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Please provide summary information on the process by which this report has been prepared, including information on the types of stakeholders who have been actively involved in its preparation and on material which was used as a basis for the report

The Working Group on National Report comprises representatives from various agencies concerned including the Royal Forest Department, NGO's, Department of Fisheries, Academic Institutes and OEPP as the secretariat. The WG has met twice to review the report prepared by the secretariate.

Mountain Ecosystems

1. What is the relative priority your country accords to the conservation and sustainable use of biological diversity in mountain ecosystems?					
a) High		b) Medium	X	c) Low	
2. How does your country assess the resources available for conservation and sustainable use of biological diversity in mountain ecosystems, both domestic and international?					
a) Good		b) Adequate		c) Limiting	X
3. Has your country requested financial assistance from GEF for funding the activities for conservation and sustainable use of biological diversity in mountain ecosystems?					
a) no Because Thailand has not yet ratified CBD.					X
b) yes, please provide details					

Assessment, Identification and Monitoring

4. Has your country undertaken any assessment of direct and underlying causes of degradation and loss of biological diversity of mountain ecosystems?	
a) no (please specify the reasons)	
b) yes, please specify major threats and their relative importance, as well as gaps	
c) If yes, please specify the measures your country has taken to control the causes of loss of mountain biodiversity Thailand has taken some assessment to identify causes of mountain biodiversity loss and degradation. Some program of activities has been carried out to halt destroying forest areas on the mountain. The programs have focused on providing incentives to the hill tribe people to sustainable use the mountain areas.	X
5. Has your country identified taxonomic needs for conservation and sustainable use of biological diversity of mountain ecosystems?	
a) no, (please specify the reasons) Thailand has identified our taxonomic needs for conservation and sustainable use of biodiversity in the holistic approach not specific to the mountain ecosystem.	X
b) yes, please specify	
6. Has your country made any assessment of the vulnerability or fragility of the mountains in your country?	
a) no, please specify the reasons Thailand has made some assessment of the vulnerability of some taxonomic group living on the limestone mountain, but not the vulnerability of the overall mountain ecosystem.	X
b) yes, please specify the results and observed impacts on mountain biodiversity	

7. Has your country made any assessment important for conservation of biological diversity of mountain ecosystems at the genetic, species and ecosystem levels? (You may wish to use the Annex I of the Convention for categories of biodiversity important for conservation)	
a) no, please specify the reasons	
b) yes, some assessments or monitoring undertaken (please specify) Importance assessment of flora and fauna of some mountain site and some kinds of mountain has been made already but there is no assessment in the overall picture of the country. Examples of the assessment are attached herewith	X
c) yes, comprehensive assessments or monitoring programmes undertaken (please specify where results can be found, and opportunities and obstacles, if any)	

Regulatory and Information System and Action Plan

8. Has your country developed regulations, policies and programs for conservation and sustainable use of biological diversity in mountain ecosystems?	
a) no Thailand has not yet developed regulations policies and programs specifically for the mountain ecosystem.	X
b) yes, please specify sectors	
9. Has your country applied the ecosystem approach (adopted at COP 5) in the conservation and sustainable use of biological diversity in mountain ecosystems?	
a) no	X
b) yes, please provide some cases or examples	
10. Does your national biodiversity strategy and action plan cover mountain biological diversity?	
a) no, please specify why	
b) yes, please give some information on the strategy and plan, in particular on mountain biodiversity	X
11. Has your country disseminated the relevant information concerning management practices, plans and programmes for conservation and sustainable use of components of biological diversity in mountain ecosystems?	
a) no	X
b) yes, please provide details where information can be retrieved concerning management practices, plans and programmes	

Cooperation

12. Has your country undertaken any collaboration with other Parties for conservation and sustainable use of biological diversity in mountain ecosystems at the regional level or within a range of mountains?	
a) no	X
b) yes, please specify the objectives of this collaboration and achievements	
13. Has your country signed or ratified any regional or international treaty concerning mountains?	
a) no	X
b) yes, please specify which treaty and provide as much as possible a report on the progress in the implementation of the treaties, including any major constraints in the implementation of the treaties	

Relevant thematic areas and cross-cutting issues

14. Has your country taken account of mountain ecosystems while implementing thematic programmes of work on agricultural; inland waters; forest; and dry and sub-humid lands biological diversity?	
a) no	X
b) yes – but in only one or two thematic programmes of work	
c) yes, included in all programmes of work	
d) if yes, please specify details	
15. Has your country taken any measures to ensure that the tourism in mountains is sustainable?	
a) no , please specify why	
b) yes, but in early stages of development (please specify the reasons)	X
c) in advanced stages of development (please specify the reasons)	
d) relatively comprehensive measures being implemented (please specify the reasons)	
16. Has your country taken any measures to protect the traditional knowledge, innovations and practices of indigenous and local communities for conservation and sustainable use of biological diversity in mountain ecosystems?	
a) no	
b) not relevant	
c) yes, but in early stages of policy or programme development	X
d) yes, in advanced stages of development	
e) some programmes being implemented	
f) comprehensive programmes being implemented	

17. Has your country developed any programmes for the protection of natural and cultural heritages in the mountains?	
a) no Thailand has no programmes specific for the protection of natural heritages in the mountains.	X
b) yes, please provide some information in the programmes	
18. Has your country established protected areas in mountains?	
a) no	
b) yes, please specify the percentage of mountains under protected areas out of total mountain areas in your country It is estimated that 60% of the mountains are under protected areas.	X
19. Has your country undertaken any activities to celebrate the International Year of Mountains and Eco-tourism?	
a) no	
b) yes, please specify Thailand has establish a National Committee on International Year of Mountains 2002 which chaired by Deputy Prime Minister. The Committee is responsible for establish the strategy and plan to protect mountain ecosystem.	X

Case-studies

Please provide case-studies made by your country in conservation and sustainable use of biological diversity in mountain ecosystems.

Further comments

Note from 7:

Abstract : Terrestrial Microsnails Biodiversity in Thailand

The taxonomy of terrestrial microsnails from almost all limestone areas in Thailand was studied from 1996-1999. Two hundred and forty-eight species were reported, of which more than 9000 are new to science. The habitats are various, from limestone walls to caves and leaf litter. The two dominant families are Vertiginidae and Diplommatinidae. In the whole southeast Asian region, Vertiginidae is dominant on the mainland while Diplommatinidae is dominant on islands such as Sumatra, Java and Borneo. Shell morphological study, and especially the SH/SW ratio, can be used to distinguish vertiginids from diplommatinds, except for *Boysidia tholus*. Radula and apertural dentition particularly in vertiginids, are excellent characteristics for classification of the two families. Therefore, a dichotomous key of apertural dentition was constructed. A preliminary study of phylogenetic analysis using genes COI and 16S rDNA has been started. The initial results look very promising for the analysis of snails in this region.

Key words : Vertiginidae, Diplommatinidae, Terrestrial microsnails, Biodiversity

Abstract : Diversity and Evolution of Small Mammals in Thailand

Caves and fissure Fillings are the most suitable places for the accumulation of vertebrate fossil material. However, in most cases, the fossil concentration of bones is the result of predator activity, either small (owls) or large (carnivores), and in these cases, the fossil communities show an association of species well representative of the corresponding ecosystem. Therefore, to reconstruct the history of biodiversity and the processes of the deposits, the study of karstic fissures and cave fillings is the best approach. They are numerous and usually yield very abundant fossil microvertebrates, especially for the late Tertiary and the Quaternary periods. Additionally, preservation of bones is enhanced by the limited amount of weathering within caves and their alkaline environment. There are many caves in limestone mountains all over Thailand but Western especially the kanchanaburi area provides an exceptionally high number of karstic fissures and caves. This area is also the most active area in Thailand for limestone mining, because of its proximity to Bangkok. Therefore, a detailed survey of limestone quarries of Kanchanaburi area provides the easiest way to find new localities rich in fossils. Small mammals are good indicators of the paleoenvironment and of paleoclimatic conditions because they are extremely dependent on vegetation cover. They are also easy to identify at the species level with the help of their teeth and on the basis of a comparative study with extant species. The fossil communities can include extinct species, species which show more primitive characters than the extant ones, extant species which had a different geographic distribution in the past and also numerous extant species. Therefore the study of the change in species composition through the Plio-Pleistocene will provide important information not only concerning the origin and evolution of extant micromammal communities, but also the paleoenvironmental changes which were driving these changes. The study of karstic and cave micromammals is the most promising way to understand the history of biodiversity. Seven localities were discovered in this study. Thirty-five species of rodent were found. Of these, 5 species are new. These fossils show that the environment and climate changed through time from grassland mixed with forest at 3-4 million years ago to forest in the present day. The radiation of rodents is related to the development of forest.

Key words : Rodentia, Pliocene-Pleistocene, Paleoenvironment, Paleoclimate, mammal, cave

Abstract : The framework species method of forest restoration is designed to restore diverse forest ecosystems on degraded forestland for biodiversity conservation or environmental protection. It involves planting 200-300 tree species to rapidly re-establish basic forest structure and ecological functioning, whilst accelerating natural forest regeneration. Framework tree species are those with high growth and survival rates when planted out in degraded areas. They should have dense spreading canopies to shade out herbaceous weeds and should provide resources to attract seed-dispersing wildlife. Tree planting restores basic ecosystem structure and function, whilst seed-dispersing wildlife re-establishes biodiversity and the original tree species composition of the forest.

Key words : forest restoration, tree species selection, seasonally dry tropical forest, frameworks tree species.

Abstract : In 1996 a project on plant-animal relation, with particular emphasis on gibbon diet and seed dispersal of trees, was initiated in the Mo Singto area of Khao Yai National Park, an area in which gibbon (*Hylobates lar*) had been studied since 1979. The major activity in this project has been the establishment of a forest dynamics plot on which all food-producing the study of gibbon diet and ranging behavior, and is now permitting new studies of the effects of seed dispersal on forest dynamics. The Mo Singto forest dynamics plot has now had a complete inventory of trees ≥ 100 cm in dbh, and the vines (primarily woody climbers) and ground flora are now also being compiled. There are 181 species offers ≥ 10 cm dbh, in 59 families and 135 genera. The most abundant families are Lauraceae (11.54% of stems), Elaeocarpaceae (6.97% of stems), Aquifoliaceae (6.70% of stems), Meliaceae (6.16% of stems) and Icacinaceae (5.74% of stems). The ground flora includes 116 identified species, and so far 86 species of woody climbers have been identified. The 28.6-ha plot has mapped with GIS and both trail maps and elevation maps with 5-m contours are being prepared. Studies of seed dispersal in selected tree species, gibbon ranging, dung beetle ecology, and population dynamics of *Aquilaria crassna* (mai hom tree) have been in progress.

Key words : *Hylobates lar*, Khao Yai National Park, forest dynamics, gibbons, seed dispersal

Abstract : Habitat fragmentation involves the reduction and isolation of natural area, and is a serious threat to wildlife. An important objective for wildlife managers is to identify species that are sensitive to fragmentation and the specific ecological consequences of fragmentation to which each species is sensitive. Large mammals are targeted by poachers and are among the first wildlife to disappear from forest following fragmentation. In this study, the distributions of large mammal and the composition of mammal assemblages were compared across forest conditions ranging from small fragments to extensive transboundary areas. Interview surveys of rangers and local people were used to determine where large mammals were concentrated inside reserves. Systematic camera-trapping and sign surveys were done in these areas for carnivores, ungulates and other large mammals. Encounter rates of signs and capture rates from camera-traps showed that large mammal composition and abundance varied between sites. Transboundary rainforests on the Thai-Malaysia border had the most abundant populations of focal species (elephants, wild cattle and tigers), the highest traffic of large mammals, and were species rich for ungulates. Forest that are narrow and internally fragmented by roads have the poorest large mammal faunas and lowest traffic mammal traffic. Geographic Information System (GIS) databases were used to map distributions of large mammals within two study areas, and assess how different species are affected by human disturbances in the landscape. At rainforest sites, carnivore abundance was influenced by factors such as proximity to roads, drainages, and levels of prey. Large ungulates (sambar and gaur) distributions were highly predictable inside another large reserve, suggesting close affinities with habitats, including saltlicks and grasslands managed by annual burning. Bear and elephant distributions were less predictable and possibly more influenced by the patterns of hunting inside themselves. In general, poaching inside Thai reserves and the internal fragmentation of reserves by roads that facilitates access to poachers,

are arguably the most serious threats to large mammals, especially those with commercial value either alive or dead. The research was conducted in collaboration with Royal Forest Department staff, students and local people. Field methods developed during the project were taught to these individuals through on-the-job training and special training courses.

Key words : habitat fragments, large mammals, forest complex, protected area

Abstract : Investigation of Wild Orchids and Research for Development of Ecotourism in Muang and Pangmapa District, Maehongson Province

Maehongson, the beautiful province of hills, with a biodiversity of attractive plants especially orchids, is situated near the Myanmar border northwest of Chiangmai. It is the best place for biological conservation and for admiring wild orchids. Research work on wild orchid conservation would be beneficial for local villagers in earning income from ecotourism. This project has resulted in co-operative work between researchers and villagers at Ban Huay Hi, Ban Huey Suatao in Muang district as well as Ban Tamlod in Pangmapa district. Biological surveys of wild orchids were made in fertile tropical rain forests accompanied by the mentioned villagers. Project activities have taken place with heartfelt collaboration of the hill tribes. Orchids of 172 species in 61 genera were collected and identified. Most of them were epiphytes and their foreign seasons were recorded to be from January-May. Local villagers and researchers agreed on trails with many wild orchids that would make good on the way for tourist attractions. For sustainable conservation, formulation of easy-to-do aseptic media for seed culture was researched. The germination medium, BRT1, contained orchid fertilizer, vitamins, table sugar, banana and agar. In addition the transflask medium, BRT2, was prepared by adding 50 g blended potato into the germination medium. Both media gave good seed germination and seedling development of *Dendrobium chrysotoxum* Lindl. As compared to a modified Vacin-Went medium. This technical-knowhow will be transferred to villagers so that they can propagate orchids. Practical training on seedling care was provided to villagers. Large sized 6-month old seedlings of *Rhynchostylis gigantea* (Lindl.) Ridley in flasks, were grown at the homes of co-workers in the villages. After having experience, ten thousand seedlings of *Dendrobium chrysotoxum* Lindl., developed from seeds collected from Maehongson forest, were transplanted and nursed at the residences of the villagers. The seedlings thrived in their environment. Vigorous seedlings were chosen to attach to the forest plants along the tourist trail to hopefully make a flower attraction.

Key words : wild orchids, seed propagation, ecotourism

Abstract : Genetic Studies of the Genus *Afgekia* Craib (Leguminosae) in Thailand

The genus *Afgekia* Craib is a small genus consisting of only three species, i.e., *Afgekia sericea*, *A. mahidolae* and *A. filipes*. All these species are wild perennial plants and woody climbers. The first two species have been found only in Thailand and are investigated in this study. *Afgekia sericea* is widely distributed throughout the northeastern region. However, *A. mahidolae* is confined to open limestone and is distributed sporadically in small populations in western Thailand. The chromosome complement of both species are very similar and are characterized by small chromosomes of metacentric and submetacentric types. They are also morphologically similar. Based on these data, the two taxa may have arisen as a result of allopatric speciation through the processes of allelic change and/or chromosomal rearrangements in different geographical populations of the ancestral species. Both *A. sericea* and *A. mahidolae* have been recognized as rare species in Thailand. Significantly, natural populations of these plants are highly vulnerable to habitat loss due to deforestation. Thus, information on genetic variation is required for conservation strategies. Data from Shannon's information index indicated that 48.2% of the variation occurred between populations and 54.8% within populations for *A. sericea*, whereas *A. mahidolae* populations exhibited 58.65 and 41.0% for within and between

populations, respectively. These data can help in designing strategic *in situ* conservation programs for these rare species in Thailand.

Key words : *Afgekia sericea*, *Afgekia mahidolae*, speciation, conservation

MICROALGAE AND LICHENS IN THE NORTHERN PART OF THAILAND

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Surveys and collections of microalgae and lichens were conducted both in the cultivated and undisturbed areas in 8 provinces in the North, these included; Tak, Sukhothai, Pisanuloke, Utaradit, Prae, Lumpang, Lumpoon and Chiang Mai. More than 110 genera of microalgae were identified from about 1,00 collected samples while 91 genera of were found in 418 lichen samples. The alga *Aphanochaete* sp. and some other specimens are rare species.

BIODIVERSITY OF MACROFUNGI IN THE WILDLIFE SANCTUARY DEVELOPMENT AND RESERVATION EXTENSION STATION, KHAO KHEAW, CHONBURI

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Surveys and collections of macrofungi, averaging 2-3 days per month, were conducted during the rainy season (May – October) of 1997 and 1998, in the areas of the Khao Kheaw Wildlife Sanctuary Development and Reservation Extension Station, Chonburi Province. A total of 267 samples were collected. Among these, 96 samples to genus (38 genera) and 64 samples to family (8 family).

A FIELD SURVEY AND COLLECTION OF MACROFUNGI IN THE TON-NGA-CHANG WILDLIFE SANCTUARY AND NEARBY AREAS

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The purpose of this study was to conduct a survey of the diversity of macrofungi in the Ton-Nga-Chang Wildlife Sanctuary and nearby area. Periodic excursions into the woodland, grassland, orchard and seashore areas and regular visits to markets in the area were made during 1993 – 1997. 354 macrofungi were collected, recorded and identified. They were classified into 140 genera of 67 families and grouped into 30 orders and 3 classes (Myxomycetes, Ascomycetes and Basidiomycetes).

THE FAMILY COMMELINACEAE IN PHU PHAN NATIONAL PARK

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A study of the family Commelinaceae in Phu Phan National Park was conducted from October 1996 to March 1998. There were 6 genera and 21 species; *Aneilema herbacum* (Roxb.) Wall. Ex Kunth., *Anneilema* sp., *Commelina benghalensis* L., *C. clavata* C. B. Clark, *C. diffusa* Burn. f., *C. kurzii* C. B. Clark, *C. oblique* Ham, *Cyanotis axillaris* Roem. & Schult., *C. barbata* Don, *C. cristata* Roem. & Schult., *C. villosa* Schult. & Hong, *M. nudifera* (L.) Brenan., *M. scapiflorum* (Roxb.) Royle, *M. spectabilis* (Kurz) Faden, *M. spirata* (L.) Bruckner, *Murdannia* sp. 1 and *Murdannia* sp. 2.

An anatomical study of leaves, leaf sheaths and stems of all species was conducted using the peeling method and cross sections. Hairs, stomata, epidermal cells and mesophyll cells were found to be useful for classification.

A STUDY ON MORPHOLOGY, CHROMOSOME AND POLLEN OF THE FAMILY ZINGIBERACEAE IN PHU PHAN NATIONAL PARK

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The morphology, chromosomes and pollen of plants in the family Zingiberaceae in Phu Phan National Park were studied between August 1997 and July 1998. A total of 47 plant specimens in 9 genera and 40 species were collected. The specimens collected belong to *Alpinia*, *Amomum*, *Boesenbergia*, *Curcuma*, *Elettariopsis*, *Globba*, *Kaempferia*, *Stahlianthus* and *Zingiber*. Among these, 32 species were identified, 37 species were described and 39 species were chromosome counted. The pollen of ten species were studied by acetolysis method; four species were studied by scanning electron microscope and also described. The rest of the collected specimens will be carried out. Two species are probably new to science.

MORPHOLOGICAL DATABASE OF FRUITS AND SEEDS OF TREE IN DOI SUTHEP-PUI NATIONAL PARK

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Doi Suthep-Pui National Park supports an exceptionally high diversity of vascular plants. Surveys conducted by J. F. Maxwell since 1987 have enumerated a total of 2,145 species to date, of which 447 are trees. The aim of this study was to provide baseline data for conservation and forest restoration research in Doi Suthep-Pui National Park. The software package FoxPro was used to develop a database of fruit and seed morphology based on data collected from 140 of these tree species. The database facilitates analysis of this data for a variety of purposes. For example, 75 tree species had fleshy fruits, 40 tree species had dry dehiscent fruits, 22 tree species had dry indehiscent fruits and only 3 tree species had multiple fruits. Fleshy fruits were found all year round, but dry fruits were found primarily between September and November. Large fruits (>2 cm length) were also found throughout the year, whereas the peak fruiting period for small fruits (<2 cm length) occurred between August and November. Database output of this kind is of considerable value for research in forest restoration and related fields.

STUDY OF PLANT DIVERSITY IN PHU PHAN NATIONAL PARK

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A study of plant diversity in Phu Phan National Park was conducted from April 1997 to May 1999. A total of 1,835 specimens were collected. The specimens were classified into 13 families, 23 genera and 40 species of ferns, 2 families 2 genera and 2 species of gymnosperms, 19 families, 75 genera and 122 species of monocotyledons, and 94 families, 267 genera and 398 species of dicotyledons. Among these specimens, six taxa are probably new to science, two are new records for Northeastern Thailand and many endemic species were found. Specimens were described and photographs and slides were taken. All data are being compiled into a specimen database, which is being prepared in Microsoft Access and on a Homepage. Plant communities in 4 sample plots (100x100m) in dry dipterocarp forest were investigated. The dry dipterocarp forest can be divided into three dominance-type, the *Shorea obtusa-Sindora siamensis* type, the *Shorea obtusa-Dipterocarp obtusifolius* type and the *Dipterocarpus tuberculatus-Parinari anamense* type.

DIVERSITY OF GROUND FLORA ALONG MAE MON STREAM ALTITUDE 475 TO 575 METRES AT CHAE SON NATIONAL PARK, LAMPANG PROVINCE

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A survey of the vascular ground flora along Mae Mon Stream at Chae Son National Park, Lampang Province was conducted from April 1996 to March 1997. The survey area extended from the headquarters at 475 m to a reservoir at 575 m, the total length of the area being c. 2.6 km. Collecting was done twice per month and effort was made to collect both flowering and fruiting material of all species here. The specimens were collected, proper detailed notes taken, pressed and preserved by drying at the CMU Herbarium, where identifications, specimen processing, distribution, and filling were carried out. A total of 172 plant specimens were collected, of 45 families, 99 genera, 128 vascular plants species including some epiphytic and epilithic species along the water fall and outcrops along the stream. Detailed descriptions of 81 species were made.

ENVIRONMENTAL RISK ASSESSMENT OF PLANNED ECOTOURISM IN SUNPUNDAN WILDLIFE SANCTUARY, MAE HONG SON PROVINCE

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Sunpundan Wildlife Sanctuary is in the process of the declaration. The present focal point for ecotourism is a small marsh called Pong Saen Pig. Therefore the study area started from this marsh and was expanded to cover a village called Ban Huai Nam Pong. Most tourists go bird watching at Pong Saen Pig.

Collected data consisted of 2 main types; existing tourism characteristics and ecotourism resources which were observed by field census and survey of local people; and physical resources, ecological resources, human use and quality of life values, which were subject of environmental risk assessment.

Birds should be a key resource for ecotourism; 72 species were easily found and identified within this small area. Moreover, there were about 600 individuals of four dominant species at Pong Saen Pig; the Mountain Imperial Pigeon (*Ducula badia*), the Parakeet (*Ptilinopus finschii*), the Thick-billed Pigeon (*Treron curvirostra*) and the Vernal Hanging Parrot (*Loriculus vernalis*). These four species are very attractive in terms of themselves and their relationships with the marsh. The most serious potential impact of ecotourism is on this bird community, but because there are few tourists at present, there has not been any observed change in this community. Other wildlife, orchids, hot springs and the way of life of local people are alternative choices for tourists. To minimize impacts on natural resources and the local community, control

of ecotourism was recommended by zoning, offering certain activities, determining carrying capacity and management.

CYTOGENETIC STUDIES OF SOME ANIMALS IN PHU-PHAN NATIONAL PARK

Cytogenetic studies were conducted of some animals in Phu-Phan National Park from January 1997 to January 2000 by using bone marrow cells of amphibians and reptiles and hepatic caeca cells of insects. Diploid chromosome numbers of amphibians were determined for one species of family Bufonidae ($2n=22$), six species of family Microhylidae ($2n=24-28$), eight species of family Ranidae ($2n=26$) and one species of family Rhacophoridae ($2n=26$). Chromosome numbers of reptiles were determined in 14 species and consisted of four species of family Gekkonidae ($2n=32-44$), five species of family Agamidae ($2n=34-36$), three species of family Scincidae ($2n=28-32$) and two species of family Columbridae ($2n=30-32$). Karyotype of twenty-nine species of insects in the order Orthoptera were studied including twenty species of family Acrididae ($2n=20-30$), six species of family Tettigonidae ($2n=22-36$), one species each of the family Pyromorphidae ($2n=22$), Gryllidae ($2n=12$) and Gryllotalpidae ($2n=16$).