

ลักษณะการกระจาย และการอยู่ร่วมกับสิ่งมีชีวิตต่าง ๆ ในแนวปะการังของฟองน้ำที่ผลิต  
สารเรเนียร์รามัยซิน (*Xestospongia* sp.) บริเวณอ่าวไทย

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

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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

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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*, *Spherospongia congenera*, *Clathria reinwardti*, *Clathria (Thalysias)* sp., *Biemna fortis*, *Coelocarteria singaporensis*, *Mycale gradis*, *Phobas aff.arborescens*, *Iotrochota baculifera*, *Monanchoca grandis*, *Amorphinopsis excavan*, *Drarmacidon 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 arborescens* (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. savignyi*, 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**

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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 ( $13.23 \pm 1.1$  mm.) was found in the 25 % of hatchery light intensity. In addition, the highest numbers of zooids ( $94 \pm 31.9$  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 ( $11.08 \pm 0.8$  mm) and the highest numbers of zooids ( $83 \pm 26.5$  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**

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Thai tunicate, *Ecteinascidia 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**

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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, Nephthidae, Nidaliidae and Xenidae, 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 Nephthidae. 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**

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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 X 30 m.<sup>2</sup> belt transect (total study area 90 m.<sup>2</sup>) 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.

อัตราการรอดและการเติบโตของตัวอ่อนปะการังเขากวาง *Acropora* spp. ในระบบเพาะเลี้ยง

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

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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 setting on the substrates within 4 days after fertilization. The settlement rate on specific substrate was  $55.0 \pm 23.58$  %. 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 บริเวณกลุ่มปะการังใน  
แหล่งท่องเที่ยวของจังหวัดกระบี่

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

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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 (*Acropora* 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  $4.37 \pm 1.19$  and  $2.46 \pm 1.98$  fragments.m<sup>-2</sup>, 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  $7.90 \pm 0.06$  cm.yr<sup>-1</sup>. 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) บริเวณอ่าวคู้งกระเบน  
จังหวัดจันทบุรี

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

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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 ( $L_{\infty}$  and  $K$ ), total mortality and recruitment patterns, relationships between carapace width and body weight of crabs, sex ratio, type of food, and Gonadosomatic 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  $L_{\infty} = 13.23$  cm and  $K = 0.87$  per year while the growth parameters of the female crab were  $L_{\infty} = 12.95$  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 occurred 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 gonadosomatic 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.

## Species diversity and distribution of Cladocera in Songkhram River Basin

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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.

ความหลากหลายและการแพร่กระจายของโคพีพอดกลุ่มคาลานอยด์และไซโคลพอยด์  
ในเขตลุ่มแม่น้ำสงคราม

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

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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, *Tropodiatomus* sp., of which is new to science. Species frequently encountered in this study were *Mongolodiatomus malaindosinensis* (Lai and Fernando, 1978), *Heliolodiatomus 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 *Dentodiatomus javanus* (Grochmalicki, 1915) (0.5%), *M. uenoi* (Kikuchi, 1936)(0.5%), *Tropodiatomus* sp. (0.5 %), *T. vicinus* Kiefer, 1930 (1%), *T. oryzanus* Kiefer, 1930 (1%), *Phyllocladion 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 %).

อิทธิพลของปัจจัยทางกายภาพและเคมีบางประการที่มีผลต่อความชุกชุมของโรติเฟอร์ในพื้นที่  
ชุ่มน้ำบึงโขงหลง จังหวัดหนองคาย

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

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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  $695 \pm 398$  and  $110 \pm 61$  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  $502 \pm 312$  and  $291 \pm 45$  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

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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  $\mu\text{m}$  and  $> 200 \mu\text{m}$ ). 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<sup>-1</sup>) in the rainy period, followed by Rotifers (309.40 0 ind.l<sup>-1</sup>) and Crustacean nauplii (24.94 0 ind.l<sup>-1</sup>). 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  
ลำธารต้นน้ำที่อุทยานแห่งชาติน้ำหนาว

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

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The investigation was conducted in Phromsong and Phromlaeng streams, Nam Nao National Park, Petchabun province during October 2004 to February 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 dissolved 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 bioassessment in Mekong 2 basin

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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.

ความหลากหลายทางชีวภาพของไบรโอโซนน้ำจืดและการประยุกต์ใช้ไบรโอโซนน้ำจืด  
เป็นดัชนีชี้วัดคุณภาพน้ำในแม่ฮ่องคราม

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

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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**

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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.) givenchy* 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.) givenchy* 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.) givenchy* and *A. (S.) zebrinus* were found co-existing in two localities.

การเชื่อมโยงตัวอ่อนแมลงชีปะขาว อันดับย่อย Baetioidea Caenoidea และ Ephemeroidea ใน  
ลำธารห้วยหญ้าเครือ อุทยานแห่งชาติห้าหนาว

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

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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 nymphadult 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.

ความหลากหลายทางชีวภาพของแมลงหอนปลอกน้ำตัวเต็มวัยบริเวณริมฝั่งพื้นที่ชุ่มน้ำใน  
เชียงใหม่เพื่อการติดตามตรวจสอบสภาพแวดล้อม

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

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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**

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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 ( $\text{NH}_3 - \text{N}$ ). The last group indicated Macromiidae Protoneuridae Platycnemididae Libellulidae and Gomphidae, which related to orthophosphate phosphorus (Ortho – P) and nitrate nitrogen ( $\text{NO}_3 - \text{N}$ ).

การวิเคราะห์ความหลากหลายทางพันธุกรรมของผึ้งมิมเล็ก *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**

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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**

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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

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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**

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From December 2004 to December 2005, firefly diversity observations at Ban Khog Kad village showed that *Pteroptyx malacca* (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.



ความสัมพันธ์ระหว่างความชุกชุมของสัตว์เลี้ยงลูกด้วยนมกับความหลากหลายและการกระจาย  
ของเห็บแข็ง (Acari: Ixodidae) ในอุทยานแห่งชาติเขาใหญ่

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

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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.