Acetylcholinesterase inhibitors from the Thai sponge *Corticium* sp.

Roosanee Langjae[1],*, Kornkanok Ingkaninan[2], Anuchit Plubrukarn[1]
[1]Prince of Songkla University, Songkhla, Thailand,
**e-mail: roosanee.l@psu.ac.th, [2]Naresuan University, Phitsanulok, Thailand*

Bioassay-guided fractionation of the Thai sponge *Corticium* sp. led to the isolation of a new steroidal alkaloid, 4-acetoxy-plakinamine B, along with an unidentified trihydroxy sterol. The structure was elucidated by means of spectroscopic analyses, including UV, IR, NMR and mass spectra. 4-Acetoxy-plakinamine B showed potent acetylcholinesterase-inhibition activity (IC_{50} 3.75±1.69 μM), with no significant cytotoxicity observed. The enzyme inhibition activity of 4-acetoxy-plakinamine B against acetylcholinesterase was reversible. In order to determine the kinetics of enzyme inhibition, V_{max} and K_m were measured. It was determined that the compound inhibited the targeted enzyme in a mixed-competitive manner.

The impact of the tsunami on coral recruitment at Mu Koh Surin National Park, Phang Nga Province

Chaipichit Saenghaisuk* and Thamasak Yeemin
Ramkhamhaeng University, Bangkok, Thailand
**e-mail: sh_chaipichit@yahoo.com*

Mu Koh Surin is a group of offshore islands in the Andaman Sea, located about 60 km from the mainland of Phang Nga Province, southern Thailand. It is recognized as one of the best diving spots. The 2004 tsunami caused severe damage to certain reef sites, especially those located in channels between islands which lie in an east-west direction, such as the channel between South Surin Island and Torinla Island. The present study concentrates on impacts of the tsunami on coral recruitment at Mu Koh Surin by using settlement plate experiments and field observation of juvenile coral colonies. Densities of juvenile coral colonies at Koh Torinla, Ao Pakkaad, Koh Pachumba, Ao Tao, Ao Jaak, Ao Mae Yai, Koh Stock, Ao Mai Ngam and Ao Suthep decreased to 0.10, 0.44, 0.89, 0.33, 0.29, 0.90, 0.05, 0.41 and 0.09 colonies/m^2, respectively. This is because juvenile colonies on substrates were washed away by strong waves and currents. The main groups of juvenile coral that decreased were *Galaxea*, *Fungia*, *Pocillopora*, *Acropora* and *Porites*. Coral recruitment on settlement plates varied by location and season. The peak of coral recruitment was in the January-March interval with an average of 56.36 ± 12.59 colonies/m^2. Coral recruitment rates at Ao Jaak, Ao Mae Yai, Ao Suthep, Ao Pakkaad and Koh Torinla were 45.56 ± 17.78, 36.05 ± 12.01, 25.43 ± 6.31, 34.57 ± 13.58 and 35.39 ± 10.56 colonies/m^2/year, respectively. The density of coral recruits on settlement plates at Mu Koh Surin was relatively high. Certain high tsunami-impacted reefs, such as Ao Pagkard, showed clear, natural recovery trends. The present study provides basic essential data for planning coral reef management at Mu Koh Surin.

Survival and growth of juvenile staghorn corals, *Acropora* spp., in a culture system

Chalothon Raksasab*, Voranop Viyakarn and Suchana Chavanich
Chulalongkorn University, Bangkok, Thailand,
**e-mail: chalothon_r@hotmail.com*

At present, anthropogenic degradation of corals in Thailand is a major issue. Thus, a new method of coral restoration using coral cultivation is being introduced as an additional way to increase coral diversity. In this study, the gametes of 4 species of *Acropora* were collected from Ao Sattahip, Chonburi Province, and brought back to a land-based hatchery for fertilization and rearing for 9 months before being transplanted to natural reefs. Results from field surveys between 2006–2008 showed that the spawning period of *Acropora* species in this area occurred during January to March each year. The spawning date and time of all species was related to the neap tide of water and the lunar cycle, which were 5–12 nights after the full moon or the new moon. In the rearing system, the rates of fertilization of each species were more than 90%. After fertilization, the survival rates of planulae were higher than 87%, and the settlement rates of planulae were between 49–75% on the 4th day after fertilization. After settling, the highest mortality rates of juvenile corals occurred during the first 3 months, the period that corals needed zooxanthellae from surrounding seawater. After 9 months, the survival rate of juvenile corals was approximately 33.0 $\pm$ 3.55%, and the size reached 11.9 $\pm$ 9.85 mm in length.

Species diversity of terrestrial earthworms in Lower Northern Thailand

Prasuk Kosavititkul[1], Somsak Panha[2] and Panee Wannitikul[3]
[1]Naresuan University, Pitsanulok, Thailand, e-mail: Prasukk@hotmail.com, [2]Chulalongkorn University, Bangkok, Thailand, [3]Suranaree University of Technology, Nakhon Ratchasima, Thailand

A total of 21 species of terrestrial earthworms were collected from the Lower Northern part of Thailand from July – November 2007. There were 9 species of Megascolecidae, 3 species of Moniligastridae, and 1 species each of Glossoscolecidae and Octochaetidae. The genera *Amynthas* and *Metaphire* of the Megascolecidae were dominant and included 15 species, of which 11 species are thought to be new species. They differed from other *Amynthas* and *Metaphire* in their patterns of genital markings and in the appearance of the male pore region. They occurred in disturbed areas or where natural environments (forests) still remain, or in the areas relatively less disturbed by human activities. *Amynthas alexandri*, *Metaphire peguana* and *M. posthruma* are now the dominant earthworms of this area. Future studies at this site might include a seasonal study on the ecology and reproduction of these earthworm species.

Population genetic study of the *Anopheles barbirostris* species complex (Diptera: Culicidae) in Thailand

Wej Choochote
Chiang Mai University, Chiang Mai, Thailand
e-mail: wchoocho@mail.med.cmu.ac.th

A total of 113 isolines of *Anopheles barbirostris*, derived from human- and animal-biting females, showed branch summation in 2 groups of seta 2-VI pupal skins: 42 isolines were *An. barbirostris* (9-16 branches), and 71 were *An. campestris* (20-30 branches). Four karyotypic forms [Forms A (X_1, X_2, Y_1), B (X_1, X_2, X_3, Y_2), C (X_2, Y_3) and D (X_2, Y_4)] were obtained in *An. barbirostris*, and 3 karyotypic forms [Forms B (X_2, Y_2), E (X_1, X_2, X_3, Y_5) and F (X_2, X_3, Y_6)] were recovered in *An. campestris*. Based on the similarity of X_2-chromosomes, the latter species was designated as *An. campestris*-like Forms B, E and F. Results of non post-mating reproductive isolation among the crosses of *An. campestris*-like Forms B, E and F indicated intraspecific karyotype variation. The low sequence divergences of ITS2 of rDNA and COI and COII of mtDNA among the forms supported their intraspecific karyotype variation. Results of post-mating reproductive isolation among crosses of *An. campestris*-like Form E and *An. barbirostris* Form A strains from Chiang Mai, Phetchaburi and Kanchanaburi supported the existence of 5 species within the taxon *An. barbirostris*, designated as an *An. campestris*-like species, *An. barbirostris* species A1, A2, A3, and A4. The large sequence divergences of ITS2, COI, and COII supported the existence of these species. Results of non-post mating reproductive isolation from the crosses of different karotypic forms of species A1 (A, B, C, D) and A2 (A, B) suggested that different karyotypic forms occurred in natural populations of species A1 and A2.

Cytogenetic and molecular evidence for five new species within the taxon *Anopheles barbirostris* (Diptera: Culicidae) in Thailand

Atiporn Saeung[1,*], Visut Baimai[2,3], Yasushi Otsuka[4], Sittiporn Suwannamit[1], Sorawat Thongsahuan[1], Pradya Somboon[1], Chamnarn Apiwathnasorn[2], Hiroyuki Takaoka[4] and Wej Choochote[1]

[1]*Chiang Mai University, Chiang Mai, Thailand,*
**e-mail: atiporn44@yahoo.com,* [2]*Mahidol University, Bangkok, Thailand,*
[3]*Center for Vectors and Vector-Borne Diseases, Bangkok, Thailand,*
[4]*Oita University, Oita, Japan*

A total of 113 isolines of *Anopheles barbirostris*, derived from human- and animal-biting females, showed branch summation in 2 groups of seta 2-VI pupal skins: 42 isolines were *An. barbirostris* (9-16 branches), and 71 were *An. campestris* (20-30 branches). Four karyotypic forms [Form A (X_1, X_2, Y_1), B (X_1, X_2, X_3, Y_2), C (X_2, Y_3) and D (X_2, Y_4)] were obtained in *An. barbirostris*, and 3 karyotypic forms [Form B (X_2, Y_2), E (X_1, X_2, X_3, Y_5) and F (X_2, X_3, Y_6)] were recovered in *An. campestris*. Based on the similarity of X_2-chromosomes, the latter species was designated as *An. campestris*-like Forms B, E and F. Results of non post-mating reproductive isolation among the crosses of *An. campestris*-like Forms B, E and F indicated intraspecific karyotype variation. Low sequence divergences of the ITS2 of rDNA, and COI and COII of mtDNA among the forms, supported their intraspecific karyotypic variation. Results of post-mating reproductive isolation among the crosses of *An. campestris*-like Form E and *An. barbirostris* Form A strains from Chiang Mai, Phetchaburi and Kanchanaburi supported the existence of 5 species within the taxon *An. barbirostris*, designated as *An. campestris*-like species and *An. barbirostris* species A1, A2, A3, and A4. The large sequence divergences of ITS2, COI, and COII supported this evidence. Results of non-post mating reproductive isolation from crosses of different karotypic forms of species A1 (A, B, C, D) and A2 (A, B), suggested that different karyotypic forms occurred in natural populations of species A1 and A2.

Diversity of mosquitoes susceptible to filarial parasites in an endemic area of *Wuchereria bancrofti* at the Thai-Myanmar border of Thong Pha Phum district, Kanchanaburi Province, Thailand

Jinrapa Phothikasikorn[1,*], Rapee Boonplueang[1], Wilai Noonpakdee[1] and Supawadee Ratchamanee[2]

*[1]Mahidol University, Bangkok, Thailand, *e-mail: pyjpt@mahidol.ac.th,*
[2]Center for Vector and Disease Control No.4.1 Kanchanaburi, Thailand

This research aimed to survey the diversity of mosquitoes that are vectors of filarial parasites of both humans and animals in suburban and forest areas in the sub unit of Ban Mea Num Noi in rubber forest plantations, Huy Kayieng sub district, Thong Pha Phum district, Kanchanaburi province. Between November 2007 and July 2008, 23 species of mosquitoes were found, of which 7 species were diurnal feeding mosquitoes (06.05-19.00 h exposure time), 12 species were nocturnal feeding mosquitoes (19.05-06.00 h exposure time) and 4 species were diurnal-nocturnal feeding mosquitoes. Among the total number of 7,485 wild mosquitoes that were caught, 17 species have yet to be identified, and 57 mosquitoes of 5 species (0.76%) were positive for filarial parasites; these will be further identified to species level using a PCR technique.

Systematics and population genetics of black flies (Diptera: Simuliidae) in Thailand

Chaliow Kuvangkadilok*, Kowit Meeyen, Sanae Jitklang and Visut Baimai
*Mahidol University, Bangkok, Thailand, *e-mail: scckv@mahidol.ac.th*

A total of 34 known *Simulium* species collected from 40 locations in northern, central and southern Thailand were identified based on morphological characters of larvae and pupae. One new species, namely *S.* (*G.*) *adleri*, was collected from Bang Thao Mae waterfall, Krabi Province, in southern Thailand. All species are placed into 4 subgenera of the genus *Simulium* Latreille s.l. Sixteen *Simulium* species were restricted to the north whereas 5 species were found only in the south. Ecological studies of the southern breeding sites indicated that species distribution and species composition were related to some physical factors of the breeding sites, such as stream size and depth, and water velocity. Larval polytene chromosomes of 1,330 individuals of *Simulium striatum* consisting of *S. quinquestriatum* (255), *S. chiangmaiense* (451) and *S. nakhonense* (624) were examined. These species showed homosequential sequences of polytene chromosome banding patterns. All larvae of *S. quinquestriatum* were monomorphic. Although most larvae of *S. chiangmaiense* and *S. nakhonense* were monomorphic, some larvae had different floating inversions with low frequencies. *S. chiangmaiense* had 6 floating inversions (IS-2, IL-1, IIS-3, IIL-1, IIL-2 and IIIL-9) with frequencies of 0.004-0.03 whereas *S. nakhonense* had 12 floating inversions (IS-1, IIS–1, IIS–2, IIIS-1, IIIL-1, IIIL–2, IIIL–3, IIIL–4, IIIL–5, IIIL–6, III– 7 and IIIL–8) with frequencies of 0.01 – 0.04 (except IIIL – 2 and IIIL – 4). It is possible that *S. quinquestriatum* is the ancestor of *S. chiangmaiense* and *S. nakhonense* with separation of the two lines occurrng by different floating inversions. However, these three species may be conspecific species by having the same polytene chromosome banding sequences. Differences in larval and pupal morphologies of these species may be due to adaptation to different ecological microhabitats. Further study of the molecular genetics of these species should provide knowledge of the taxonomic status of this species-group.

Biodiversity and ecology of black flies (Diptera: Simuliidae) in northern and southern Thailand

Sanae Jitklang[1,]*, Chaliow Kuvangkadilok[1], Visut Baimai[1], Hiroyuki Takaoka[2] and Peter H. Adler[3]

*[1]Mahidol University, Bangkok, Thailand, *e-mail: sjitklang@yahoo.com, [2]Oita University, Oita, Japan, [3]Clemson University, South Carolina, U.S.A.*

The ecology of black flies in northern and southern Thailand was investigated. Larvae and pupae were collected from 65 stream sites in 10 northern provinces during the rainy, cool and hot seasons. An additional 18 sites in 9 southern provinces were studied. A total of 27 black fly species were identified from northern Thailand. Twenty-six species were found in the cool season, when the species richness and abundance were highest. A total of 18 species were found in 9 provinces in southern Thailand. *Simulium tani* was the most widely distributed species, occurring at 66.7% of sites in the South. Distributions of larval black flies in northern and southern Thailand were not random. Ecological analyses of stream sites revealed that air and water temperature, altitude, conductivity and salinity, dissolved oxygen, humidity, and stream size were important factors associated with the distributions of black flies in both regions. The polytene chromosomes of three described morphospecies in the *Simulium ceylonicum* group were examined from 52 sites in Thailand. Ten cytoforms were revealed on the basis of unique suites of fixed and floating inversions. All cytoforms appear to be good species, supported by chromosomal and morphological evidence. Three reproductively isolated cytoforms, for which sufficient specimens were available, were formally described as new species. The existence of chromosomally distinct entities in established morphospecies of the *S. ceylonicum* group supports a common trend of hidden biodiversity in Southeast Asian black flies. A preliminary study of symbionts showed that five groups of symbionts were found in larval black flies from northern Thailand: nematodes, microsporidia, chytrid fungi, trichomycete fungi and ichthyosporean protozoa.

Searching and ovipositional behaviors of the fruit fly parasitoid, *Diachasmimorpha longicaudata*

Sangworn Kitthawee
Mahidol University, Bangkok, Thailand, e-mail: grskt@mahidol.ac.th

Successful parasitism of parasitoids requires the processes of host habitat location, host location, host acceptance and larval development in the host. Parasitoids often respond to stimuli associated with both hosts and their habitats. They may use visual, acoustic or olfactory receptors to locate hosts. Questions concerning which stimuli can attract the solitary endoparasitoid, *Diachasmimorpha longicaudata*, to its tephritid fruit fly host were investigated. Results from laboratory studies of the stimuli affecting "searching and ovipositional behavior" showed that female parasitoids begin ovipositor-probing behavior when responding to sound and/or vibration produced by movement of host larvae within their microhabitat, and/or chemical stimuli derived from host larvae and/or host substrates. In nature, stimuli would be expected to be more complex. After parasitoids locate hosts, they may be faced with a sequence of decisions concerned with oviposition. The parasitoids may decide to use the hosts for oviposition or ignore them. If the hosts are accepted, parasitoids must decide to lay their eggs. A further question is what sex of egg should be laid? There is some evidence indicating that most solitary parasitoids lay male eggs in small hosts, and female eggs in large hosts. Thus, progeny sexes are under the decision of the female parasitoid. Another decision faced by female parasitic wasps results from their haplodiploid system, i.e., males develop from unfertilized eggs and females from fertilized eggs. This raises the question of how can female-biased sex ratios be achieved? This is because if a high proportion of female parasitoids is produced, their success at controlling host populations will increase. Thus, it is conceivable that the processes of searching and oviposition in parasitoids play an important role in a biological control program.

Ecological genetics and reproductive isolation of fruit fly parasitoids in the *Diachasmimorpha longicaudata* complex in Thailand

Sangworn Kitthawee
Mahidol University, Bangkok, Thailand, e-mail: grskt@mahidol.ac.th

The parasitoid *Diachasmimorpha longicaudata* is a beneficial wasp that is useful in biological control. Although *D. longicaudata* has been well studied, several researchers have documented and suggested that *D. longicaudata* is probably a species complex. Thus it is necessary to undertake genetic investigation of *D. longicaudata* populations in the field in order to understand their genetic diversity and to elucidate their taxonomic status. In this study, *D. longicaudata* samples were collected from several localities in Thailand. They were grouped into three forms (DLA, DLB and DLBB) based on host species. The PCR-linked single-strand conformation (PCR-SSCP) technique for nuclear DNA (28s and ITS2 regions) was used for investigating the molecular systematics of these *D. longicaudata* forms. Based on the 28s region, three different SSCP banding patterns were detected thus indicating that these three forms could be distinguished. The internal transcribed spacer (ITS2) region was amplified and PCR products were investigated. Three different products were found. Both SSCP patterns and PCR products of the 28s and ITS2 regions, respectively, suggested that genetic divergence exists within the *D. longicaudata* complex (DLA, DLB and DLBB). Moreover, results of cross-mating experiments among the three different forms of *D. longicaudata* provided evidence that these forms were reproductively isolated due to reproductive incompatibility. These results suggest that the three forms of *D. longicaudata* in Thailand are closely related species.

From captivity to conservation: the adaptive characteristics of the Thai aquatic firefly, *Luciola aquatilis*

Anchana Thancharoen
Kasetsart University, Bangkok, Thailand, e-mail: agrant@ku.ac.th

Luciola aquatilis sp. nov. Thancharoen (Coleoptera: Lampyridae) is a new species of aquatic firefly from Thailand. It is a common firefly species associated with freshwater area and possesses a wide distribution across Thailand. At present, this species is subjected to many negative impacts associated with human activity and urbanization, resulting in decreasing numbers and populations disappearing from many habitats. The successfully developed rearing technique of this species was not only useful for maintaining a complete life cycle for many generations, but also offers an opportunity for observing the duration and development of each instar, feeding habits, mating behavior and other biological data useful for consideration of developing conservation management practices of this species. There are several adaptive characteristics of *L. aquatilis* observed from laboratory culturing. Thus, the successful conservation of the fireflies is possibly done in the field.

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

Touchkanin Jongjitvimol* and Wandee Wattanachaiyingcharoen
Naresuan University, Phitsanulok, Thailand
**e-mail: jongjitvimol_t@hotmail.com*

Species surveys and sample collections of insects in the infraorder Aculeata in the north of Thailand were carried out from January 2006 to October 2008. The techniques of line transects and random sampling were used for sample collections. We found that in northern Thailand, the aculeates collected could be classified into 3 superfamilies, namely Apoidea Chrysidoidea and Vespoidea. A total of 120 species was recorded visiting flowers, from host plants and/or from colonies. The 86 specimens were identified to the species level and 34 specimens were identified to the genus level. These species belonged to 64 genera, 24 subfamilies and 9 families, namely Anthophoridae, Apidae, Chrysididae, Formicidae, Halictidae, Megachilidae, Scoliidae, Sphecidae and Vespidae. Family Formicidae (ants) had the highest species composition (50.83% or 61 species). Species diversity indices using Pielou's index in habitats were high, except in grassland, while dominance indices using Simpson's index indicated a simple structure. Sorensen's similarity coefficient showed that deciduous forest with bamboo and hill evergreen forest (0.6386), and primary forests combined and cultivated areas (0.6207) had similar aculeate species community structures.

Distribution, nest dispersion, nesting sites and nest structures of the stingless bee, *Trigona collina* Smith, 1857 (Apidae, Meliponinae) in Thailand

Touchkanin Jongjitvimol* and Wandee Wattanachaiyingcharoen
Naresuan University, Phitsanulok, Thailand
**e-mail: jongjitvimol_t@hotmail.com*

The stingless bee species, *Trigona collina* Smith, 1857, is distributed throughout Thailand. From 640 collected colonies, nesting sites were only found in the altitude range from 18 to 830 meters above sea level. Most nests located in mixed deciduous forests were found at an altitude lower than 400 meters above sea level. Nesting sites could be divided into 4 main groups: 1) cavities in tree trunks (15.63%), 2) cavities in termite mounds (42.60%), 3) underground cavities (33.75%), and 4) cavities in buildings (7.96%). A total of 47 colonies were studied and the results of a standardized Morisita index of dispersion within the study area showed that nest dispersion was strongly clumped ($p<0.05$). The pattern of nest dispersion in this species probably ensures an adequate number of mates in their mating range. The nest structure of *T. collina* is comprised of 5 main components: 1) the external entrance tube, 2) batumen barrier, 3) honey pots, 4) pollen pots and 5) brood cells. The batumen is a multilayered cover of the brood chambers. We suggest that the variation in the number of batumen layers in the nest of *T. collina* is associated with temperature regulation of the nests. Nest dispersion was investigated in a mixed deciduous forest at the Phitsanulok Wildlife Conservation Development and Extension Station.

The development time of the red dwarf honey bee *Apis florea* in Huai Kayeng Sub-District, Thong Pha Phum District, Kanchanaburi Province

Sitthipong Wongvilas*, Sureerat Deowanish, Siriwat Wongsiri
Chulalongkorn University, Bangkok, Thailand
**e-mail: wongvilas@hotmail.com*

The development times of *A. florea* workers, queens, and drones were studied in Huai Kayeng Sub-District, Thong Pha Phum District, Kanchanaburi Province, from March 2008 to July 2008. Five colonies of *A. florea* were used to study development times of eggs, larvae and pupae of workers, queens and drones. The development times of egg, larval and pupal stages of workers were 3.02 ± 0.57, 4.07 ± 0.64 and 9.57 ± 0.5 days (n=100), respectively. The development times of egg, larval and pupal stages of queens were 3.06 ± 0.76, 5 ± 0.67 and 7.19 ± 0.59 days (n=32), respectively. The drone's developmental times for eggs, larvae and pupae were 2.99 ± 0.39, 6.72 ± 0.45 and 12.73 ± 1.03 days (n=100), respectively. The total developmental periods from egg to adult of workers, queens and drones were 16.66 ± 1.08 (n=100), 15.25 ± 0.59 (n=32) and 22.44 ± 1.17 (n=100) days, respectively. Development times of workers and queens of *A. florea* from this study were shorter than those determined in previous research especially in the larval and pupal stages. Basic information from this research could be used to help community villagers understand important aspects of bee biology in order to preserve bees and make decisions for conservation of natural resources in the future, and to encourage sustainable resource utilization.

A taxonomic study of water striders (Hemiptera: Gerridae) in the Mae Klong River Basin, Thailand

Ezra Mongkolchaichana, Buntika Areekul Butcher and Chariya Lekprayoon
Chulalongkorn University, Bangkok, Thailand
**e-mail: Mukkalin86@hotmail.com*

Water striders play a major role as biological control agents. They live in various types of habitats, such as freshwater**,** brackish water and seashores, including the open sea. This study aimed to ascertain the taxonomy and distribution of water striders in the Mae Klong River Basin. Specimens were collected from stream and stagnant water in Kanchanaburi, Ratchaburi, Samut Songkhram Tak and Uthai Thani Provinces. From this study, a total of 5,550 water strider individuals were collected and identified into 20 genera, 36 species and 4 morphospecies. They are *Amemboa armata, Amemboa cristata, Amemboa dentata, Amemboa javanica, Amemboa riparia, Amemboa schwendingeri, Aquarius adelaidis, Cylindrostethus costalis, Cylindrostethus scrutator, Eotrechus hygropetricus, Gnomobates* sp., *Lathriobates johorensis, Limnometra ciliata, Limnometra matsudai, Limnometra* sp., *Limnogonus fossarum, Limnogonus nitidus, Metrocoris acutus, Metrocoris bilobatus, Metrocoris ciliatus, Metrocoris nigrofascioides, Metrocoris squamifer, Metrocoris tenuicornis, Naboandelus* sp., *Neogerris parvulus, Onychotrechus esakii, Pleciobates tuberculatus, Pleciogonus wongsirii, Ptilomerag jariyae, Ptilomera hemmingseni, Ptilomera tennaserim, Ptilomera tigrina, Rhagadotarsus kraepelini, Rheumatogonus intermedius, Rheumatogonus vietnamensis, Rheumatometroides insularis, Tennagogonus* sp., *Ventidius hungerfordi, Ventidius malayensis* and *Ventidius pulai*. *Rheumatometroides insularis* collected from Samut Songkhram Province was the first record for Thailand.

Development of a biotic index for rapid bioassessment in the Mekong II Sub-Basin, Thailand

Paiboon Getwongsa* and Narumon Sangpradub
*Khon Kaen University, Khon Kaen, Thailand, *e-mail: paiget1@yahoo.com*

The aim of this study is to develop a multimetric biotic index by using benthic macroinvertebrate community structures for wadeable streams in the Mekong II sub-basin in Thailand. The sampling method followed the rapid bioassessment protocol of the US EPA. Habitat assessment, water physicochemical measures and multihabitat instream sampling using D-frame dip nets for benthic macroinvertebrates were conducted in 15 streams. Three-hundred fixed-count subsamplings of benthic macroinvertebrates were performed in the laboratory. Samples were collected seasonally in a 2 year period from November 2005 through November 2007. Reference sites were established from positions in the headwaters (*a priori* method) with most located in preserved areas, whereas the test sites were situated in places with human activity. Spatial and temporal structure and composition of benthic macroinvertebrate communities were considered in reference and test sites. The *a priori* method for establishing reference status was not the best for stream classification due to there being intermittent stream types. Therefore *a posteriori* methods were used to classify 74 references sites into 46 types based on statistical analysis of physicochemical parameters, benthic macroinvertebrate data, and habitat assessment scores. Twenty orders, 108 families, 172 taxa, and 35,053 individuals of benthic macroinvertebrates were found. Of 72 metrics tested, 7 core metrics, including Beck's biotic index, EPT taxa, Hilsenhoff biotic index (HBI), intolerant taxa, % clinger organisms, % non-insect organisms, and scraper taxa, were calculated to determine a final biotic index score.

Diversity of Protura in Doi Inthanon National Park

Natdanai Likhitrakarn* and Jiraporn Tayutivutikul
Chiang Mai University, Chiang Mai, Thailand
**e-mail: kongerrrr@hotmail.com*

In this study of the diversity of Protura in Doi Inthanon National Park, Chiang Mai province, soil samples were collected six times from five different forest types chosen at 500 meter intervals. The forest types were dry deciduous dipterocarp forest, mixed deciduous forest, lower evergreen forest, upper evergreen forest, and cloud forest, respectively. At each site, 10 soil samples were collected using a 15 × 15 centimeters quadrant to a depth of 5 centimeters. The soil samples were then transferred to Berlese funnels for 72 hours for the extraction of soil arthropods. The proturan specimens were separated and permanent slides were made for each sample.

Identification of proturans in Doi Inthanon National Park, Chiang Mai province, resulted in records of 11 species and 2 subspecies. They include 3 described species (*Condeellum regale* (Condé), *C. ishiianum ishiianum* Imadaté, and *Silvestridia keijiana* (Imadaté)), and a newly recorded subspecies for Thailand (*C. ishiianum setosum* Imadaté). In addition, one new species was found (*Baculentulus inthanonensis* Likhitrakarn, Nakamura and Tayutivutikul, *in preparation*). Seven undescribed species (*Australentulus* sp., *Kenyentulus* sp. 1, *Kenyentulus* sp. 2, *Eosentomon* sp. 1, *Eosentomon* sp. 2, *Eosentomon* sp. 3, and *Eosentomon* sp. 4) also have a high probability of being new species. It was found that we could not use Berlese funnels for collecting proturans when soil samples are wet. This research demonstrates the potential richness of proturan fauna in Thailand, and additional studies should be continued and expanded.

Taxonomy of Gasteracanthine spiders (Araneae: Araneidae) in Thailand

Prasit Wongprom* and Kosol Charernsom
*Kasetsart University, Bangkok, Thailand, *e-mail: p_wongprom@hotmail.com*

The taxonomy of Gasteracanthine Spiders in Thailand was investigated from 2005-2007. All specimens were identified to tribe, genus, and species. Based on external morphology and genitalia, specimens identified up to the present time include 2 tribes, 4 genera and 12 species. All species recorded were as follows: *Macracantha arcuata* (Fabricius, 1793), *Thelacantha brevispina* (Doleschall, 1857), *Gasteracantha diadesmia* Thorell, 1887, *Gasteracantha geminate* (Fabricius, 1798), *Gasteracantha kuhli* C.L. Koch, 1938, *Gasteracantha hasselti* C. L. Koch, 1837, *Gasteracantha doriae* Simon, 1877, *Gasteracantha clavigera* Giebel, 1863, *Gasteracantha diardi* (Lucas, 1835), *Gasteracantha frontata* Blackwall, 1864 *Gasteracantha irradiata* (Walckenaer, 1842) and *Caerostris sumatrana* Strand, 1915. Among these, two morphospecies in the genus *Gasteracantha* were described as new species for Thailand.

Species diversity of stored product and house dust mites in Central Thailand

Ammorn Insung, Jarongsak Pumnuan and Ploychompoo Konvipasruang
King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

A survey of stored product and stored food mites as well as house dust mites was conducted in the central part of Thailand in the eight provinces, Singburi, Chainat, Angthong, Supanburi, Kanchanaburi, Petchaburi, Prachuabkirikhan and Lopburi. The study was conducted from January-June 2008. Four families of mite pests as well as four families of predatory mites were found. The mite pests were classified as Acaridae, Eriophyidae, Histiostomidae and Glycyphagidae. The predatory mites were classified as Aschidae, Bdellidae, Cheyletidae and Smarididae.

House dust mites were classified into three Families. The highest number occurred in the family Pyroglyphidae, followed by Glycyphagidae and Cheyletidae. The most abundant species was *Dermatophagoides pteronyssinus* (Trouessart), comprising 57.7% of mites, followed by *Blomia tropicalis* (Bronswijk), *Cheyletus* sp., *Dermatophagoides farinae* (Hughes) and *Euroglyphus maynei* Cooreman, with 33.3, 6.5, 0.5 and 0.5 % of mites, respectively.

Acaricidal activity of essential oils of medicinal plants against the house dust mite, *Dermatophagoides pteronyssinus* (Trouessart)

Ammorn Insung and Jarongsak Pumnuan
King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

Fumigation by essential oils obtained from 9 selected medicinal plants was applied to house dust mite, *Dermatophagoides pteronyssinus* (Trouessart). Essential oils at various concentrations of 0 (95% ethanol as control), 0.01, 0.05, 0.10, 0.50, 1.00 and 1.50% (0, 0.012, 0.060, 0.120, 0.600, 1.200 and 1.800 μg/cm^3) at a volume of 3 cm^3 were applied within a 2.5x10^4 cm^3 knockdown chamber. The fumigation period was 1 hour, and mortality of house dust mites was observed at 24 hours after fumigation. It was found that essential oils of clove, *Syzygium aromaticum*, and cinnamon, *Cinnamomum cassia*, were successful in killing mites with 100% mortality at a concentration of 1.00% (1.200 μg/cm^3) and resulted in LC_{50} valves of 0.092 and 0.232 μg/cm^3, respectively. Next were turmeric, cassumunar ginger, lemon grass and citronella grass which had LC_{50} valves of 0.561, 0.704, 0.811 and 0.935 μg/cm^3, respectively. Essential oil formulations with the main components being clove or cinnamon essential oils at 1% concentration were also tested. Essential oils of cassumunar ginger or citronella grass at 1% concentration were used as minor components together with various perfumes, lavender, jasmine blue gum and coffee at 2.5%. All formulations could completely kill mites, and coffee and jasmine perfumes were strong smelling.

Cercarial infections of freshwater snails in the family Thiaridae in the Northeast of Thailand

Duangduen Krailas* and Siriluk Chotesaengsri
*Silpakorn University, Nakhonpathom, Thailand, *e-mail: kduang@su.ac.th*

Cercarial infections of freshwater snails in the Family Thiaridae in the Northeast of Thailand were studied at twenty-eight sampling sites. The snails were collected every two months for one year for each sampling site which started and ended at varying times between February 2006 and October 2007. A counts per unit of time method and a scoop method were used in this study. Samples were collected every 10 minutes by five collectors. A total of 12,474 collected snails were classified into nine species. *Melanoides tuberculata* was the most common species comprising 60.88% (7,594:12,474) of collected snails. Cercarial infections were investigated using shedding and crushing methods. Eleven species of cercariae were categorized; they were *Cystophorous cercaria*, *Stictodora tridactyla*, *Apatemon gracilis*, *Centrocestus formosanus*, *Loxogenoides bicolor*, *Haematoloechus similis*, *Haplorchis taichui***,** *Acanthatrium hitaense*, *Mesostephanus appendicalatus*, *Cardicola alseae* and *Alaria mustelae*. Four species of snails were trematode hosts (1st intermediate hosts). They were *M. tuberculata*, *Melanoides jugicostis*, *Adamietta housei* and *Tarebia granifera* with infection rates of 22.80%, 6.80%, 0.66% and 0.15%, respectively. The number of cercarial-infected snails was 1,761, giving an infection rate of 14.12% (1,761/12,474). The infection rate of *L. bicolor* was 45.85% (801/1747); it was the most frequently infected snail species in this study. Double infections were found and consisted of three types. The first type was *S. tridactyla* and *C. alseae*, the second type was *L. bicolor* and *S. tridactyla*, and the third type was *A. hitaense* and *H. taichui*.

Variability in recruitment of non-native mussels *Mytilopsis adamsi* Morrison, 1946, in Haad-kaew Lagoon, Songkhla Province

Kringpaka Wangkulangkul* and Vachira Lheknim
Prince of Songkla University, Songkhla, Thailand
**e-mail: kringpaka@hotmail.com*

Mytilopsis adamsi Morrison, 1946 (Bivalvia: Dreissenidae) has been found for the first time in Thailand as an introduced species in Haad-kaew Lagoon in 2002. It is native to tropical West America; however, it has been reported to have invaded a number of ports in Indo-Pacific countries. According to many studies, *M. adamsi* is an eurythermic and euryhaline species, and also has high, rapid growth and a fast maturity rate. This mussel forms dense monocultures that exclude most other native species and subsequently there is an alteration in the biodiversity and community of infected areas. It can attach to all submerged structures, which causes economic problems. From background information, we suggest that *M. adamsi* has a high potential to invade and colonize the whole part of Thale Sap Songkhla's system. In order to control and manage this invasive species, an understanding of the basic biology and life history of *M. adamsi* is urgently needed.

The objective of this study is to investigate the spatial and temporal variability of recruitment and determine environmental parameters that may have effects on the success of recruitment. Investigated recruitment parmeters include larval supply and adult abundance and environmental parameters include salinity, water temperature, pH, dissolved oxygen and abundance of plankton. Recruitment data is essential for understanding the population dynamics of the mussel population. This is important for further study of *M. adamsi* and management of this species. This present study is possibly the first research regarding invasive mussels in Thailand.

Diversity of non-cropped vegetation, insects, and soil arthropods in relation to land management in Thong Pha Phum, Kanchanaburi

Chatchawan Chaisuekul*, Nipada Ruankaew Disyatat and Marut Fuangarworn
Chulalongkorn University, Bangkok, Thailand
**e-mail: chatchawan.c@chula.ac.th*

The non-cropped vegetation, insects on non-cropped vegetation, and soil arthropods were compared between an organic farm, a chemically-intensive orchard, and a forest edge in Thong Pha Phum, Kanchanaburi. Nine samplings were conducted every two months from August 2006 - December 2007. Non-cropped vegetation found in all three areas was predominantly pioneer and invasive plants, considered weeds in agricultural practice, such as Cogon grass (*Imperata cylindrical*), Siam weed (*Chromolaena odorata*), and Sensitive plant (*Mimosa pudica*), particularly after habitat disturbance either by herbicide spraying, weed mowing, and burning. The forest edge and the organic farm had higher Shannon-Weiner diversity indices of above ground insects and soil mites than the chemically-intensive farm. The diversity index and the complexity of trophic levels were also higher in plots dominated by Siam weed than any by other plants. This suggests that Siam weed may be a potential reservoir of beneficial insects, especially parasitoids. High Shannon-Weiner diversity indices were observed in the late rainy season (October) of both years implying that there was an influence of water and vegetation availability on diversity and complexity of the trophic level in a habitat. Management practices, particularly habitat disturbance such as herbicide spraying, weed mowing, and burning, in each habitat influenced the diversity of non-cropped vegetation and associated arthropods.

Sentinel system for pesticide contamination in agricultural areas of the Thong Pha Phum region

Noppadon Kitana*, Saowanee Sematong and Kallaya Zapuang
Chulalongkorn University, Bangkok, Thailand
**e-mail: noppadon.k@chula.ac.th*

Agriculture is an important activity in Thong Pha Phum region. Cultivation of crops requires extensive use of pesticides that may contaminate the environment and affect the health of organisms in the area including humans. The current research aims to develop a sentinel system for pesticide contamination, which includes, 1) a database of pesticide use and 2) animal species potentially useful as sentinels of contamination. Questionnaire surveys of farmers from Tambon Lintin and Tambon Huay Khayeng of Thong Pha Phum District, Kanchanaburi Province, showed that during 2006-2007 84% of farmers used pesticides in their agricultural activities. The most commonly used herbicides were glyphosate and paraquatdichloride and the most commonly used insecticides were methomyl, chlorpyrifos and parathion methyl. The heaviest use of herbicides occurred in May or at the beginning of the rainy season when farmers prepared their fields for new crops, and the heaviest use of insecticides occurred in April to control the outbreak of aphids. The results suggest the possibility of large quantities of one or more pesticides being used at the same time, leading to contamination of the environment. Preliminary surveys of animal species potentially useful as sentinels of pesticide contamination were conducted in natural habitats overlapping with agricultural areas. Several species of freshwater snails were selected as potential sentinel species. Further investigation of the biologic responses of these sentinel species together with information on pesticide use and types of pesticides to be monitored could be of importance for risk assessment of pesticide contamination in natural ecosystems as well as human settlements.