A

H. tokyoensis from Aichi
H. nebulosus
H. tokyoensis from Kanagawa
H. lichenatus

Nel’s (1978) D

B

0

Modified Rogers’ D

C

0

Modified Rogers’ D
Fig. 2

A

\[ \text{Nei's (1978) D} \]

B

\[ \text{Modified Rogers' D (Wright, 1978)} \]
Taxonomy, cytology, and phytogeography of *Potentilla* sect. Leptostylae (Rosaceae) in the Sino-Himalayan region

Hirono IKEDA (Okayama University of Science)

![Images of Potentilla species](image.png)

**Fig. 2.** Distribution of section Leptostylae (1) species excluding the *Potentilla helluo* group. Shading indicates the distribution of *P. aconitifolia* L.

**Fig. 3.** Distribution of section Leptostylae (2) *Potentilla taurica* group.

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1. A systematic revision of *Potentilla* sect. Leptostylae in the Sino-Himalayan region.

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**Morphological characters**

a. Life forms based on branching patterns
b. Stipules of radical/cauline leaves
c. Inflorescence
d. Number of stamens
e. Chromosome numbers
Species of sect. Leptostylae in Nepal

<table>
<thead>
<tr>
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<tr>
<td>1. P. commutata</td>
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<td>[SeqID data]</td>
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<tr>
<td>2. P. nepalensis</td>
<td>[Chrom data]</td>
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<tr>
<td>3. P. variegata</td>
<td>[Chrom data]</td>
<td>[SeqID data]</td>
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</table>

Materials for molecular analysis

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Source</th>
<th>Information</th>
</tr>
</thead>
<tbody>
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<td>Surveys</td>
<td>China: NW Vawna (9): 157.1 (1997)</td>
<td>[Survey data]</td>
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<td>E: Nepal: Dawa (Nepal) (96: 157)</td>
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<td>[Survey data]</td>
</tr>
</tbody>
</table>

M: size marker
1: P. commutata
2: P. smithiana
N: negative control

P. cardoniana
Conclusion

1. 25 species of *Ponanilla* sect. Leptostylae can be recognized in the Sino-Himalayan region.
2. Molecular analysis suggests that sect. Leptostylae is monophyletic.
3. "Leptostylae clade" is divided into two sister clades which correlate with two groups. Micropylaeae and Leptostylae.
4. Molecular analysis also suggests that close related species do not always share same ploidy level nor similar geographical distribution.
EVO LUTION OF BROWN FROGS IN EAST ASIA

Masafumi Matsui
Graduate of School Human and Environmental Studies, Kyoto University, Japan

Compared with tropical regions like Borneo, anuran fauna of temperate East Asia is much limited in biodiversity. This situation, however, means that alpha-level taxonomy has been nearly completed in several frog groups, and our study is in the stage of beta-level (estimation of phylogenies among anuran taxa) and of gamma stage (inferring evolutionary history). One example is brown frogs of the *Rana temporaria* group of Boulenger (1920). This group generally includes morphologically very similar species and are notoriously difficult to classify. Therefore, their phylogenetic relationships are still poorly understood, and although some electrophoretic and karyotypic studies elucidated relationships among some members of brown frogs, the resultant phylogeny does not necessarily agreeable among authors. On the other hand, Dubois (1992) split the subgenus *Rana*, which corresponds to so-called brown frogs, into six species groups. However, such groups ideally should be established after phylogenetic relationships among species are well clarified. By comparing partial sequences of mtDNA cytochrome b genes, we biochemically elucidated phylogenetic relationships and inferred evolutionary history among species of east Asian brown frogs of the genus *Rana*. Common ancestor of these frogs is suspected to have 26 chromosomes and bred in lentic water. From this common ancestor, the ancestor of the present *R. amurensis* and of all other present species seem to have diverged. The latter stock seems to have given birth to 1) a stock that led to *R. sauteri* from Sanyi, Taiwan, and Japanese *R. tagoi* at the periphery of the Chinese continent, 2) a stock leading to *R. okinavana* from Okinawa, *R. sauteri* from Wulai, Taiwan, and *R. tsushimensis* from Tsushima, also at the continental periphery, and 3) another stock that gave rise to the remaining species with 26 chromosomes (e.g., *R. japonica*) at wider areas including the inner continent. The first lineage seems to have adapted to a new breeding habitat of lotic water, and an isolated population in Taiwan among the second lineage also invaded the lotic water, resulting in convergence with the first lineage. Some of the third lineage seem to have given birth to a stock with 24 chromosomes that has quickly evolved in regions surrounding current Japan Sea and given rise to several lineages that are now different genetically [*R. pirica*, *R. dybowskii*, an undescribed species (Tsushima and Korea), *R. chensisensis*, *R. huanrenensis*, and *R. ornativentris*]. These species might have invaded areas overlapping with those already occupied by descendents of frogs with 26 chromosomes. Thus, results of our phylogenetic analyses were generally inconsistent with the classification by Dubois (1992), and validity of his six species groups was not supported. The methodology I introduced with the example of studies on east Asian brown frogs will be applied to much richer anuran fauna of Borneo as the second stage of biodiversity studies, and laboratory studies paralleled with field surveys of anuran fauna, will surely deepen the understanding of great natural heritages endowed to this island.

Date of Presentation
26th August 2003
Genus Rana?
<Neighbor-joining>

エゾアカ

チョウセンヤマアカ

2N=24

ヤマアカ

ニホンアカ

ツシマアカ

リュウキュウアカ

2N=26

タゴ

ナガレタゴ

ウシガエル

アフリカツメガエル

0.05
(Dubois, A. 1992)  (DNA analysis)

**Rana**

2N=24

**Group R. chensinensis**
- *R. ornativentris*
- *R. sp.* (サハリン)
- *R. pirica*
- *R. dybowskii* (対馬、韓国)
- *R. dybowskii* (沿海州、中国東北部)
- *R. semiplicata*
- *R. chensinensis* (中国東北部)
- *R. chensinensis* (中国中西部)

R. huanrenensis

2N=26

**Group R. japonica**
- *R. omeimontis*
- *R. longicrus*
- *R. japonica*
- *R. amurensis*

**Group R. amurensis**
- *R. amurensis*

**Group R. tagoi**
- *R. tagoi*
- *R. sakuraii*

R. tagoi

**Group R. temporaria**
- *R. okinavana*
- *R. tsushimaensis*
- *R. huanrenensis*

**Group R. okinavana**
- *R. okinavana*
- *R. tsushimaensis*
- *R. suteri* (烏来)

**Pseudorana**

*R. suteri*
Common ancestor of East Asian brown frogs

2n=26 chromosomes

Lentic breeder
Ancestor of *R. amurensis*

Common ancestor of frogs with 2n=24 chromosomes

3) Common ancestor of other forms
CHECKLIST OF VERTEBRATES OF SABAH AND HABITAT CLASSIFICATION
KNOW VERTEBRATE SPECIES IN SEVEN PROTECTED AREAS IN SABAH

Masaaki Yoneda
JICA Advisor / Sabah Parks
Block B, Komplek Sinsuran, P.O.Box 10626, 88806 Kota Kinabalu, Sabah

1. Introduction

Checklist of animals and plants is necessary for a catalog of fauna and flora of focused area, and also for comparative study of biological communities among the areas. Several nature history books published by the Natural History Publications (Borneo) include checklists of Sabah and Borneo. Most of studies for protected areas management also attach inventory data of the area. However, a checklist compiles vertebrate species of Sabah and protected areas is not published. A checklist is prepared for comparative study of vertebrate species known in seven protected areas in Sabah as a background data for Crocker Range Park management plan. It is also expected that the checklist is used as standard list of scientific name for record of inventory and collections. The inventory in protected areas in Sabah is still not enough except few areas, like as Kinabalu Park. Number of species in the protected areas will increase after detail study in the areas. The systematic situation of several species will be reviewed and be changed in future. New species will be found and added to the checklist of Sabah. The checklist should be revised regularly.

2. Target area and number of known species

Target areas and habitat classification

Seven protected areas in Sabah, Crocker Range Park (CRP), Kinabalu Park (KP), Tawau Hill Park (THP), Maliau Basin (MB), Tabin Wildlife Reserve (TWR), Kulamba Wildlife Reserve (KWR), and Kinabatangan Wildlife Sanctuary (LK) are selected as target areas of the checklist. Known vertebrate species of each protected areas are listed from existing reports. Known species in Sabah and Borneo are also shown in the checklists. Crocker Range Park and Kinabalu Park are located in western mountain area in Sabah. Tabin Wildlife Reserve, Kulamba Wildlife Reserve, Kinabatangan Wildlife Sanctuary and Tawau Hill Park are situated in eastern lowland area of Sabah. Maliau Basin is located in Witti mountains, southern part of Sabah in medium habitat of eastern lowland and western mountains. Areas size and gazetted year of the target protected areas are shown in Table 1. Crocker Range Park is the largest protected area in the 7 target protected areas.

Number of known species

Number of known species of the 5 vertebrate taxa in the world, Borneo, Sabah and the 7 target protected areas are shown in Table 2. A total of about 52,000 vertebrate species are described in the world. More than 1,200 vertebrates are known in Sabah. Birds occupy the largest group in the known vertebrate fauna in Sabah. Table 2 shows also the number of known species in the 7 target protected areas. However, the number of species in each protected area is not so accurate one because the study

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12th March 2004
on vertebrate fauna is not complete except Kinabalu Park in where intensive studies have been conducted and data have been accumulated.

**Endanger species and protected animals**
Number of protected vertebrate species in Sabah and Crocker Range Park, by Sabah Wildlife Enactment and CITES, are shown in Table 3, together with number of endangered species by IUCN 2000 Red List of Threatened Species list. A total of 198 vertebrate species (mammals, birds and reptiles) are listed as protected animals in the Appendix of Sabah Wildlife Conservation Enactment. Seventy five species in the 198 protected vertebrates are known in Crocker Range Park. The IUCN 2000 Red List lists up 73 endangers vertebrates (mammals, birds and reptiles) as Critically Endangered (CR), Endangered (EN), and Vulnerable (VU) categories in Sabah. There are no amphibian and freshwater fish species that are included in these endangered species categories in Sabah.

3. Distribution pattern of mammals and bioregion classification of Sabah

**Habitat classification of Sabah**
Terrestrial habitat of Sabah is divided into two major areas by altitudinal topographic condition, mountain areas (>1,000 m) and lowland. The mountain area is sub-divided into Mt. Kinabalu - Crocker Range - Trus Madi - Tamabo mountain area in western part of Sabah and Maitland - Brasery - Witti mountain area in southern part of Sabah. The former mountain area is characterized by high chain mountains, which make backbone of Borneo. The latter is hill-mountain area without main peak, and most of the area is overlapped with Sabah Foundation concession area. The lowland is also divided into eastern part of lowland and west coast lowland. Figure 1 shows the habitat classification based on the topographic situation in Sabah.

**Habitat of large mammals**
Table 4 indicates the distribution of 5 large mammal species in Sabah. All 5 large mammal species are known in eastern part of lowland in Sabah, but, there is no habitat in western mountain except isolated orangutan populations in Kinabalu Park and Crocker Range Park. Sumatra rhino inhabited in north-east lowland of Mt Kinabalu before World War II but the animal is extinct in the area.

**Distribution pattern of mammals in order level**
1) Insectivora (shrew)
Eight species are known in Sabah. Western mountain habitats have higher number of Insectivora than other habitats. Known habitats of two insectivora species, small gymure (*Hylomys susitus*) and Sunda water shrew (*Chimarragale phaeura*), are limited in the western mountain area (Crocker Range Park).

2) Scandentia (tupai)
Ten species are known in Sabah. Seven species are reported in western mountain habitat and 6 species are known in eastern part of lowland habitats. Two tupais, Bornean smooth-tailed treesheerw (*Dendrogale melanura*) and mountain treessheerw (*Tupaia montana*), are known as hill-mountainous habitat species.

3) Chiroptera (bat)
Eighty-three species are known in Sabah. But the known species list of Chiroptera in each protected areas are still incomplete except Kinabalu Park, because special equipment and specialist for identification are required for the bat fauna study.