

**Regional Workshop for East, South and Southeast Asia on Updating National Biodiversity Strategies and Action Plans, 9-16 May 2011, Xi'an, China**

**Regional and national center of excellence to support scientific and technical cooperation**

**National Institute of Biological Resources in Korea**

**13 May 2011**

**Hong-Yul Seo, Ph.D**

**NIBR, Ministry of Environment, Korea**



# Contents

## I Legal Status and Mandate

## II Main Activities

- 1 Collections and Management
- 2 Scientific Research
- 3 Education and Exhibition
- 4 Global Networking

## III Concluding Remarks

# I. Legal Status and Mandates

## ❖ Legal Status

➤ The Natural Environment Conservation Act

➤ Nature & Park Act

➤ **Wild Animals and Plants Protection Act**

◆ Main Policies

▪ **Endangered Wild Animals and Plants**

▪ Management of Exotic Species

▪ **Korean Indigenous Species**

▪ **National Biological Resources Management(NIBR)**

▪ Convention on Biological Diversity

# I. Legal Statue and Mandates



Ministry of Environment established NIBR in 2007

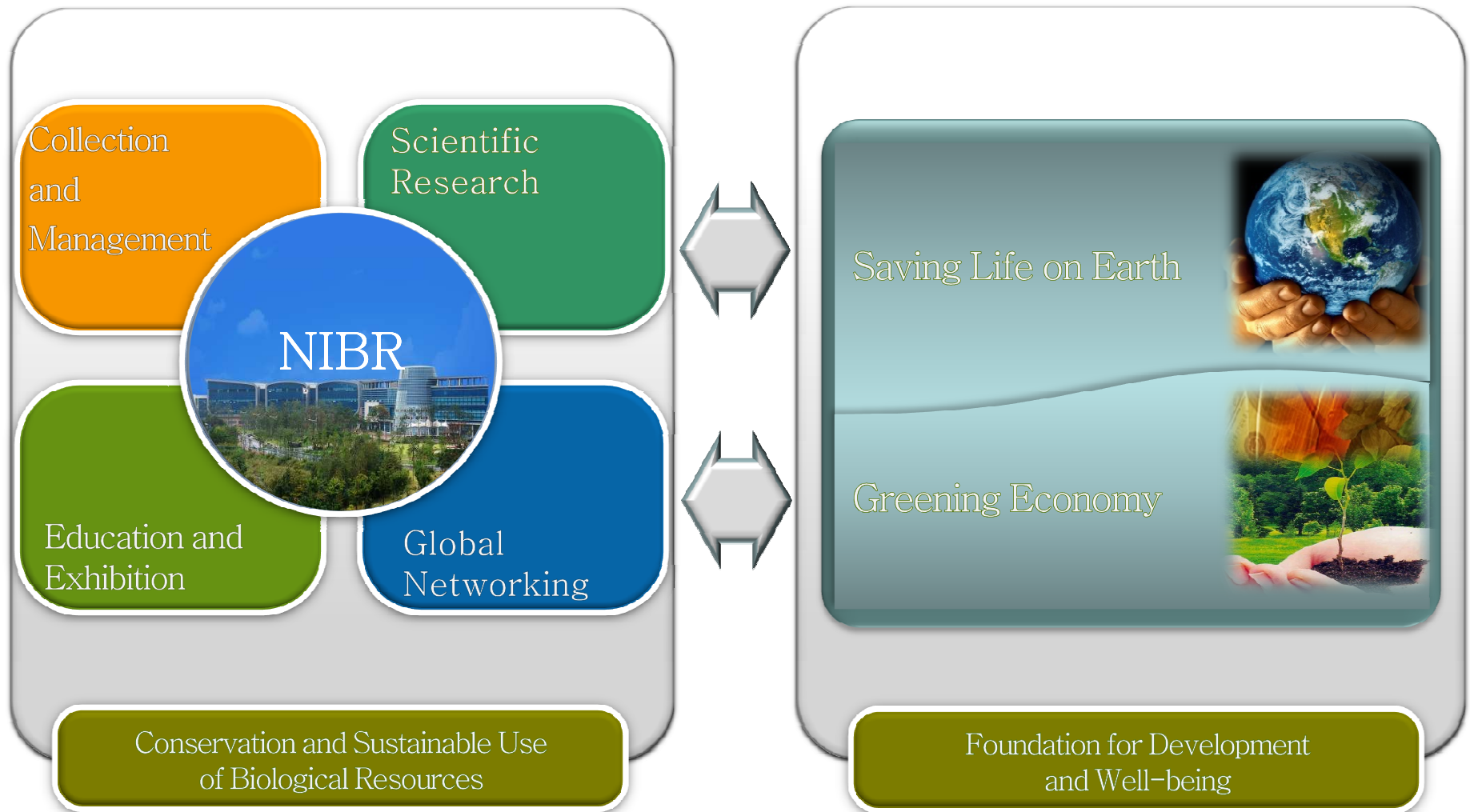
## ❖ Three Main Mandates

- ◆ To create **an efficient preservation and management system** for biological resources and biodiversity
- ◆ To increase **public awareness on biological diversity** and **the importance of biological resources**, and **train future researchers** through exhibition and educational programs
- ◆ To build **a solid infrastructure** to support the **biotechnology industry** and enhance national competitiveness





## II. Main Activities



## II. Main Activities – Collection and Management



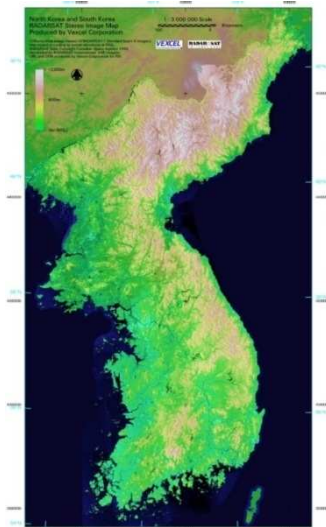
## II. Main Activities – Collection and Management

### ❖ Current Status of Biodiversity and Bio-resources



- Estimated species on earth: 10,000,000 species

Known-to-science: 1,750,000 species



- Estimated species in Korea: 100,000 species

Known-to-science in Korea: 32,000 species



## II. Main Activities – Collection and Management

### ❖ Management of Bio-Resources in Korea

- ◆ Compilation of a national list of indigenous species of the Korean peninsula
  - Created a validated checklist of 32,000 indigenous species in Korea(2010)
  - Data-based taxonomic information, literature of the type species, synonyms, and Korean names
  - Improve scientific and systematic management of National Biodiversity

ANTHOCEROTOPSIDA 뿔이끼강

ANTHOCEROTACEAE Dumort. 뿔이끼과  
1829.

ANTHOCEROS Linne. 뿔이끼속  
1753.

*Anthoceros punctatus* L. 뿔이끼  
Spec. Plant. 1: 1139, 1753.  
Choi 1980; Choe 1980; Choe 1983; Kim &  
Hwang 1991; Park 2007.

*Anthoceros laevis* ssp. *carolinianus* →  
*Phaeoceros carolinianus* (Michx.) Prosk.

PHAEOCEROS Prosk. 마당뿔이끼속  
1951.

*Phaeoceros carolinianus* (Michx.) Prosk. 마당뿔  
이끼  
Bull. Torrey Bot. Club 78: 347, 1951.

Syn. *Phaeoceros laevis* ssp. *carolinianus*  
(Michx.) Prosk., *Anthoceros laevis* ssp.  
*carolinianus*.  
Choe 1975; Choi 1980; Choe 1980; Kim &  
Hwang 1991; Park 2007; Schuster 1992b.

*Phaeoceros laevis* ssp. *carolinianus*  
(Michx.) Prosk. → *Phaeoceros carolinianus*  
(Michx.) Prosk.



## II. Main Activities – Collection and Management

### ❖ Management of Bio-Resources in Korea

#### ◆ The documentation of type and voucher specimens of indigenous species of Korea

- Aims to complete confirmation of voucher specimen of indigenous species of Korean peninsula.



[Voucher Specimens of Indigenous Species of Korea  
(좁나도고사리삼, *Ophioglossum thermale* var. *nipponicum* Nishida)]

## II. Main Activities – Collection and Management

### ❖ Sustainable securement and management of Bio-Resources

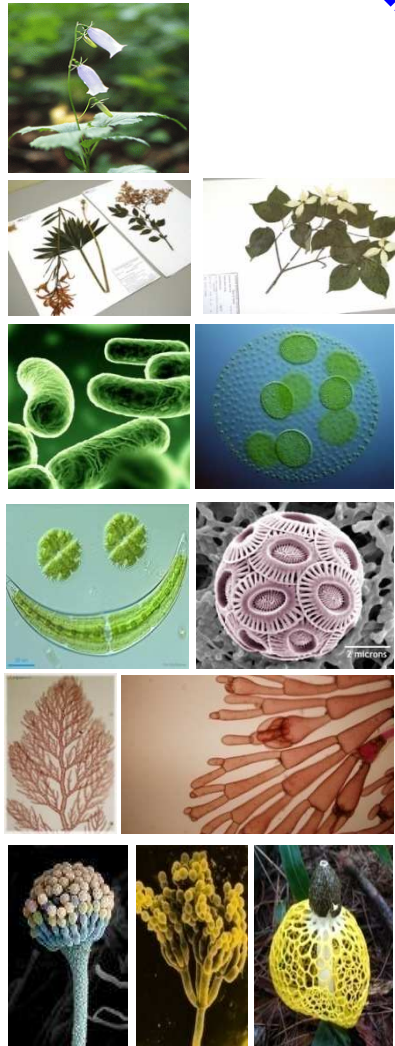
#### ◆ Build an inventory for management of endemic species of Korea

- The number of 2,188 indigenous species was confirmed



## II. Main Activities – Collection and Management

### ❖ Bio-Resources Specimen Collections at NIBR



<b>Taxa</b>	<b>No. of Collection</b>
<b>Vascular plants</b>	<b>&lt;270,000 individuals.</b>
<b>Fungi/Algae/Lichens</b>	<b>&lt;120,000 individuals.</b>
<b>Invertebrates including insects &amp; Vertebrates</b>	<b>&lt;1,400,000 individuals.</b>



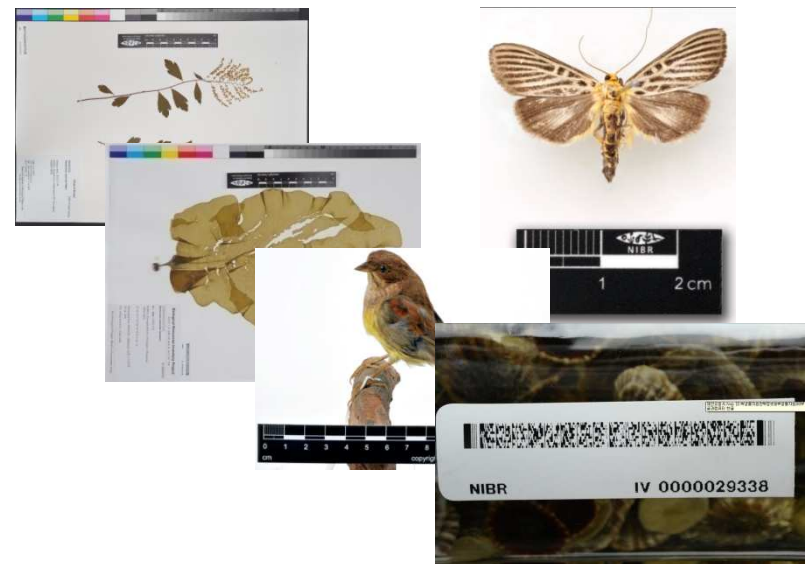
## II. Main Activities – Collection and Management

### ❖ Set up a Standardized Specimen Management System and NIBR Database

- ◆ Establish standardized infrastructure designed to manage specimen collections
  - Assign each individual specimen with its unique identification code and manage it with 2-Dimensional barcode system
- ◆ Intensive accumulation of biodiversity data into NIBR database system
  - Completed inputting 77.9% of NIBR specimen data into the database (as of Aug. 2010)

#### [Standardized Specimen Management System]

#### [Specimens with Bar-codes and Labels]





## II. Main Activities – Collection and Management

### ❖ Preservation of Gene, Seeds, and Cultures - The ARK of Korean Native Species

#### ◆ Genetic Resources Bank

##### [Collections of Genetic Resources]

Taxa	28,668
Vascular Plant	5,714
Fungi/Algae	2,342
Vertebrates	4,757
Invertebrates except insects	3,951
Insects	3,902
Prokaryotes	8,002

##### [Systematic Preservation with Full Passport Data]

The screenshot shows a detailed specimen passport form for *Dendropanax trifidus*. The form is organized into several sections:

- Header:** Includes specimen number (NIBRV0000181623) and scientific name (학명).
- Classification:** Lists taxonomic ranks from Division (MAGNOLIOPHYTA) to Variety (Hybrid).
- Locality Information:** Includes latitude (34° 8' 51.3" N), longitude (126° 35' 13.6" E), altitude, and depth.
- Collection Information:** Records collector (Hyun Kim, Mi-Jang Song), collector number, collection number (1172), and date (2005-09-16).
- Specimen Information:** Details specimen type (건조표본), material (자료별주), and collection method (일반표본).
- Determination Information:** Lists the date of determination (Date) and the determiner (Det. by: Hyun Kim).
- Other Information:** Includes sample ID (NIBRGR0000172488) and sample type (생체).

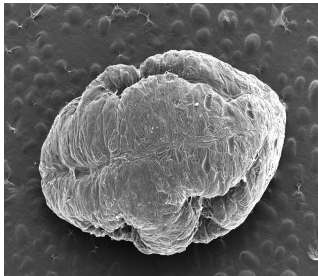
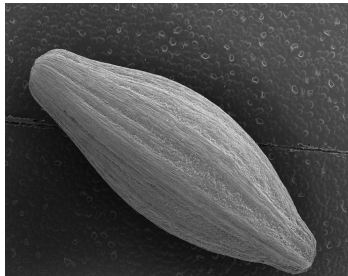
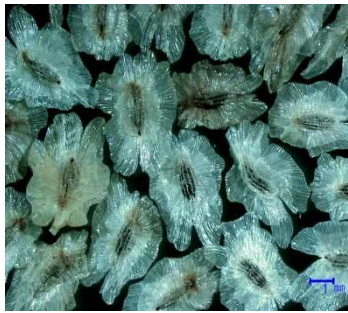
## II. Main Activities – Collection and Management

### ❖ Preservation of Gene, Natural Resources, Seeds - The ARK of Korean Native Species

#### ◆ Seed Bank & Culture Collection

- Keeping Seeds for Restoration: endangered, endemic and rare species
- Maintenance of viable lines for bio-industry
- Establishment of infrastructure for massive production of wild species

#### [Diversity of Seeds and Seed Storages at WGRC]



#### [Examples of Culture Collections]



# II. Main Activities – Collection and Management

## ❖ Integrated Biological Information Service

### ◆ Species Korea (<http://nibr.go.kr/species/>)

- designed as a portal site for Korean biological resources
  - Offers a thorough set of data including systematic information, morphological characteristics, ecological traits, original articles, documentation, pictures, illustrations, specimen data
- provide reliable taxonomic and biodiversity information of Korean indigenous species

The screenshot shows the homepage of the Species Korea portal. At the top, there is a navigation bar with links for HOME, 로그인, 회원가입, 사이트맵, and CBD-ORIG KOREA 가가. Below this, there are tabs for 생물자원검색, 맞춤정보설정, 자료실, 세스시, and 이용안내. The main content area features a '새로 등록된 생물자원' (Newly Registered Biological Resources) section with four items: *Colasmenus exense*, *Chrysosplenium albifolium* var. *schizum*, *Microphoxa quadrivalve*, and *Canaxus auratus*. There is also a '세스시' (Species) section and a '팝업존' (Pop-up Zone) for the '한반도 생물자원 102종에 대한 시범 서비스' (Pilot Service for 102 Species of the Korean Peninsula).

The screenshot shows the detailed page for the species *Deutzia platrata* Kom. The page includes a large image of the white flowers, a '기본정보' (Basic Information) section with a list of categories like '과' (Family) and '속' (Genus), and a '개요' (Overview) section. The '개요' section contains a detailed description of the species and its distribution. There is also a 'Comment' section and a map of Korea showing the distribution of the species.



## II. Main Activities – Collection and Management

### ❖ Biological Identification System

- To provide biological identification and taxonomic knowledge on Korean biological resources for educations, researches and bio-industries

#### ◆ Off-line Identification Service

- NIBR scientists directly conduct the identification and classification of unknown animal and plant specimens
- Accurate and timely identifications

#### ◆ On-line Identification Service

- Provide **Interactive Key Program**, the most commonly used computer-aided biological identification tool
- Web-based identification system (<http://www.nibr.go.kr>)



Off-line Service



Online Service

identification



Education



Applied Research



Bio-Industry



## II. Main Activities – Scientific Research



## II. Main Activities – Scientific Research

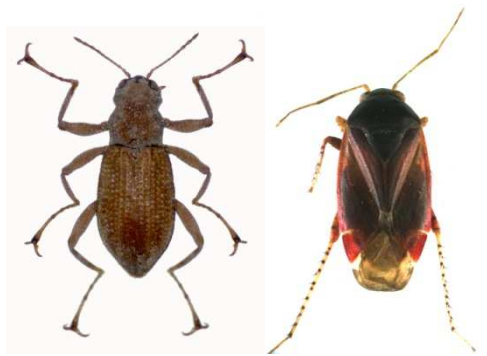
### ❖ The survey of indigenous biological resources of Korea

- NIBR has so far discovered 3,536 new or unrecorded species (2006~2010 for 4years)

#### ◆ New Species

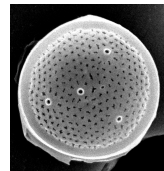


*Ascidicola* sp.



*Leptelmis* n. sp.    *Psallus* n. sp.

#### ◆ Unrecorded Species



*Minidiscus trioculatus*



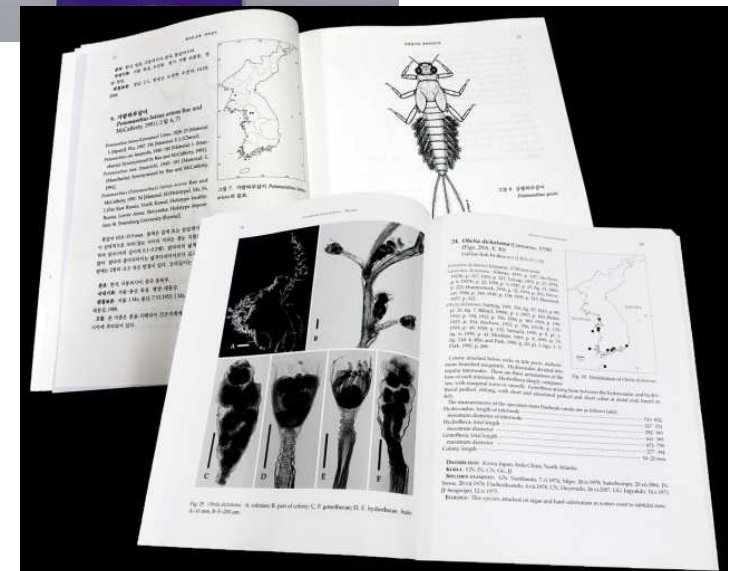
*Conchodytes nipponensis*



*Liomera margaritata*

### ❖ The Flora and Fauna of Korea project

- 16 Volumes for 1,037 species (Vertebrates, Invertebrates, Fungi, and Algae)



## II. Main Activities – Scientific Research

### ❖ Scientific research underpinning endangered species conservation policies

#### ◆ Monitoring the status of endangered species in Korea

- Scientific data for the endangered species policy
- 30-40 species every year, 6 year duration for each species

#### ◆ Updating the List of Legally Protected Endangered Wild Species

- Building criteria and steps for the list and updating the list
- The number of endangered species is on increase.

Year	1989	1993	1998	2005
Number of Species	92	179	194	221

#### ◆ Publishing Red Data Book in Korea (by 2013)

- Listing endangered species based on international criteria (i. e. IUCN)
- The first volume of Red Data Book covering Birds, Amphibians, Reptiles, and Fishes expected by the end of 2010



## II. Main Activities – Scientific Research

### ❖ Propagation and Restoration of Endangered Species

- Extensive research on restoration strategies for freshwater tortoise, fresh water fish and long-beetle are expected to continue.
- Restoration of two endangered fish species every year following national strategies for endangered species conservation
  - This year: *Pseudopungtungia nigra*(감돌고기), *Iksookimia choii* (미호종개)



- Cooperative works to restore several plant species with National Parks and ex-situ conservation institutes.

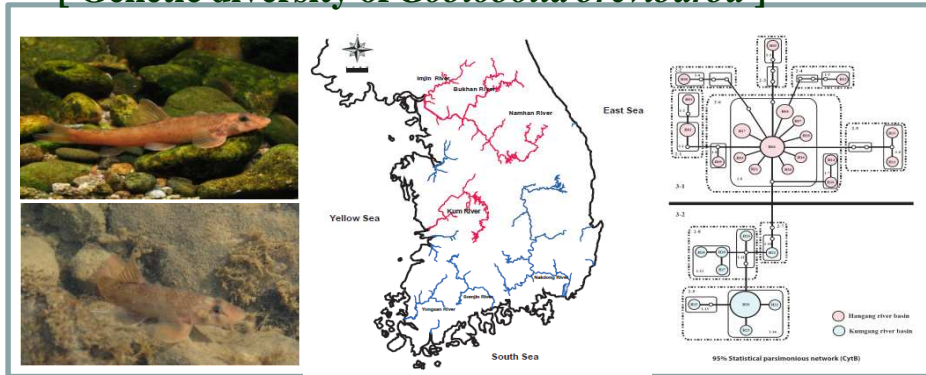




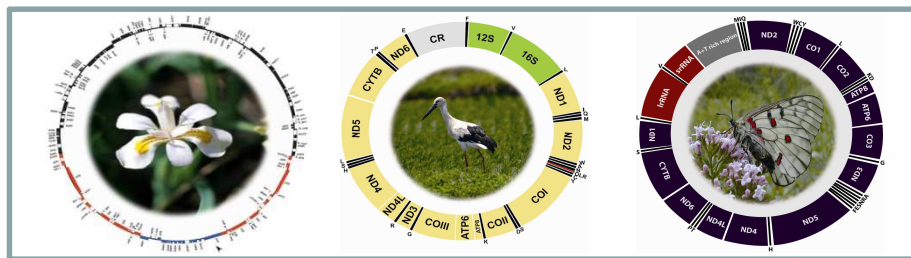
# II. Main Activities – Scientific Research

## ❖ Genetic Evaluation of important species

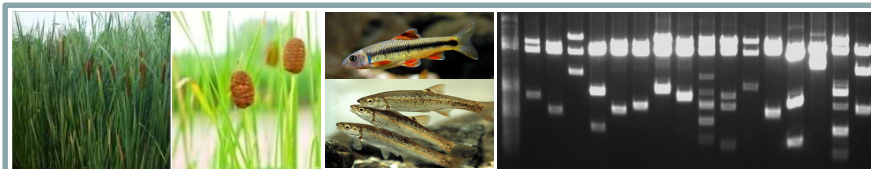
### ◆ Genetic Evaluation of Endangered Species [ Genetic diversity of *Gobiobotia brevibarba* ]



### [Genomic DB for cytoplasmic organelles of endangered species]



### [Screening of environmental resistance or indicator genes]



## Scientific Restoration of Rare Species and Sustainable use

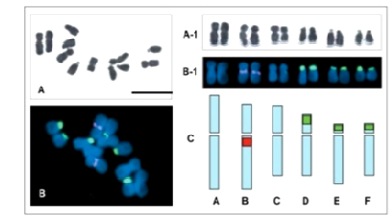
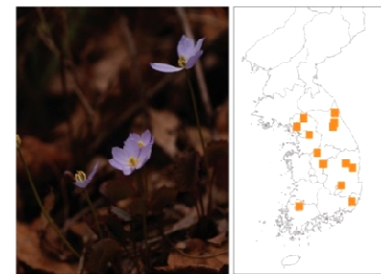


### ◆ Chromosome study of Endangered species

BERBERIDACEAE | 薔薇目

Family : Berberidaceae  
 Scientific name : *Jeffersonia dubia* (Maxim.) Benth & Hook. f. ex  
 Korean : 평평이물

- Chromosome number:  $2n=2c=14$
- Chromosome size(μm): 1.95-3.50
- Karyotype formula:  $2A_n+2B_{sm}+2C_m+2D_{sm}+2E_{st}+2F_{st}$



Perennial herbs with rhizome. Leaves long petiolate, with almost circular blade, about 9cm in length and width, dark red during flowering period, later green. Flowering stem 8-10 cm tall, elongating after flowering to 20-30 cm. Flowers solitary, 2-3 cm in diam., sepals 3-5, lanceolate to linear, petals 6-8, obovate, pale lilac. ovules 10-30. Fruit capsule. Seeds oblong, black, arillate.

Habitat: Deciduous broad-leaved forests, on humus-rich soil, in shade.  
 Distribution: Korea, Far East (Primorsky Region, Amur River basin) and northeastern China.  
 Use: Ornamental, medicine.

A and A-1, Somatic metaphase chromosome complement and karyotype  
 B and B-1, FISH image of metaphase chromosomes using 5S and 45S rDNA genes  
 C, Ideogram of physical location of two rDNA genes. Bar: 5μm

REFERENCE  
 Kim et al. (2005) Karyotype analysis and physical mapping of rDNAs using McFISH in *Jeffersonia dubia* Benth, Korean Jour. Medicinal Crop Sci. 13(1): 48-51.

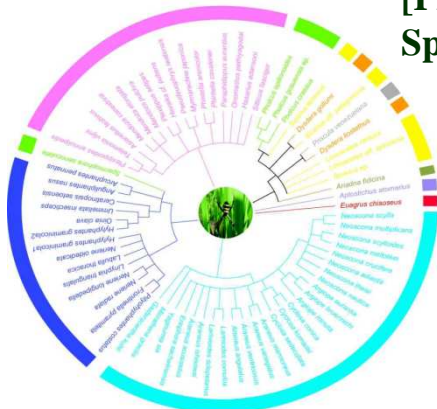
## II. Main Activities – Scientific Research

### ❖ Phylogenetic Tree Construction of Korean Species and Its Use

#### ◆ Molecular phylogenetic analyses of major Korean taxa

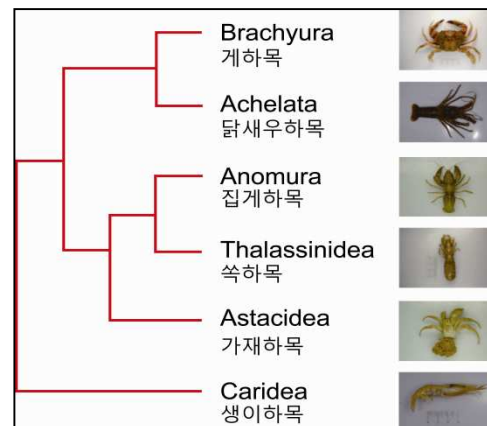
- Effective screening of candidates using their phylogenetic relationships
- Construction of screening frames

[Phylogenetic tree of Spiders using 16S rDNA]



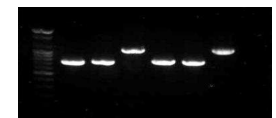
Family of Arachnida	
Salicidae	Cyrtachenidae
Scytodidae	Segestriidae
Linyphiidae	Sicariidae
Araneida	Dysderidae
Dipluridae	Pholcidae

[phylogenetic tree of Decapoda COI, 16S rDNA, 18S rDNA]



#### ◆ DNA bar-coding for Korean species

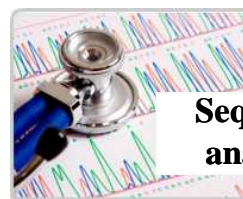
- Standardization of species identification
- Development of quality control toolkit



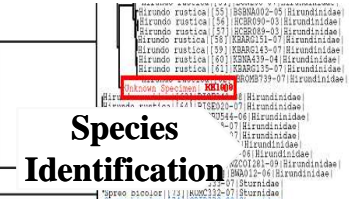
Sample prep.

DNA Extraction

PCR & Electrophoresis



Sequence analysis





## II. Main Activities – Scientific Research

### ❖ Investigation of Traditional Knowledge

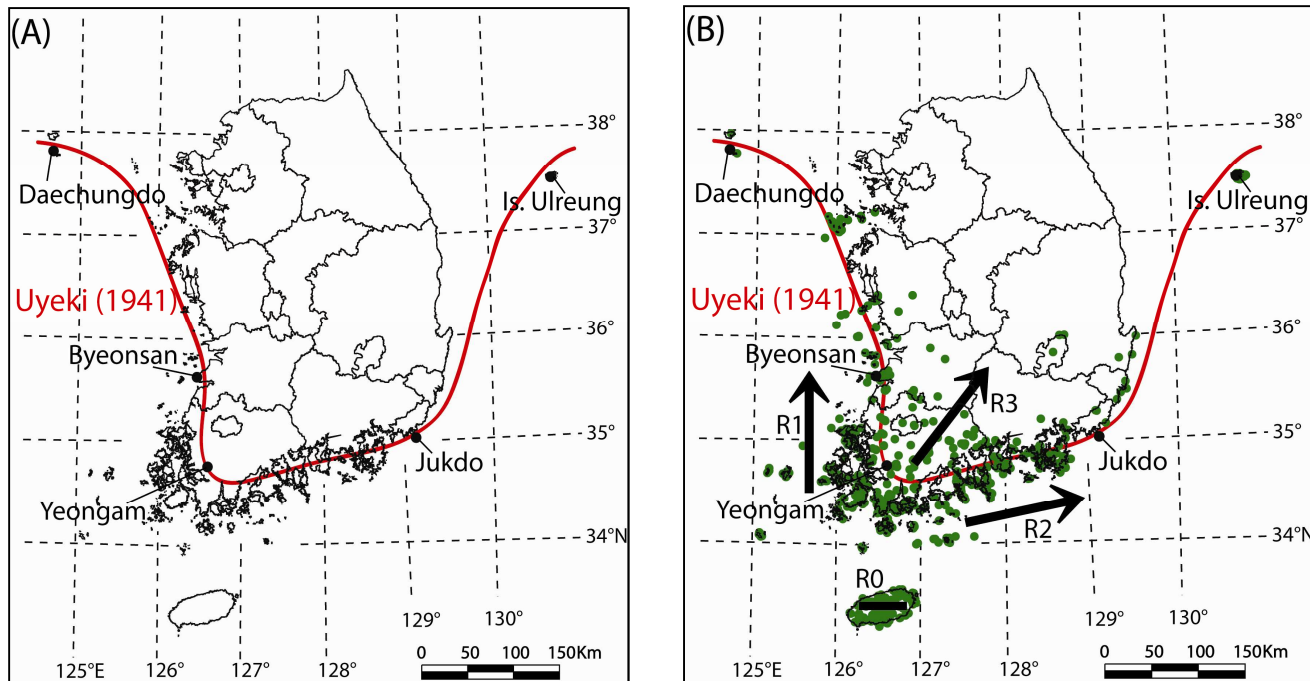
- Reporting Orally handed-down traditional knowledge in 3 regions in Jeollabuk-do in 2009
- Focusing collecting and systematizing traditional knowledge in Korean National Park through all taxa



## II. Main Activities – Scientific Research

### ❖ Climate Change and Biodiversity

#### ◆ A probable vegetation shift to the North



#### ◆ Expanded distribution of warm temperate evergreen broad-leaved trees

- most vigorous and expeditious in Gwangju, throughout south Jeolla Province and along the western coastal areas of South Chungcheong Province



## II. Main Activities – Education and Exhibition



## II. Main Activities – Education and Exhibition

### ❖ Education programs for the General Public

- Enhance public understanding of the true values of indigenous species
- 78 programs for Pre-school children, Children, Adolescent, Adult, Family  
about 10,000 participate in our program each year



## II. Main Activities – Education and Exhibition

### ❖ Educational Programs to train Future Researchers and Professionals

#### ◆ Para-taxonomist Training program

- Investigations of natural environment in the Korean peninsula

#### ◆ Student Internship Program

- Summer and winter courses
- Cooperative Programs with Universities and Research Institutes
  - Postdoctoral program in systematic biology

#### ◆ Teacher Enhancement Program

#### ◆ Docent Training Program



## II. Main Activities – Education and Exhibition

### ❖ NIBR Cyber Academy

- On-line video providing lectures and experiments
- Various kinds of images and descriptions about diverse species
- User-friendly and self-motivated study on biological resources

The screenshot displays the NIBR Cyber Academy website. At the top, there is a navigation bar with a search box and a '사이트맵' (Site Map) link. Below this is a main banner featuring a large green leaf with a frog and a white egret. The website is organized into several sections: a user login area on the left, a central navigation menu with links like '센터소개' (Center Introduction) and '강의자료' (Lecture Materials), and a main content area with various educational resources. The footer contains logos for the Ministry of Environment and the National Institute of Biological Resources, along with copyright information.



## II. Main Activities – Education and Exhibition

### ❖ Unique Museum for Indigenous Species in Korea

- 6,453 specimens belonging to 1,903 indigenous species
- about 0.5 million visitors a year

### ❖ Comprehensive Exhibitions Focusing on Education

- Multilateral educational programs offering firsthand experience, participation and audiovisual education

### ❖ Eco-friendly Exhibitions Caring for Nature

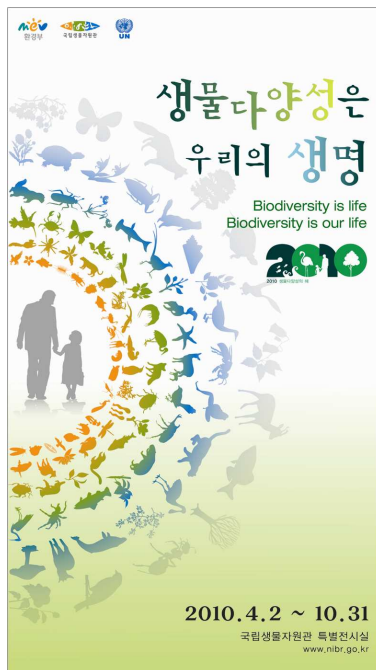
- Made from road-kills or accident-kills



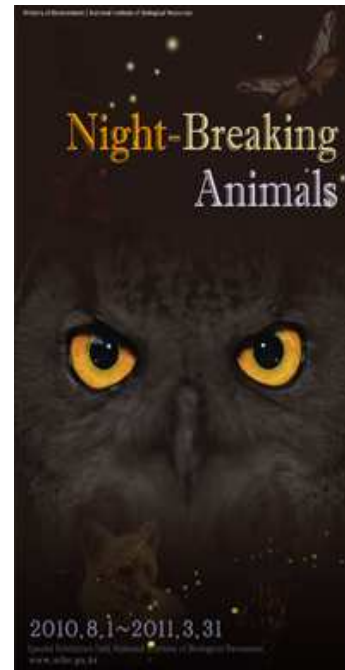
## II. Main Activities – Education and Exhibition

### ❖ Special Exhibitions

- Various topics related to biological resources
- Three or four times a year



2010 IYB Special



Night-Breaking Animals





## II. Main Activities – Education and Exhibition

### ❖ Global Figures visiting the NIBR



[A. Djoghlaf, executive secretary, CBD]



[Ambassadors from Cambodia, Laos, Myanmar, Vietnam, Philippines, Costa Rica, Colombia and Peru]



[N.N. Kyaw, Forest research institute, Myanmar  
S. Sawathvong, Department of Forestry, Laos]



[R. C. Salazar, Ministry of Foreign Affairs,  
Republic of Costa Rica]



[E. Lahmann, Director, IUCN]

## II. Main Activities – Global Networking

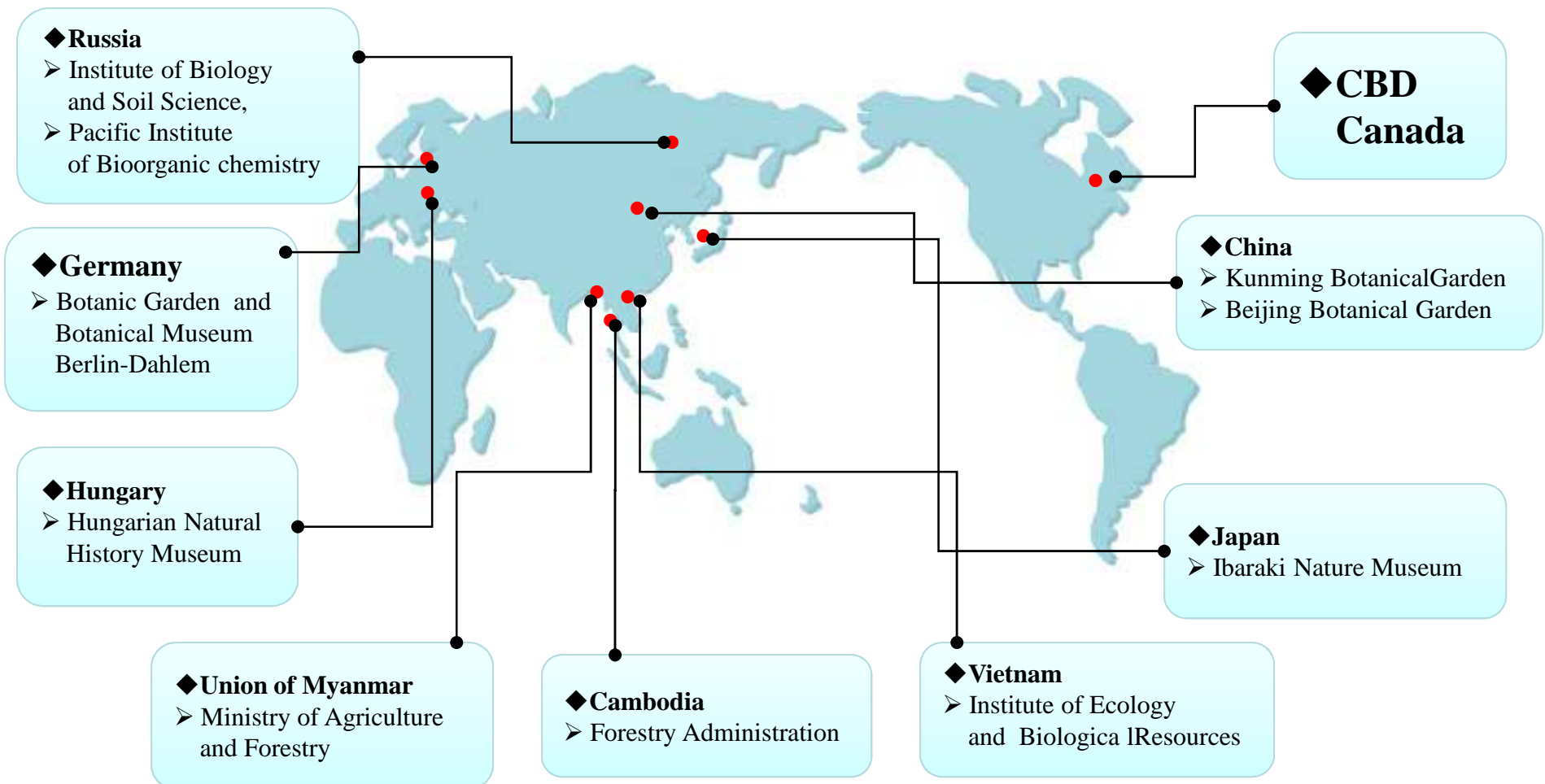




## II. Main Activities – Global Networking

### ❖ International Cooperation for Biodiversity Inventories

- MOU with 10 prominent institutes from 8 countries



## II. Main Activities – Global Networking

### ❖ Several on-going co-operative researches with partners

#### ◆ Cooperation with Cambodia

- Biodiversity survey on the less explored field
- Financial and technical aid to establish a an advanced research facilities and professional training programs
- Held workshops about Cambodia's research and conservation of biodiversity (July 2009)

#### ◆ Cooperation with Hungary

- Co-funded joint research project: taxonomic studies on unidentified insect specimens and publication of a pictorial book
- Exchange of specimens (total of 2,500 specimens) and experts
- Joint seminars, workshops and meetings

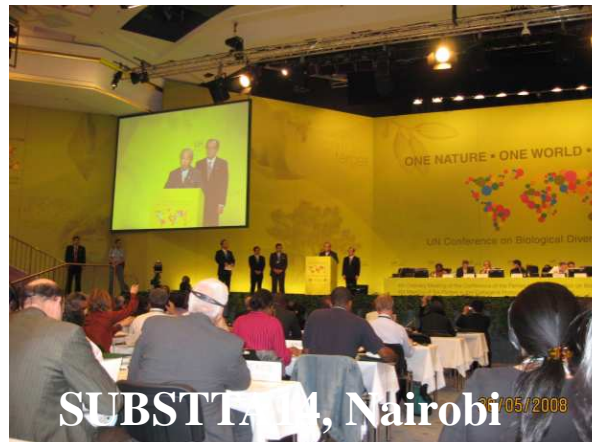
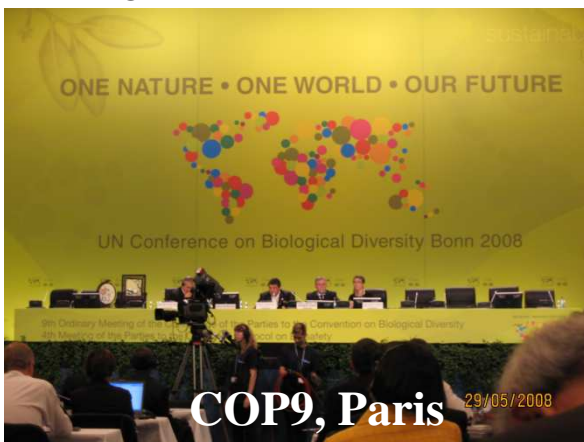


## II. Main Activities – Global Networking

### ❖ NIBR joins CBD consortium of Scientific Partners with 11<sup>th</sup> member

✧ The Smithsonian National Museum of Natural History, The Royal Botanic Gardens Kew, The Royal Botanic Garden Edinburgh , etc.

- NIBR's expert experience contributes to implementation of CBD
- To support the multi-year plan of action on south-south cooperation of biodiversity for development
- To help enhance capacity of developing countries and to promote exchanges of best experience and practices among themselves
- Sign a MOU with CBD (Oct 2010)

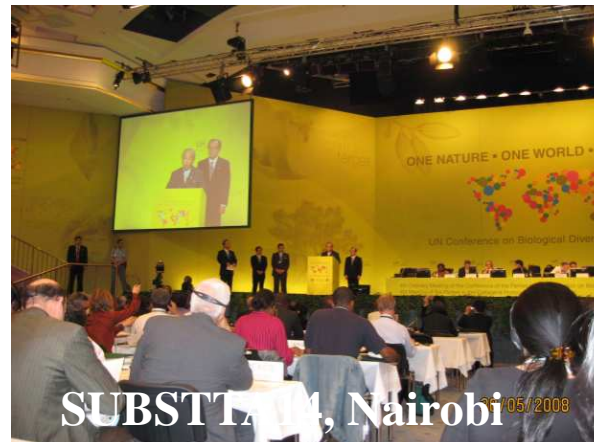
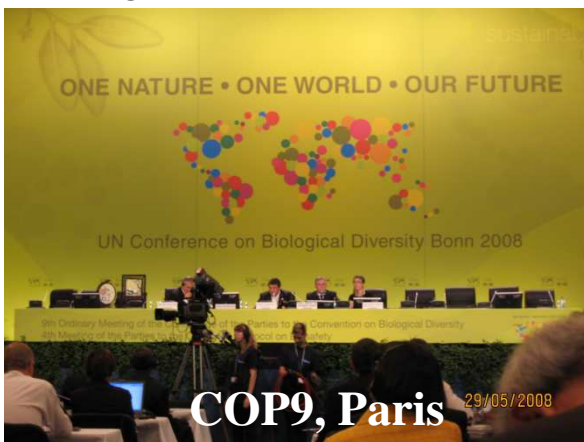


## II. Main Activities – Global Networking

### ❖ NIBR joins CBD consortium of Scientific Partners with 11<sup>th</sup> member

✧ The Smithsonian National Museum of Natural History, The Royal Botanic Gardens Kew, The Royal Botanic Garden Edinburgh , etc.

- NIBR's expert experience contributes to implementation of CBD
- To support the multi-year plan of action on south-south cooperation of biodiversity for development
- To help enhance capacity of developing countries and to promote exchanges of best experience and practices among themselves
- Sign a MOU with CBD (Oct 2010)





## II. Main Activities – Global Networking

- ❖ **1<sup>st</sup> NIBR International Training Program in Biodiversity Conservation and Management (13~ 23, Apr. 2011)**
  - ✧ **4 countries with 10 participants**
    - Mongolia, Lao PDR, Vietnam, Cambodia
  
- Major functions and facilities of NIBR
- Major research projects and international cooperation regarding biological resources
- Collections management and importance of genetic resources
- Biological resources database: construction, maintenance and utilization
- Guided tour of NIBR exhibition
- Migratory bird watching
- Biodiversity of the Korean Peninsula: Plants
- Conservation of endangered species in Korea
- Current status of R&D investment for biological diversity and resource conservation in Korea
- Benchmarking (Warm-temperate Forest Research Center, Jeju Biodiversity Research Institute)
- Field excursion (Mt. Halla National Park)
- Discussion on biodiversity conservation in Jeju Island
- Program assessment and discussion

## II. Main Activities – Global Networking

### ❖ 1<sup>st</sup> NIBR International Training Program in Biodiversity Conservation and Management (13~ 23, Apr. 2011)

#### 1. Mongolia

Sundev Gombobaatar : Biodiversity research and conservation in Mongolia

#### 2. Lao PDR

Bouavong Sangvane : Forest resource conservation in Lao PDR

#### 3. Vietnam

Nguyen Nhu Cuong : Biodiversity in Vietnam

#### 4. Cambodia

Kry Masphal : Biodiversity conservation and management in Cambodia

# III. Concluding Remarks

Prominent Korean novelist, Kyung-ni Park's Belief (1926-2008)



- ◆ *“Humans should live off nature’s interest.”*  
= Biodiversity is natural capital that we, humans, borrow from nature.

## Take-home Message

- ◆ Destruction of ecosystems and loss of biodiversity mainly stemmed from reckless and unsustainable human development and interference in the past.
- ◆ A strong emphasize must be placed on **that development in economy and future bio-industry should go hand in hand with biodiversity conservation.**

생물다양성은  
우리의 생명  
Biodiversity is life

**2010**  
2010 International Year of Biodiversity

Biodiversity is our life

2010 International Year of Biodiversity  
2010 세계생물다양성의 해

**Thank  
YOU NIBR**

생물다양성 연구 · 보전의 중심  
국립생물자원관

생물다양성은  
우리의 생명  
Biodiversity is life

**2010**  
2010 International Year of Biodiversity

Biodiversity is our life

제 1 전시실  
생물다양성  
입구  
→

안지지 마세요