, and the number of spines) and morphometric characteristics (e.g. standard length, forked length, snout length, eye length, head length and depth) will be measured. The data will be analysed by using the Truss network method to discriminate physically-similar fish populations and using multivariate analyses (i.e. Discriminant Analysis, Cluster Analysis, and Factor Analysis) for separating different fish populations. Data on morphometric measurements have often been analysed to determine differences between fish populations. Once we have a better understanding of the morphometrics of the Greater Brook Carp, we can determine the number of Greater Brook Carp populations at Khao Nan National Park. This will lead to better ways of sustainable conservation and national park management.

การศึกษาความหลากหลายของสัตว์เลื้อยคลานและสัตว์สะเทินน้ำสะเทินบก ในอุทยานแห่งชาติเขานัน จังหวัดนครศรีธรรมราช

Diversity study on reptiles and amphibians in Khao Nan National Park, Nakhon Si Thammarat Province

T. Chan-ard, S. Makchai and S. Lhaoteaw
National Science Museum, Techno Thani Klong 5, Klong Luang, Pathum Thani 12120

A diversity study on reptiles and amphibians in Khao Nan National Park is in the frame of thinking and research direction of the Khao Luang Project, part 1:a study of Khao Nan Cloud Forest. This joint project was funded by BRT between January and December in 2006. The expected objectives comprise taxonomic and ecological investigation of target fauna which might be used as the indicator of the ecosystem richness. Data collection will be focused on species richness, abundance and status of these animal groups in variable microhabitats and altitudes using suitable methodologies such as general collecting, stream and forest transects, 5x5 m plot samplings and pit-fall trapping which are related to their distribution and secretive niches. The output of this project will be used for the preparation of sustainable biological resources management plans between the national park and the local people communities.

การเตรียมข้อมูลด้านบรรยากาศสำหรับการพัฒนาแบบจำลองศักยภาพการกระจายตัวของสิ่งมีชีวิต ณ อุทยานแห่งชาติเขานัน

Preparation of atmosphere data for potential distribution modelling, Khao Nan National Park

W. Srisang (Student), K. Jaroensutasinee (Thesis Advisor), M. Jaroensutasinee (Thesis Co-Advisor)
Institute of Science, Walailak University, Thasala Nakhon Si Thammarat 80160

This study aims to model potential distribution and niche characterisation using Geographical Information Systems (GIS) tools at Khao Nan National Park. This study will incorporate the power of GIS with multivariate statistical tools to formalise the link between the species and their habitats, in particular to quantify the parameters of habitat-suitability models. This work is divided into two parts: field and ecological modelling works. Field works include collecting biological and physiological data in the field. Both data will be collected in GIS format. The species richness and species diversity of selected species assemblages will be related with topography, atmosphere, hydrology, land cover and soil composition. Since there are large quantitative data, the database system will be used in this study for collecting the data. Then the biological and physiological data will be employed in the ecological modelling that has been developed. Eight atmospheric stations were established at Khao Nan National Park Head office and 7 Khao Nan National Park stations. All atmospheric data were collected daily by trained national park rangers using Atmosphere GLOBE protocol including cloud type, cloud cover, relative humidity (RH), the amount of rainfall, solar noon air temperature, and maximum and minimum air temperature. There are 240 atmosphere data recorded in April and May 2006. There were the averages of 25 - 50% cloud cover, 71% RH, the daily rainfall 8.1 mm, solar noon temperature 31.1 ^{O}C, maximum temperature 32.6 ^{O}C, and minimum temperature 22.2 ^{O}C.

ระบบฐานข้อมูลความหลากหลายทางชีวภาพ NBIDS

NBIDS : Biodiversity Database Information System

K. Jaroensutasinee and Complex System Research Unit Team
Institute of Science, Walailak University, Thasala, Nakhonsithammarat 80160

NBIDS biodiversity database system is designed to be a prototype for a general biodiversity database system that provides services to various user groups. The target user groups include public use, researchers, to administrators for decision making. The designed services are database queries and searching, entering and editing services, mapping and graphing, and advanced computational models e.g. various biological indices for managements and monitoring. Moreover, the system will provide physical and environmental data such as soil, hydrology, atmosphere data and data from various satellites for uses with biological data and for ecological models buildings.

ความหลากหลายทางชีวภาพของราทะเลบริเวณอุทยานแห่งชาติขนอม-หมู่เกาะทะเลใต้

Biodiversity of Marine Fungi at Khanom Beach and South Sea Islands National Park

J. Sakayaroj
Phylogenetics Lab, National Center for Genetic Engineering and Biotechnology, Klong Luang, Pathumthani 12120

Thailand is a rich biodiversity country in the tropical zone. However, currently only 34% of the described marine fungi have been documented for Thailand, compared to the worldwide figure. Therefore, it is an urgent need to continue investigate the diversity of marine fungi, especially those that occur on little known substrata and from new survey area, Khanom beach and South Sea Islands National Park. This project will be undertaken for three years. Year 1: a broad survey of saprobic marine fungal diversity from various poorly known substrata will be made. In Year 2, the biodiversity of marine fungi at Khanom will be continued, but the major thrust will be the evaluation of endophytic fungi of sea grasses and selected animals. Molecular sequencing and phylogenetic analysis will be a major tool for confirming their identity. In Year 3 final sampling for saprobic and endophytic fungi will be undertaken and compilation of the data. Fungi will be isolated into axenic culture and deposited in the BIOTEC Culture Collection, where they can be screened for industrial enzymes and bioactive compounds. Data gathered from this project will increase the number of scientific publications and our knowledge of fungi in Thailand.

การศึกษาความหลากหลายทางชีวภาพของสาหร่ายทะเลในอุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้จังหวัดนครศรีธรรมราช (เกาะแตน)

Diversity of macroalgae at Ko Tan, Had Khanom-Mu Ko Thale Tai National Park, Nakhon Si Thammarat Province

A. Prathep
Seaweeds & Seagrasses Research Unit, Centre for Biodiversity of Peninsular Thailand, Department of Biology, Prince of Songkla University, Hat Yai, Songkla 90112

Diversity of macroalgae at Ko Tan, Had Khanom-Mu Ko ThaleTai National Park, Nakhon Si Thammarat province was investigated by randomly selecting 8 sites along the coastal line of Ko Tan during 1st- 5th October 2005. There were 15 species of green algae: *Avrainvillea erecta* (Berkeley) A. Gepp & E.S. Gepp, *Avrainvillea* sp., *Boergesenia forbesii* (Harvey) Feldmann, *Boodlea composita* (Harvey) F. Brand, *Bryopsis pennata* J. V. Lamouroux, *Caulerpa racemosa* (Forsskäl) J. Agardh, *C. serrulata* (Forsskäl) J. Agardh, *Caulerpa* sp.1, *Caulerpa* sp.2, *Chlorodesmis hilderbrandtii* A. Gepp & E.S. Gepp, *Dictyosphaeria* sp., *Enteromorpha* sp., *Halimeda* sp., *Rhipidosiphon javensis* Montagne and *Struvea* sp. Fifteen species of red algae were *Acanthophora spicifera* (M. Vahl) BØergesen, *Actinotrichia* sp., *Amphiroa* sp., *Chondria* sp., *Gelidiella acerosa* (Forsskäl) Feldmann & G. Hamel, *Gelidium pusillum* (Stackhouse) Le Jolis, *Gelidium* sp., *Gracilaria rhodymenioides* A.J.K. Millar, *G. salicornia* (C. Agardh) E.Y. Dawson, *Hypnea* sp., *Jania* sp., *Laurencia* sp., *Leveillea* sp., *Peyssonnelia* sp. and coralline red algae.; 9 species of brown algae were *Dictyota* sp., *Padina* sp.1, *Padina* sp.2, *Sargassum polycystum* C. Agardh, *Sargassum* sp., *Turbinaria conoides* (J. Agardh) KÜtzing, *T. decurrens* Bory de Saint-Vincent, *T. ornata* (Turner) J. Agardh and *Turbinaria* sp.; and 2 species of blue-green algae were *Lyngbya* sp. and *Symploca* sp.

ความหลากหลาย การแพร่กระจายและความหนาแน่นของหญ้าทะเล บริเวณอุทยานแห่งชาติหาดขนอม หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Diversity, distribution and abundance of seagrass at Had Khanom-Mu Koh Talay Tai Marine National Park, Nakhon Si Thammarat Province, Thailand

A. Prathep
Seaweeds & Seagrasses Research Unit, Centre for Biodiversity of Peninsular Thailand, Department of Biology, Prince of Songkla University, Hat Yai, Songkla 90112

The ecological roles of seagrasses are very important, they filter estuarine and coastal waters of nutrients, contaminants, and sediments, and are closely linked to other communities e.g. coral reef and mangrove systems. Seagrass also are home to many economic marine organisms (crabs, sea cucumber and seashells) and those of the endagered species such as dugong and turtle. However, very little is known about diversity, distribution and abundance of seagrass at Nakorn Sri Thammarat Coastal line, Gulf of Thailand. This project, therefore, is to investigate diversity and distribution as well as to monitor seagrass along the coastal line of Kanorm and Mu Ko Talay Tai Marine National Park, Nakorn Sri Thammarat. The study would be done using the sampling protocol of SeagrassNet and Seagrass-Watch; which have been used worldwide. The SeagrassNet would allow us to monitor the seagrass changes throughout time by sampling quarterly as well as the Seagrass-Watch. The data from this project would be shared with SeagrassNet and Seagrass-Watch members around the world. While, database, activities of this project would be share with Thai through http://www.seagrassthailand.com., where more people can share their knowledge and experience of seagrass under this webpage. A paper, at least, should be produced under this research project. We also wish to have a few students enroll and work under this project in various aspects of seagrass study.

ความหลากหลายของชนิดฟองน้ำทะเลที่อาศัยอยู่ในแนวปะการังบริเวณหมู่เกาะทะเลใต้ อุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Species diversity of marine sponges (Demospongiae, Porifera) dwelling in the coral reefs in Had Khanom – Mo Ko Thale Tai National Park, Nakhon Si Thammarat Province

S. Putchakarn
Marine Biodiversity Research Unit, Institute of Marine Science, Burapha University, Muang, Chonburi 20131

Marine sponges are one of the better known groups of invertebrates. They play important roles, not only for marine ecological communities but also for economically biological resources from the ancient time. Although there are many studies on sponges as natural product sources in Thailand, but there has not been many studies conducted on their biodiversity, particularly in the Southern part of the Gulf of Thailand. Hence, the research project on species diversity of marine sponges (Demospongiae, Porifera) dwelling in the coral reefs in Had Khanom – Mo Ko Thale Tai National Park, Nakhon Si Thammarat Province is proposed. The main objectives of this study are inventory surveys and collecting sponge specimens in the study area. The results of this study will be advantage for the basic knowledge on marine biodiversity and local wisdom, the conservation and the sustainable uses and marine biological resources database development in the local area through the national level. The procedure of the study is starting from assigning site collection, reference articles and technical collections, survey planning and area approach, field surveys, sponge identification, registration and database development and submitted the final report.

ความหลากหลายและการกระจายของกัลปังหาบริเวณอุทยานแห่งชาติหาดขนอม - หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Species diversity and distribution of Gorgonians at Had Khanom - Mu Ko Thale Tai Natural Park, Nakhon Si Thammarat

V. Viyakarn, T. Loyjiw, C. Raksasab and S. Chavanich
Department of Marine Science, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Gorgonian is a marine invertebrate that is belong to phylum Cnidaria as same as coral and jelly fish. The gorgonian was classified in the same group (subclass Octocorallia) of blue coral, soft coral and sea pen. Unlike the coral and sea anemone which have 6 tentacles, gorgonian has 8 tentacles which use for catching food. The purpose of this study is to investigate the diversity and distribution of gorgonians at Had Khanom - Mu Ko Thale Tai Natural Park by using SCUBA diving technique. The samples were photographed and some were collected and preserved in 70% alcohol for further identification and being reference specimens. Shapes and characteristics of colonies and sclerites of gorgonians are used to identify into the genus level. The results from the preliminary surveys at Ko Tan showed that there were at least 9 genera of gorgonians. They were found at 5-12 m depth of water, and normally attached on rocks, dead corals, or rubbles that lie beneath sand or silt substrate. Their distribution was in clump. The most dominant genus species was *Subergorgia*.

กระบวนการเพิ่มจำนวนประชากรและการเปลี่ยนแปลงของสังคมปะการังแข็งขนาดเล็ก ในเขตอุทยานแห่งชาติหาดขนอมและหมู่เกาะทะเลใต้

Recruitment processes and community dynamics of juvenile scleractinian corals on inshore reefs around Khanom-South Sea Islands Marine National Park

S. Piromvaragorn
Centre for Biodiversity of Peninsular Thailand, Department of Biology, Prince of Songkla University, Hat Yai, Songkla 90112

Tens of thousands of Thai people depend in part or wholly on the biodiversity of coral reefs distributed along the islands of Khnom or the “South Sea Islands” archipelago. The Khnom – South Sea Islands Declared Area is undergoing final preparation to receive Marine National Park status. Knowledge of marine biodiversity and ecosystems of the region is therefore urgently required in order to develop an effective management plan. We propose to undertake long-term studies of recruitment processes which will provide understanding of the resilience of reefs around this region. This study will be the first detailed study of key processes on Khnom’s reefs using a rigorous sampling design and quantitative analyses. The information derived from this study will enable reef management agencies to formulate an effective conservation plan. Other key components of project, such as education via public media, will increase public awareness of the importance of preserving Thailand’s marine biodiversity. Moreover, the field team will also include training of new researchers and local community management officers to allow them to gain necessary skills to enhance Thailand’s marine conservation efforts and to strengthen the Thai Coral Reef Network.

การศึกษาความหลากหลายของเอไคโนเดิร์มบริเวณอุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Diversity study on Echinoderms in Khanom Beach – South Sea Islands National Park, Nakhon Si Thammarat Province

A. Mucharin[1], S. Putchakarn[2], and P. Komkham[3]
[1]National Science Museum, Techno Thani Klong 5, Klong Luang, Pathum Thani 12120
[2]Marine Biodiversity Research Unit, Institute of Marine Science, Burapha University, Muang, Chonburi 20131
[3]Departmen of Biology, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

The biodiversity study of the Echinoderms in Khanom Beach – South Sea Island National Park has its prime objective to survey the richness of Echinoderms species inhabiting this national park. Obtained data will be further used as basic information for sustainable management of the site, especially dealing with the ever-growing ecological tourism. It will also be the wise way to incorporate understanding between the park staff, researchers, and local people living in adjoining areas of the park, on the biological resources and their precise conservation. The study process starts from gathering of fundamental data on the areas and the Echinoderms fauna reported to occur in the south of the country, emphasized on the study areas and neighboring sites; followed with field surveys in actual area by standard survey techniques; obtained data will be laterly identified, analyzed, and finally final report submitted.

ความหลากหลายของทากเปลือยบริเวณอุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Species diversity of Nudibranch at Had Khanom - Mu Ko Thale Tai Natural Park, Nakhon Si Thammarat

S. Chavanich, L. Harris, P. Koeysin, P. Kuanui and V. Viyakarn
Department of Marine Science, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

Nudibranch is belong to the mollusk group, but it has no shell protecting its soft body. The purpose of this study is to investigate the diversity and habitat ecology of nudibranch. Specimens are collected by using SCUBA diving technique. The specimens are photographed and recorded by using VDO camera before they are collected and preserved in the alcohol. Shapes, body colors, and color patterns of the nudibranchs are used to identify into the species level. The preliminary results showed that nudibranch can be found on coral colonies, coral reef, and sand substrate between 1-15 m depth of water. The most dominant nudibranch species are in Family Phyllidiidae.

การศึกษาชนิดของสัตว์กลุ่มหอยทะเลที่มีเปลือกหุ้มในบริเวณอุทยานแห่งชาติหาดขนอมและหมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Survey and identification of seashells at Had Khanom – Mu Ko Thale Tai National Park, Nakhon Si Thammarat, Thailand

P. Horpet and A. Kaenpech
Marine and Coastal Resources Management Technology
School of Engineering and Resources Management, Walailak, Thasala, Nakon Si Thammarat 80160

This project aims to survey and identify 'seashells' found at Had Khanom – Mu Ko Thale Tai National Park**,** Nakhon Si Thammarat Thailand. The term 'seashells' includes marine animals in phylum Mollusca mainly belong to class Bivalvia and class Gastropoda, which have external hard-shell covered, but this term excludes the ones in subclass Opisthobranchia (slugs), class Aplacophora (worm-like molluscs), and class Cephalopoda (squids, cuttlefish, etc). Whilst the study area is undergoing final preparation to designate a Marine National Park, it is necessity to fulfill knowledge of biodiversity of fauna and flora in the area to facilitate an effective and sustainable management plan. Scientific research and methodology of this study is primarily followed that described in a book 'The Molluscs of the Southern Gulf of Thailand' by Swennen et al., 2001. This book is the fourth of the series Thai Studies in Biodiversity, published by the Biodiversity Research and Training (BRT) program, which is widely accepted internationally for its clear and concise descriptions and illustrations. Results obtained from our study will be used as basis knowledge for better management of the seashells in the study area, in particular to fulfill the knowledge and information of seashells in the upper part of the Southern Gulf of Thailand and further comparisons can be made with other findings from the Southeast Asia and Indo-Pacific regions.

ความหลากชนิดของปูน้ำเค็มในอุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้

Marine crab diversity in Had Khanom – Mu Ko Thale Tai National Park

P. Tantichodok[1], A. Kaenphet[1] and R. Promdam[2]
[1]Institute of Science, Walailak University, Thasala, Nakhonsithammarat 80160, [2]BRT, 5th Floor, NSTDA Building, Rajdhevee, Bangkok 10400

This is project is to study the marine crab diversity at Khanom - Mu Koh Thale Tai National Park by investigating the number of diversity of marine crab at the area and around. This would provide a baseline data on biodiversity of this area, which would be useful for further research. The study would be starting by reviewing the literature of the marine crab in the Gulf of Thailand and in this region. Then the investigation would be done by collecting all marine crabs in each marine habitat e.g. beach, rocky shore, mangrove forest, seagrass bed and coral reefs. The collection would be done also through local fishermen catches in Khanom and around. This area is now in the process of setting up as *a national park.* Then the data would be analyzed and reported.

ความหลากหลายของเพรียงหัวหอมที่อาศัยอยู่ในแนวปะการังบริเวณหมู่เกาะทะเลใต้ อุทยานแห่งชาติหาดขนอม-หมู่เกาะทะเลใต้ จังหวัดนครศรีธรรมราช

Species diversity of marine ascidians dwelling in the coral reefs in Had Khanom-South Islands National Park, Nakhon Si Thammarat Province

S. Munkongsomboon
Marine Biodiversity Research Unit, Institute of Marine Science, Burapha University, Muang, Chonburi 20131

Marine ascidians are higher invertebrate closed to chordate animals. They play important roles as filter feeder organisms, which clean up the suspended sediment in the water column. Although there are many studies on ascidians as natural product sources in Thailand, but there has not been many studies conducted on their biodiversity, particularly in the Southern part of the Gulf of Thailand. Hence, the research project on species diversity of marine ascidians dwelling in the coral reefs in Khanom-South Islands National Park, Nakhon Si Thammarat Province is proposed. The main objectives of this study are inventory surveys and collecting ascidian specimens in the study area. The results of this study will be advantage for the basic knowledge on marine biodiversity and local wisdom, the conservation and the sustainable uses and the marine biological resources database development in the local area through the national level. The procedure of the study is starting from assigning site collection, reference articles and technical collections, survey planning and area approach, field surveys, ascidian identification, registration and database development and submitted the final report.

ความหลากหลายของปลาในแนวปะการัง ภายในเขตอุทยานแห่งชาติหาดขนอมหมู่เกาะทะเลใต้

Diversity of reef fish in Had Kanom-Mu Ko Talay Tai National Park, Nakhon Si Thammarat

J. Jeewarongkakul[1], S. Plathong[1] and S. Songploy[2]
[1]Coral Reef and Benthos Research Unit, Centre for Biodiversity of Peninsular Thailand Faculty of Science, Prince of Songkla University, Had Yai, Songkla 90000, [2]Marine Biodiversity Research Group, Faculty of Science, Ramkamhang University, Bandkapi, Bangkok 10240

Reef fish community in 6 stations, East of Ko Wang Nai, West of Ko Wang Nai, Ko Wang Nok, Ko Rab, Ko Tan, Ko Mud Sum, were recorded during September 8st - 12st, 2006. Seventy species of reef fish were recorded during this survey. The most dominant reef fish species, in term of abundance and frequency of occurrence, are damsels, *Neopomacentrus cyanomos* and *Neopomacentrus filamentosus*. Within 300 m^2 census area, the highest abundant of fish number are in Ko Tan (2,004.6), followed by Ko Rab (991.2), West of Ko Wang Nai (458.4), Ko Wang Nok (672.8), Ko Mud Sum (267.2) and East of Ko Wang Nai (82.2), respectively. In term of number of species, Ko Tan has a highest number of fish species (49 species) followed by Ko Rab (35 species), Ko Mud Sum (35 species), Ko Wang Nok (32 species), East of Ko Wang Nai (20 species), and West of Ko Wang Nai (13 species), respectively. However, in term of diversity index and evenness, Ko Mudsum has a highest diversity index and eveness (2.49, 0.61), followed by East of Ko Wang Nai (2.08, 0.51), Ko Wang Nok (2.04, 0.50), Ko Tan (1.77, 0.43), Ko Rab (1.73, 0.42) and West of Ko Wang Nai (1.03, 0.25).

สถานภาพโลมาบริเวณหมู่เกาะทะเลใต้ ประเทศไทย

Status of dolphin in Thale Tai Archipelago, Thailand

A. Intongcome and T. Thrupsomboon
Marine and Coastal Resources Research Centre, The Central Gulf of Thailand, Muang, Chumphon 86000

Survey status of dolphin in Hadd Kanom-Talaytai archipelago national park which cover Donsak district, Suratthani province to Sichon district, Nakhonsithamarat province and other islands such as Ko Tan, Ko Rab, Ko Wangnai, Ko Wangnok would be done on 2 years project since August 2006 : The data will be collectd by data by interview fishery communities, stranding samples and ship-based survey 3-5 miles from coastline. The study by interview from Marine and Coastal Resources Research Centre, Southern Gulf of Thailand during 2005 show that 3 species of dolphin from 2 families were found. There are Indo-pacific hump-backed dolphin ***(****Sousa chinensis****)***, Irrawaddy dolphin **(***Orcaella brevirostris***)** and Finless porpoise **(***Neophocaena phocaenoides***)**. One stranding sample of Indo-pacific hump-backed dolphin ***(****Sousa chinensis****)*** was also found at Thongnian-bay Kanom district Nakhonsithamarat province at April 2006.

สมุทรศาสตร์ฟิสิกส์บริเวณชายฝั่งขนอม-หมู่เกาะทะเลใต้

Physical oceanography around Khanom coast to Southern Sea Island

P. Sojisuporn
Department of Marine Science, Faculty of Science, Chulalongkorn University, Pathumwan, Bangkok 10330

The purpose of this project is to consolidate physical aspects such as climate, geology, and physical oceanography of Khanom Beach to southern Sea Island. The main hypothesis is that the biodiversity in the area is controlled by the physical parameters. Two fielding samplings will be carried out, and the numerical circulation and dispersion model will be applied to the dispersion of sediment or coral egg in the area. The project will be completed in 2 years (Jan 2007-Dec 2008). The project will produce one M. Sc. student and at least one academic paper.