Natural History Collection as Science Infrastructure for Research and Outreach

MOTOKAWA Masaharu

The Kyoto University Museum
Kyoto University

2022-02-23 PSU Special Seminar on Biodiversity Conservation & Museum Management

KYOTO UNIVERSITY

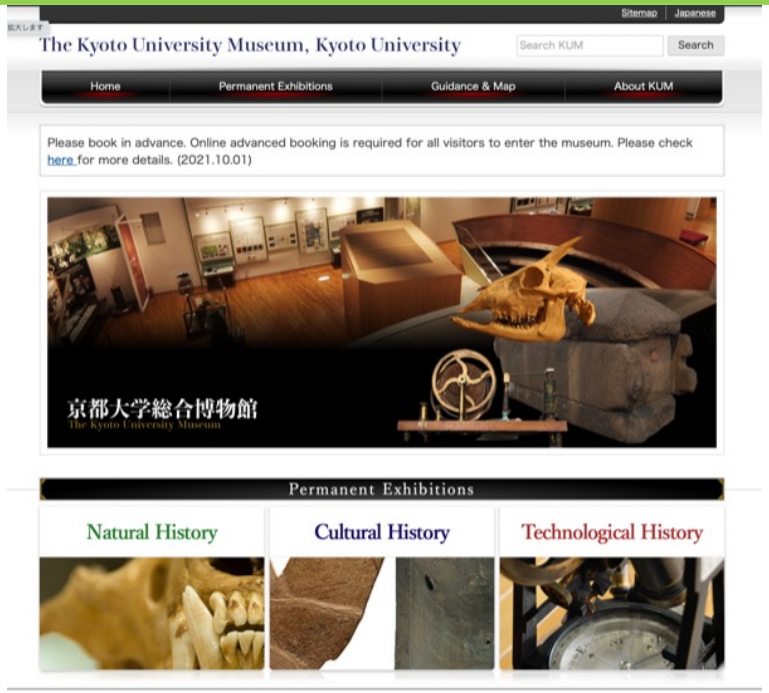
Kyoto University Museum founded in 1997
at Kyoto University Found in 1897 as 2nd Natl. Univ.; Now Research-Oriented Univ.

Is “University Museum” a kind of “Museum” ? ←Today’s Question

Permanent exhibition of animals in Kyoto, one of 6 exhibition corners in natural history.

KYOTO UNIVERSITY

The Kyoto University Museum



https://www.museum.kyoto-u.ac.jp/en/

2.6 million items' collection
Natural history, Cultural history, and Technological history under one roof as "総合博物館" (Sougou Hakubutsukan) meaning integrated or comprehensive museum.
3 professors, 3 associate professors, 1 lecturer, 3 assistant professors and 4 researchers are working on collection.

KYOTO UNIVERSITY

The Kyoto University Museum

KYOTO UNIVERSITY

My research interest

1. Species diversity of mammals in Asia
2. Concepts for museum and specimen in Asia

KYOTO UNIVERSITY

Why concepts for museum and specimen in Asia?

Around 2010　Kyoto University: Is museum necessary?
Just windows to public; storage; researcher no need; part-time staff is enough; old specimens no need; waste of space; waste of money ...

Then, collaborating with Asian university museums, especially National Taiwan Univ. (NTU).
We visited many museums in universities or research institutes not only in Japan, also Korea, China, Taiwan, Vietnam, Thailand, Malaysia, Singapore, Indonesia, and UK.
I know PSU museum at museum symposium in NTU in 2014; organized (co-organized) international symposia in Kyoto, Guangzhou, Taipei, Tainan, Hanoi, Yangon and Norwich; joined APRU, UMAC, etc.

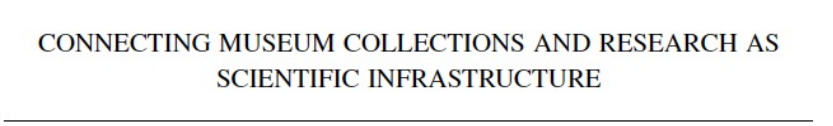
2015/09-2016/01　Chulalongkorn University　Concepts for museum and specimen in Asia

KYOTO UNIVERSITY

Today's Talk

1. Diversity of Museums in Asia
2. Importance of Specimens
3. uniMuse: University and "University Museum"
4. Natural History Collection Role in uniMuse
5. Specimens' Management
6. Research Resource Archive
7. Special and Permanent Exhibition
8. Education in uniMuse
9. Research in uniMuse
10. uniMuse Global Net
11. Species Diversity of mammals in Asia
12. uniMuse as Science Infrastructure

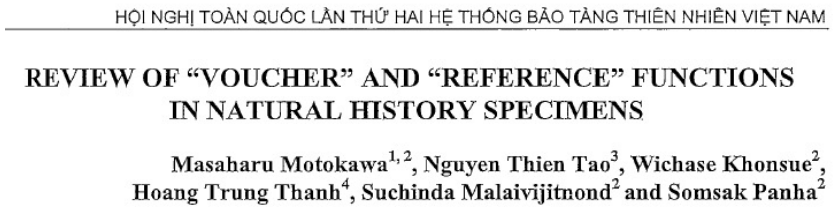
Publications related to today's talk



CONNECTING MUSEUM COLLECTIONS AND RESEARCH AS SCIENTIFIC INFRASTRUCTURE

MASAHARU MOTOKAWA, HARUYOSHI GOTOH, SHUNSUKE YAMASHITA, HIDETOSHI NAGAMASU AND TERUFUMI OHNO

International Journal of Humanities and Arts Computing 8 Suppl.: 84–94. DOI: 10.3366/ijhac.2014.0100 (2014)



HỘI NGHỊ TOÀN QUỐC LẦN THỨ HAI HỆ THỐNG BẢO TÀNG THIÊN NHIÊN VIỆT NAM

REVIEW OF "VOUCHER" AND "REFERENCE" FUNCTIONS IN NATURAL HISTORY SPECIMENS

Masaharu Motokawa[1,2], Nguyen Thien Tao[3], Wichase Khonsue[2], Hoang Trung Thanh[4], Suchinda Malaivijitnond[2] and Somsak Panha[2]

Proceedings of the 2nd National Scientific Conference of Vietnam Natural Museum System: 103–108. (2016)

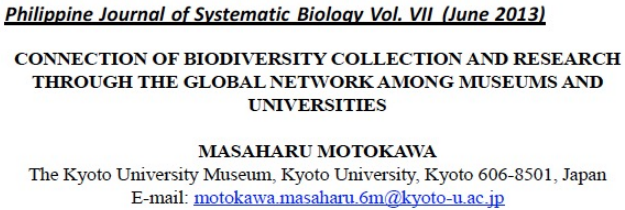
APRU RESEARCH SYMPOSIUM ON UNIVERSITY MUSEUMS 2014:
Reshaping Outreach Services of University Museums through Innovation and Partnership

O-03

The Creative Role of Research Outreach in Leading Universities

Masaharu Motokawa

Proceedings of APRU Research Symposium on University Museums 2014: 37–39. (2014)



Philippine Journal of Systematic Biology Vol. VII (June 2013)

CONNECTION OF BIODIVERSITY COLLECTION AND RESEARCH THROUGH THE GLOBAL NETWORK AMONG MUSEUMS AND UNIVERSITIES

MASAHARU MOTOKAWA
The Kyoto University Museum, Kyoto University, Kyoto 606-8501, Japan
E-mail: motokawa.masaharu.6m@kyoto-u.ac.jp

Philippine Journal of Systematic Biology 7: 76–85. (2014)

KYOTO UNIVERSITY

Meiji Restoration (1868)

The Restoration led to enormous changes in Japan's political and social structure and spanned both the late Edo period (often called the Bakumatsu) and the beginning of the Meiji era, during which time Japan rapidly industrialized and adopted Western ideas and production methods. The Restoration led to enormous changes in Japan's political and social structure and spanned both the late Edo period (often called the Bakumatsu) and the beginning of the Meiji era, during which time Japan rapidly industrialized and adopted Western ideas and production methods. (https://en.wikipedia.org/wiki/Meiji_Restoration)

[Zoology relations]
Museum ← 1872 in Tokyo
School ← 1876 in Sapporo (Sapporo Agriculture School)
University ← 1877 in Tokyo (Imperial University)
Society ← 1885 in Tokyo (Zoological Society of Japan)
Journal ← 1885 in Tokyo (Zoological Magazine)

Museum in Asia have old origin and are diverse: 博物館 (Hakubutsukan)

Museum (and related languages)

Ancient Greek, Μουσεῖον (Mouseîon, “a shrine of the Muses”)

→ Special place for science, history, culture, art, etc.

博物館 (Hakubutsukan) in Japanese as translation of “museum”

福沢諭吉 (Fukuzawa Yukichi) in 1868 『西洋事情』at opening Meiji era

「博物館は世界中の物産，古物，珍物を集めて人に示し，見聞を博くする為に設るものなり」

“Museum (Hakubutsukan) is set up for the purpose of collecting goods, antiques, and curiosities from around the world, and showing them to people and enriching (博くする) their knowledge.”

→ Enriching (博) objects’ knowledge (物) house (館)

→ 박물관 (Bagmulgwan) in Korean

博物馆 (Bówùguǎn) in Chinese: exported from Japan?

Museum in Asia: Viện bảo tàng　พิพิธภัณฑ์ (Phiphiṭhphaṇṭ́h)

Viện bảo tang in Vietnamese

"寶 bảo 藏 tang 院 viện" treasures + storage + house

→ Storage of treasures

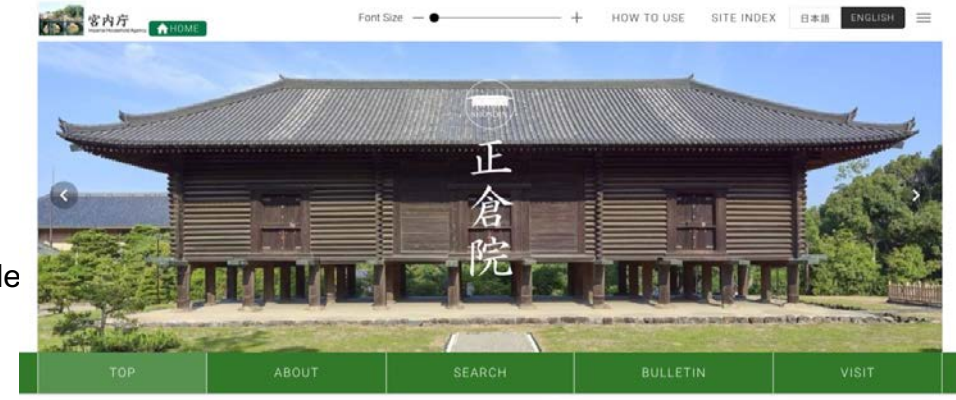
Similarly, 正倉院 (Shosoin) in Nara, Japan

The Shosoin Repository was originally a storehouse of the temple Todaiji, and had been used for storing the treasures since the Nara period. Established in 756.

Sometimes people say that the oldest museum in Japan

"正 sho 倉 so 院 in" principal + storage + house

藏 and 倉 are almost same meaning.



https://shosoin.kunaicho.go.jp/en-US

พิพิธภัณฑ์ (Phiphiṭhphaṇṭ́h)

Dr. Pipat: Bali 'pi+pit or vi+vit' meaning 'special+diverse/mix'
'phanth' means store, storage, collectively goods.

→ Also, storage of treasures

Museum background in Asia looks so diverse, depending on history before importing the western museum concept

博物館 (Hakubutsukan)　박물관 (Bagmulgwan)　博物馆 (Bówùguǎn)
→ Enriching (博) objects' knowledge (物) house (館)　**Exhibition oriented**

Viện bảo tang　寶藏院　พิพิธภัณฑ์ (Phiphiṭhphaṇṭ́h)　正倉院 (Shosoin)
→ Storage of treasures　**Storage oriented**

In addition, Burmese "ပြတိုက်" (pyatite), show + heritage

Museum
Special place for Muse
Actual features of European museums, I suppose
Storage oriented changed to **Integrated one**

Why and how specimens are important?

Previous answers are because:
1. of type specimens
2. they are vouchers for research
3. taxes have been spent to collect specimens, etc.

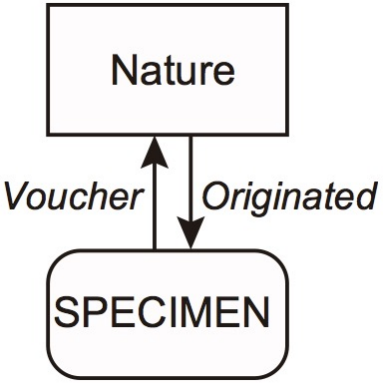
“Reference” and “Voucher”?
1. Reference collection e.g. Zoological Reference Collection [ZRC] in Lee Kong Chian Nat. Hist. Mus., Natl Univ. of Singapore)
2. Voucher specimens e.g. in many U.S. museums)

Function 1:
Specimens as Voucher for Nature

Specimens collected from nature are prepared with appropriate data. This does not require research.

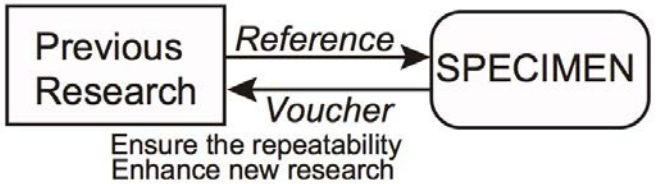
The specimen documents the existence of an organism, at a given place and time.

All the natural history specimens in the world becomes “global voucher collections for nature”



Function 2:
Specimens as Voucher for Previous Research

Previously referred as “to ensure the repeatability of research which otherwise could not be adequately reviewed or reassessed”.

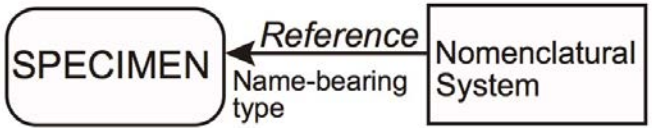


While most subsequent research using such specimens is rather focusing in enhancing new scientific findings with reference to the past research.

1. “to ensure the repeatability of research”
2. “to enhance the new research with connecting the previous research with referring such voucher specimen”

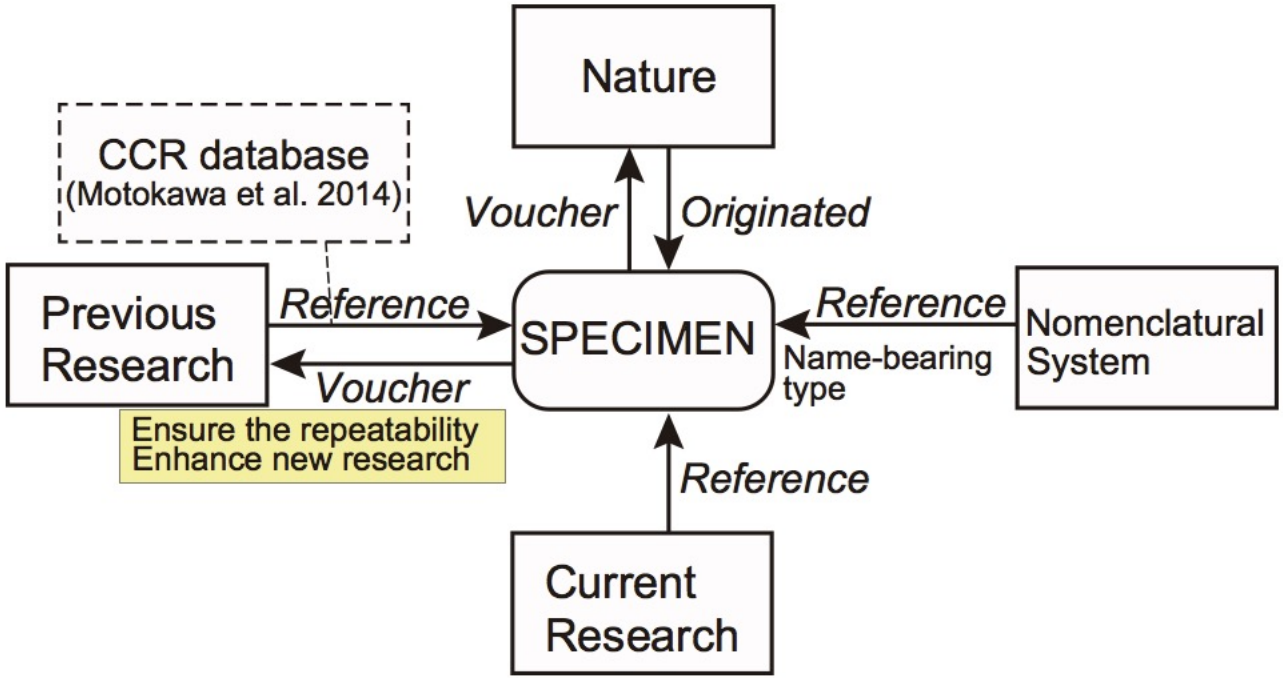
Function 3:
Specimens as Reference for Nomenclatural System

Holotype and name-bearing types have crucial importance. The original literature and name-bearing type are closely tied as Function 2 “to ensure the repeatability of research” and “to enhance the new research with reference and connection to the previous research through such voucher specimen”.



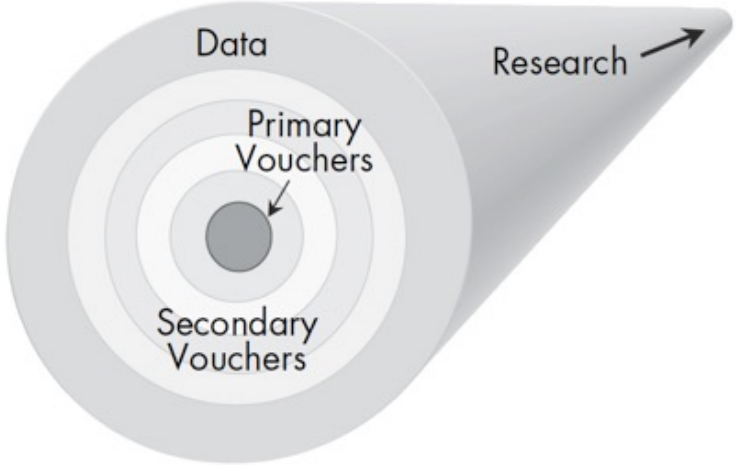
I distinguish the special function of name-bearing type to be “reference for nomenclatural system.” Nomenclatural system references both the name-bearing types and original and subsequent taxonomic literatures.

Summary for Function of Specimens



Secondary Vouchers (Kageyama et al. 2006)

"A specimen, a sample, or product thereof, and its associated data, that documents the existence of an organism at a given place and time in a manner consistent with disciplinary standards, to ensure the repeatability of research which otherwise could not be adequately reviewed or reassessed."



Secondary Voucher and Relevant Materials

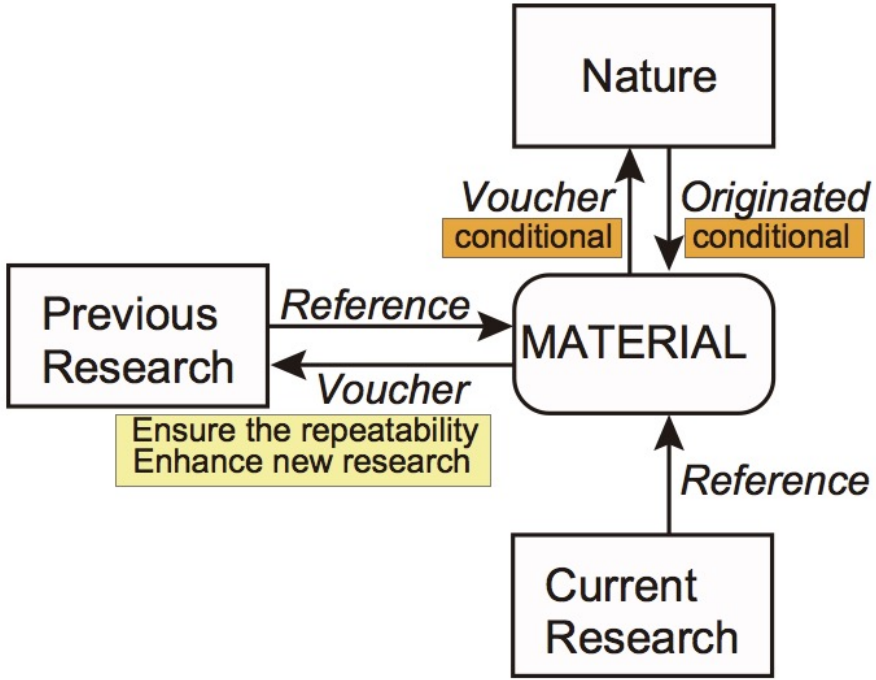
“Secondary vouchers” concept is that the vouchers are not only restricted to specimens, but also involve other items and their associated data.

I found two different sources and functions within “secondary vouchers.”:
(1) taken from nature, as with specimens.
They may have functions of “voucher for nature” and “voucher for previous research” similar to specimens.

(2) taken from specimens or other relevant material.
They only have the function “voucher for previous study.”

Management of relevant materials in focusing on their formation process, not on their physical forms (photos, video, recording, etc.) is important.

Summary for Secondary Vouchers



Redefinition of “Specimen” and “Relevant Material”

“Specimen,” originated from nature; that documents the existence of an organism at a given place and time, and sometimes utilized for practical identification (voucher for nature); that ensures the repeatability of research which otherwise could not be adequately reviewed or reassessed, and that enhances new research with reference and connection to previous research (voucher for previous research). Name bearing types additionally have a function as reference for nomenclatural system.

“Relevant material,” also defined as “secondary vouchers,” either taken from nature or taken from a specimen or other material; that sometimes documents the existence of an organism at a given place and time in a manner consistent with disciplinary standards (voucher for nature); that ensures the repeatability of research which otherwise could not be adequately reviewed or reassessed, and that sometimes enhances new research with reference and connection to previous research through the material (voucher for previous research).

There are many different Japanese words applied for “specimen”.

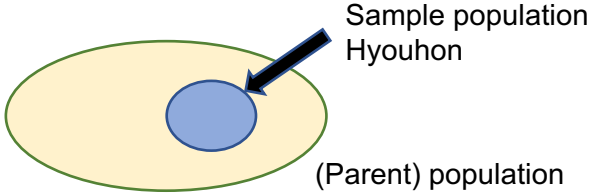
標本 (Hyohon): Museum specimens / Statistics

Statistics: sample population is **標本**(Hyouhon)集団
(parent) population is 母集団.
For museum specimens, **標本** may refers sampling population from nature population.
Closely related to reference function to the nature.

In this regard, archeological, historical, and paleontological materials are not to be referred 標本 (Hyouhon) in Japanese: to be Japanese words equivalent to artifacts, relics, remains, fossils, objects.

Thai: ตัวอย่าง Tạwxỳāng

Vietnam: Mẫu vật
sample, example



Specimen of Natural History was Made as “Specimen”

Related to the Hyouhon concepts in Japanese words, I point out:

Specimen of natural history was basically made or prepared as “specimen” for the purpose of science (since 19th century).

Archeological specimens and materials were made for the use of old-time people in their life, and those specimens in museums are considered remains or relics.

Drawings, calligraphic works, some of ceramics, etc. were made for the purpose of exhibition (with relation to “storage of treasures” for museum origin).

Different conceptual origins of museum specimens

“uniMuse”
University museum is not “museum” nor “university”

KYOTO UNIVERSITY

Integrative uniMuse in Japan

Kyoto University Museum (and most Japanese uniMuses)

Integrative museum

- Japanese history
- Archeology
- Historical geography
- Zoology
- Botany
- Mineralogy and paleontology
- Technological history, etc.

In Japan, 3 uniMuses in Kyoto Univ., Univ. of Tokyo, Hokkaido Univ. have own museum buildings, while other uniMuses are scattered in campus like as cluster of discipline specific museums.

Many Europe, US, Asian uniMuses (Thai, Vietnam etc.):

Discipline specific museum

- Zoology Museum
- Archeology Museum
- Herbalium
- Anthropological Museum, etc.

Advantage and disadvantage in Integrative uniMuse

In case of Kyoto uniMuse

Advantage

Promotion of interdisciplinary research
Collection management in better environment, including cost performance
Flexibility for organizing special exhibitions and museum activities

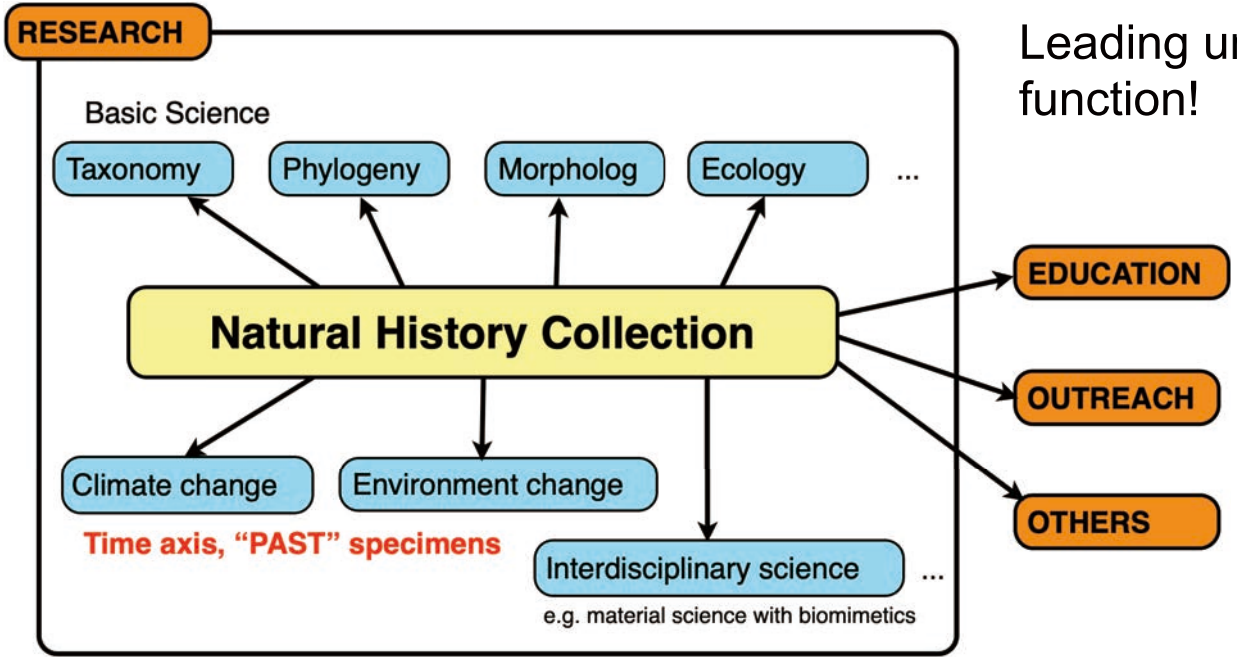
Disadvantage

Collection has a distance from the related departments and their faculties
- Less use of collection
- Keeping necessary collection in the department, and transfer unnecessary material to uniMuse

Solution

Kyoto uniMuse appointed faculty staffs of specialist in each discipline belonging to other Graduate Schools as affiliate staffs of uniMuse in charge of collection management of specified materials or taxonomic groups. Enhance communication between uniMuse and affiliated staffs contribute for better use and keep of specimens.

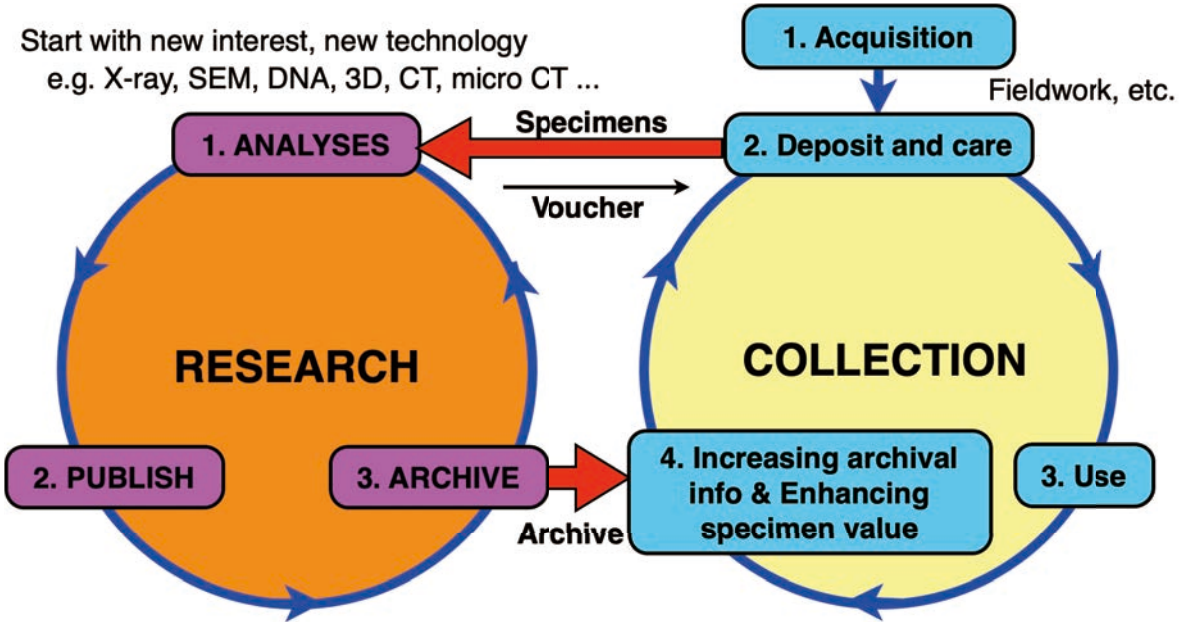
Role and Use of Natural History Collection



Leading universities cover all the function!

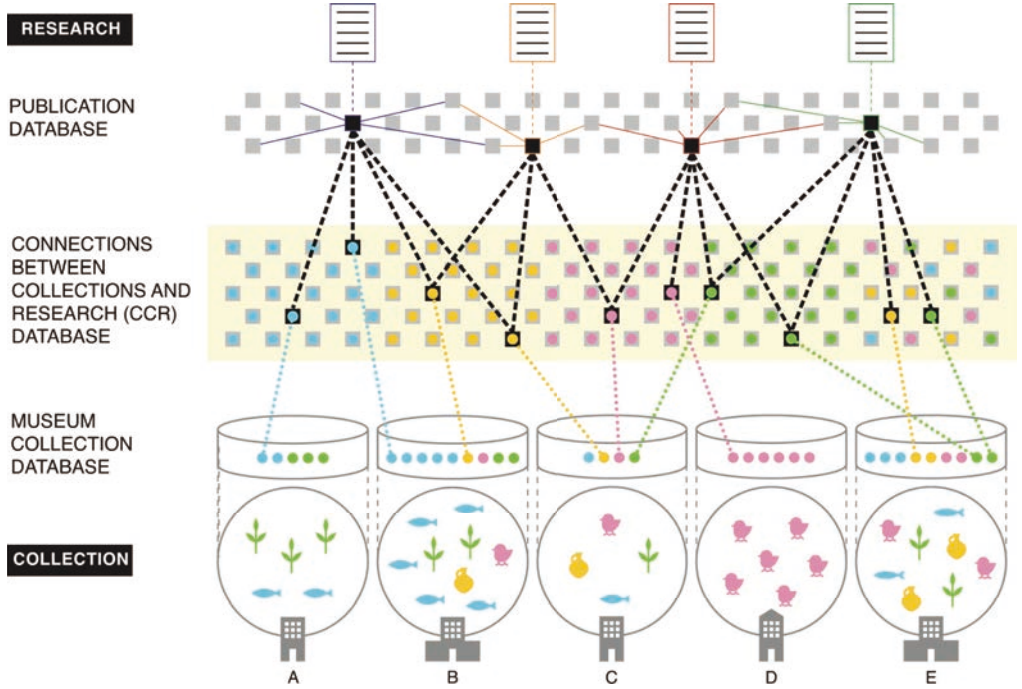
KYOTO UNIVERSITY

Natural History Collection Cycle in uniMuse



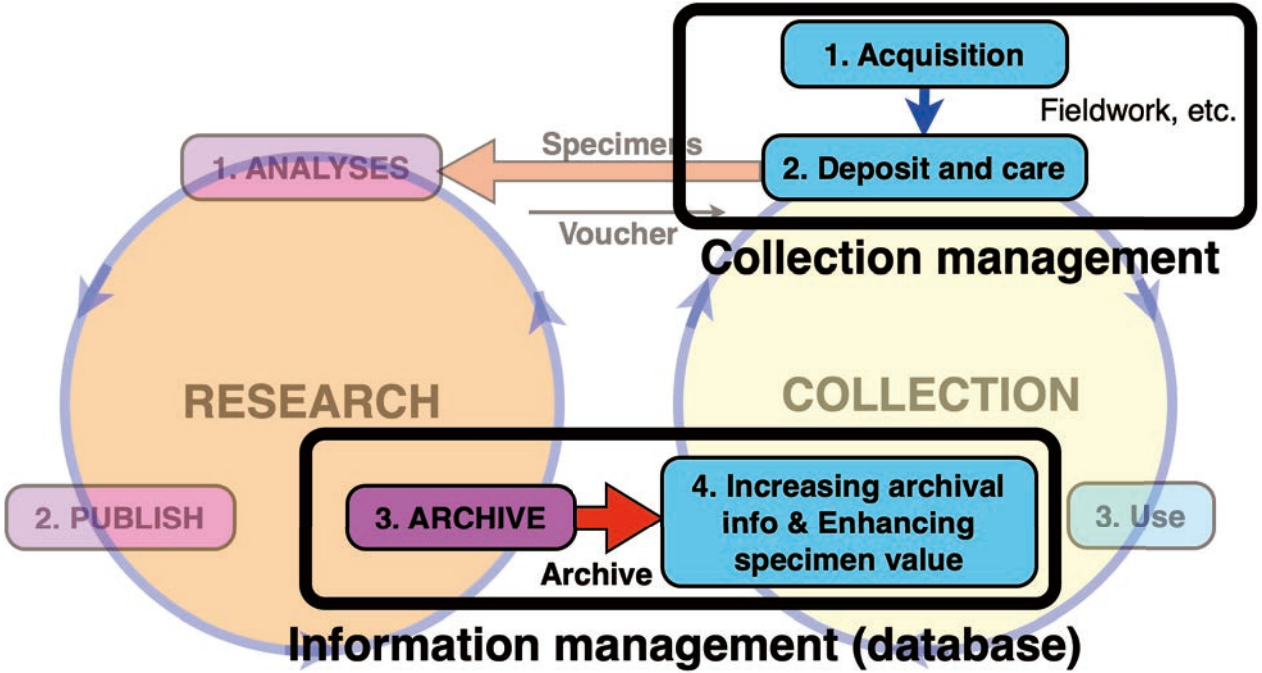
Research and collection in uniMuse work as endless cycle!

CCR
Connections between Collections and Research (Motokawa et al. 2013)



KYOTO UNIVERSITY

For Sustainable Cycle in Research and Collection



KYOTO UNIVERSITY

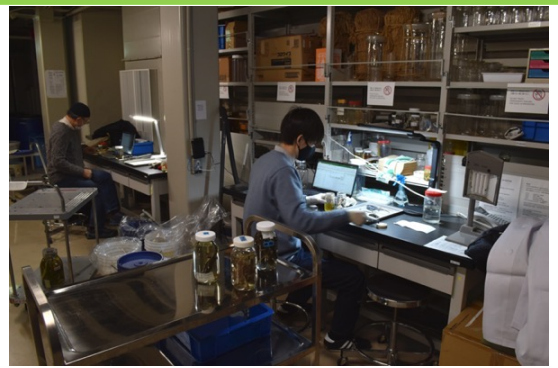
Specimens' Management

Kyoto uniMuse deposits about 18,000 registered mammal specimens and 80,000 reptile specimens, etc.
More specimens is waiting for registration.

What is the origin of zoological specimens? And our policy.
(1) Current research obtained specimens (with new fieldworks).
(2) Specimens transferred from Kyoto Univ. departments.
(3) Specimens personally kept by Kyoto Univ. researchers.
(4) Specimens donated from outside Kyoto University.
Having relations to Kyoto University research / education activities.
Having merit for future Kyoto University research / education activities.
Most specimens have strong tie with research / education activities.
Differece from National Museum.

Management of specimens:
Registration, data management, database, shelving, rearrangement, etc.

Collection Rooms: Working on Specimens with Students and Professor Emeritus (2 days every month)


KYOTO UNIVERSITY

Collection Rooms

KYOTO UNIVERSITY

Collection Rooms

KYOTO UNIVERSITY

Research Resource Archive, Kyoto University (KURRA)

About “Research Resource Archive, Kyoto University”

“Research Resource Archive, Kyoto University” (KURRA) was established to collect and preserve systematically various materials that were made within educational and research activities in Kyoto University, and to make them available for further activities.

A central feature of KURRA is that it treats materials other than books and specimens: photographs, films, recordings, field books, records of research meetings, lecture notes, and manuscripts, from primary sources. These primary source materials are investigated and registered in the Kyoto University Digital Archive System, and set up for the services. Furthermore, based on the materials, KURRA creates movies which present educational and research activities in Kyoto University, and show them to the public.

KURRA is relevant to education and research activities of all departments of Kyoto University, and for this reason, its action program is decided by the steering committee that consists members from all departments and a chairperson, who is an executive director of the university. Based on the action program, the Kyoto University Museum (a governing department) and Academic Center for Computing and Media Studies operates activities of KURRA, and Institution for Information Management and Communication supports them.

Kyoto University found in 1897, 125th anniversary in 2022
Old Zoological Specimens since 1890 by Prof. Shishido Ichiro

KYOTO UNIVERSITY

Special Exhibition (2017): Early History of Zoology at Kyoto University
Viewed from the Collection I intended to exhibit all specimens






KYOTO UNIVERSITY

Preparation process was utilized for education

Shared and discuss with SSH high school teacher. Thereafter, students visited the exhibition.

Class for curator license program.

Making exhibition with volunteer student.

Shell Collection from Hirase Museum (1913–1919): Research Collaboration: History from Specimens and Archives

Old zoological exhibition (> 100 years ago)

Exhibition in Kyoto Pref. Library in 1910

Visiting photo place in 2017 by Motokawa, Mr. Callomon, and Dr. Oshida

KYOTO UNIVERSITY

Special Exhibition Related Activities

Distributed posters in both Japanese and English
Although most exhibition is only distributed in Japanese, but it is great waste of opportunities for whom to see exhibition such as foreign students and tourist.
English circulation is very important in creating very original exhibition.
All the panels are prepared in Japanese and English
Guide Tour: 5 times in Japanese and 5 times in English (by me)
Exhibition related lecture (in Japanese): 3 times in different speaker
Collaborated exhibition corner with Kyoto Prefecture Library
Introduction of KU graduate student researches in Japanese (1 day)
Introduction of young researchers in Asia (1 day)
Symposium on University Museums (in English)
Science program for SSH high school student using exhibition
Training program on science for teachers using exhibition
Lecture series of Kyoto University talking about the exhibition
Utilizing for museum curator license program

Other Previous Special Exhibition in Zoology

2005-2006, 2012, 2017: 3 times
Around every 5 years
→ Good to develop new ideas, PhD students are expected to have a chance during the course.

KYOTO UNIVERSITY

Special Exhibition in uniMuse

Focus on university research activities or university history in uniMuse.

History is sometimes thought to be told by ”written material”, but only special things were mentioned, and normal or daily life is rarely described.
Specimens and objects are expected to tell us many more things through survey and examination.

Not necessary to focus on “rare” material. Sometimes, “a set of” specimens have great value.

Already existed knowledge and material to be transmit to the public?
Taking already existed knowledge and material, develop and create more advanced scientific knowledge and outreach with a special exhibition project, and all involved process and events to be the opportunity of maximization of the final outcomes in science, outreach and university education.

Permanent Exhibition (now renewal ongoing)

Direction of uniMuse exhibition

Exhibition basing on university research activities and history
Picking up the strong topic in Kyoto University with specimens
It is different from museum exhibition for general understanding:
such as “History of Japan”, “Evolution of Animals”, etc.
How such topic exhibited?
Not for the memory.
Continued to future outcome in research and education.
Most important target audience are Kyoto University students, along with younger generation, then everyone from all over the world.
Do specimens tell us?
In limited length, panel cannot explain everything and should be brief.
But specimens inspire audience more than panel.
Further self learning may start. Exhibition function for such drive.

Permanent Exhibition

KYOTO UNIVERSITY

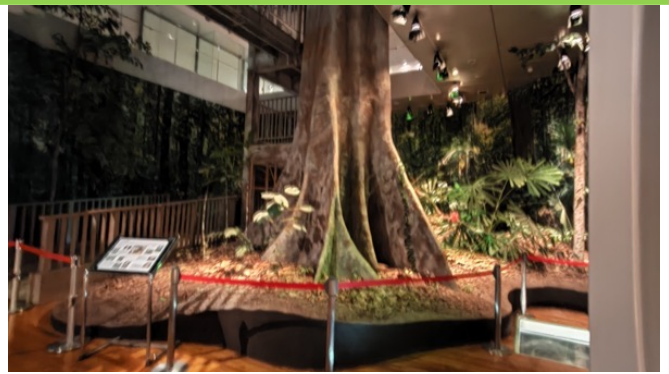
Permanent Exhibition






KYOTO UNIVERSITY

Permanent Exhibition



KYOTO UNIVERSITY

Permanent Exhibition Renewal is Going:
Specimens for thinking about diversity and function

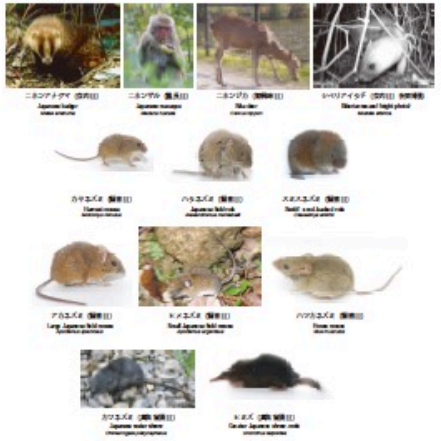
KYOTO UNIVERSITY

Renewal Panel: What specimens can tell and cannot tell?

京都の動物たち
Animals in Kyoto

芦生のある京都府には、哺乳類 52 種・爬虫類 16 種・両生類 23 種の陸上脊椎動物が生息している。京都大学では哺乳類・爬虫類・両生類の多様性や自然史に着目した系統分類学・生態学・行動学の研究を活発に行ってきた。近年はニホンジカ、イノシシ、ツキノワグマ、ニホンザルによる農作物加害や市中への出現が増えており、野生動物保護管理に関する研究も進めている。

Among the terrestrial vertebrates found in Kyoto Prefecture, where Ashiu is located, there are 52 species of mammals, 16 species of reptiles, and 23 species of amphibians. At Kyoto University, research is carried out on the phylogeny, systematics, ecology, and ethology of these animals, with a focus on biodiversity and natural history. Recently, there has been an increase in the extent of agricultural damage, and in urban areas, other incidents of human-animal conflict, attributable to sika deer, wild boar, black bears, and macaques, which is being assessed by wildlife management research.



分布はどのように形成されたのか？
How the animal distribution had been formed?

動物は種によって分布が異なる。日本だけに限られる日本固有種もいれば、大陸まで広域に分布する種もいる。京都はモグラ類が 3 種生息するなど興味深い地域である。形態や遺伝子の地域間の変異を調べ、それぞれの種がどのように現在の分布を形成したのかを探るのが京都大学が得意とする動物地理学である。

Different species of animals are characterized by differing distribution pattern. Some species occur only in Japan (Japanese endemic species), while most others are extensively distributed in both Japan and continental regions. Kyoto is an interesting area in terms of animal distribution, as illustrated by the co-occurrence of three different species of moles, and in this regard, zoogeography, the study of the geographical variation in morphology and genetics that examines the development of current distribution patterns, is a strong field at Kyoto University.

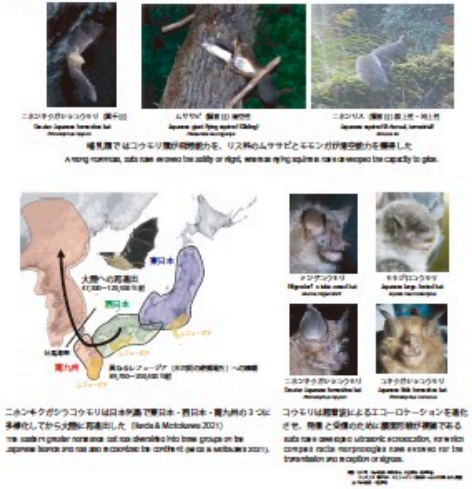
島嶼からなる日本では、多くの動物たちは過去の寒冷な氷河期で大陸と陸続きになったときにやってきた。そのため、日本は種の進化の終着地と考えられてきた。一方、海峡による隔離の影響が少ない飛翔性コウモリの 1 種で、日本から大陸への再進出が起こったことが京都大学の研究で解明された。

During historical glacial periods, Japan, which comprises a series of islands, was colonized by numerous animal species from current-day continental regions via land bridges. Following glacial retreat, these species became isolated from the continent, and have subsequently evolved in unique ways in Japan. In contrast, given its ability of flight, the distribution of one bat species has been less influenced by post-glacial isolation, and indeed, a recent study at Kyoto University has revealed that this bats has undergone reverse colonization from Japan to the continent.

動物たちの生活史と形の進化
Evolution of the life history and form of animals

動物は外観や骨格の形が種によって異なる。地上性・樹上性・地下性・水棲の生活様式、飛翔・滑空といった移動様式、食べ物、気候、繁殖などを反映しながら、形態が進化した。機能に着目して形態変異のパターンや進化史を解明する機能形態学といわれる研究にも、博物館標本が活用されている。

Different species of animals are characterized by differing external and internal features. Differences in habitat type (e.g., terrestrial, arboreal, fossorial, and aquatic), volant and gliding means of locomotion, food, climate, and reproduction have all contributed to the development of unique morphologies during the course of evolutionary history. Museum specimens are utilized for research on functional morphology, in which patterns of morphological variation and evolution are examined with respect to function.



Education in uniMuse

uniMuse has education role more than public education
(1) Education for museum specialists (curator license course in Japan).
Teaching classes, practice in (1) university and (2) museum.

(2) Education for graduate students (master and PhD) in uniMuse.
Students in Graduate School of Science are locaterd in uniMuse
for research on specimen-based discipline (e.g., biodiversity).
Postdocs and visiting researchers also joined in uniMuse.

(3) Museum literacy for students in general.
1st year student seminar (10 students only from various faculties)
“Think about museum specimens”: lectures, presentation, collection view.

(4) Inter-discipline education in uniMuse.
(5) Seeking opportunities of younger generation to university.

Children Museum: Public Education for Children?
Or Education and Practice as Teaching Staff for University Students?

Children Museum in Kyoto University uniMuse
Every Saturday (with sometime interruption due to Covid-19 in 2020–2022)

Face-to-face talk using specimens and materials:
Children (and parents)
Teaching staff (mostly undergraduate or graduate students)
Free dialogue, without time limitation.

It contributes science outreach ability of students.

Now we consider the Children Museum as education for university students, more than for children.

Activities of PhD and Master Students in uniMuse

Supervisor and student relationships

Conducting research for their thesis: various taxa and methods

Team activities

Outreach of research, Press release

Curation support of uniMuse collection (paid in part)

Teaching assistant for museum license course (paid)

Participating uniMuse activities

Interdisciplinary seminars, symposia

Student outreach as university or uniMuse activities

Lecture for elementary school, high school, university students

Program for international visiting groups

Opportunities

Having a desk and lab inside museum; seeing non-research specimens

Meeting with many researchers and students

Direction of Research Activities in My Group

Species Diversity of Terrestrial Vertebrates in Asia, as international collaboration:

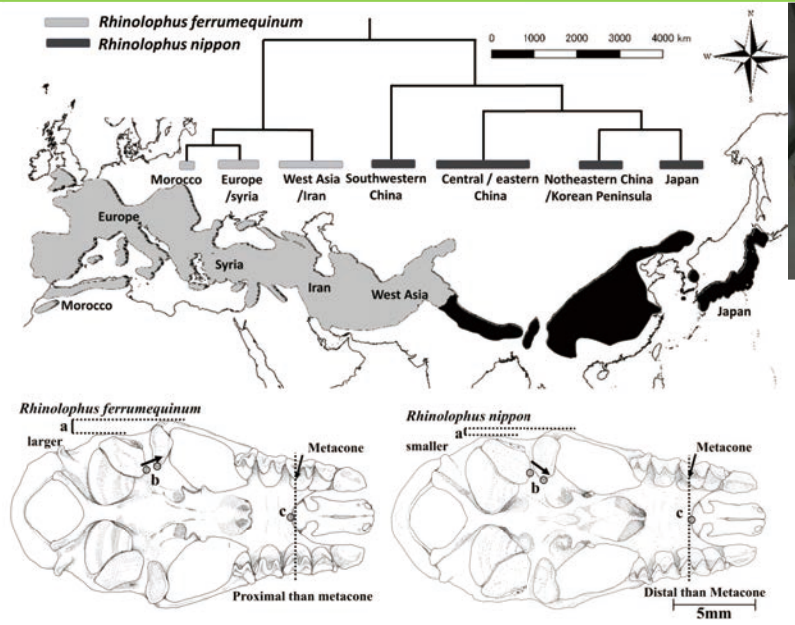
- Comparative understanding of diversity patterns among taxa.
- Various taxa with different habitat
- Different morphological parts with different modules:
  - Skull, skeleton, teeth, reproductive traits, etc.
- Morphology, genetics, and geography considered jointly.
- Wide geographic coverage:
  - Japan, Korea, China, Taiwan, Vietnam, Laos, Thailand, Myanmar, Malaysia, etc.
  - Lowland to high mountain
  - Islands with small to large areas

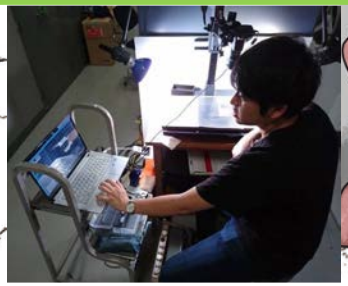
Understanding from the diversity or differences, not only from the similarities.

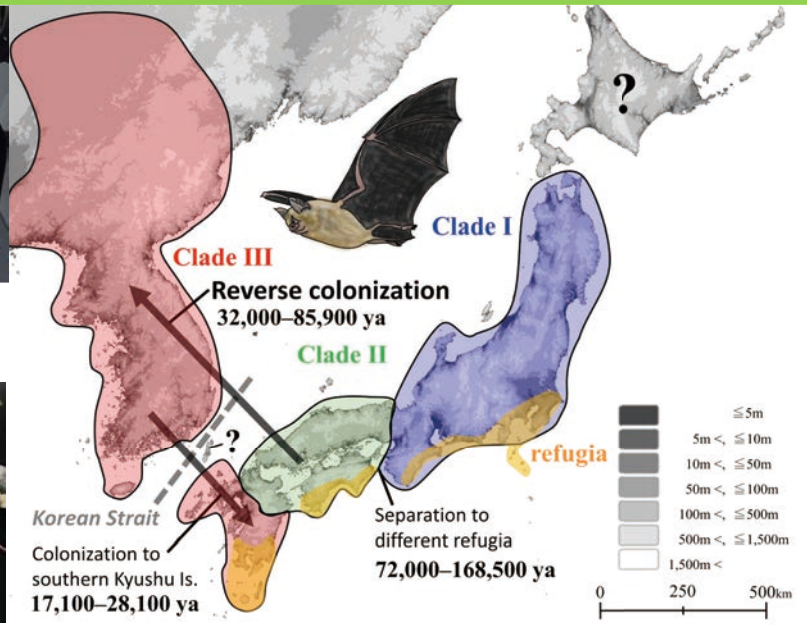
Specimens and samples used:

- Museum collection is very useful and important, but not complete in each museum.
- Fieldwork-based new survey and collecting specimens and samples
- Collection and samples of several museums (domestic and global) analyzed jointly.

Research of Student: Yugo Ikeda, PhD course
Diversity of rhinolophid bats in Asia







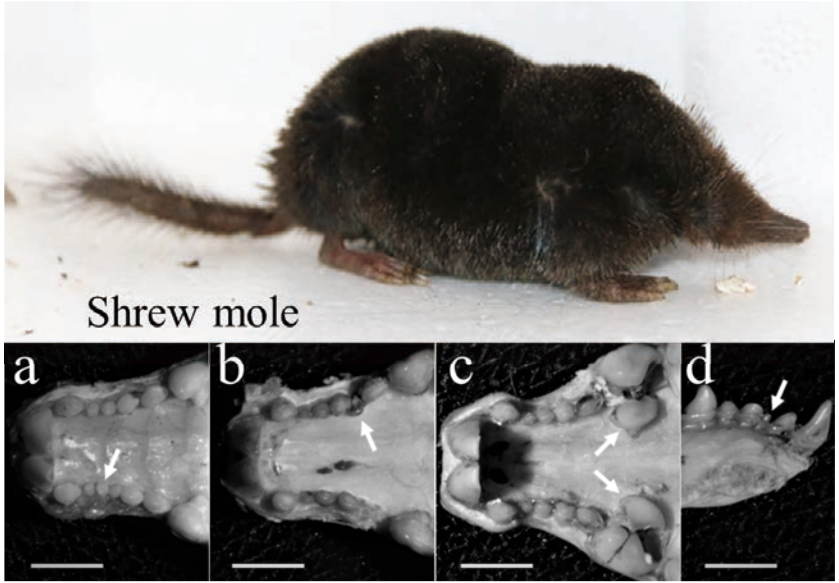
Taxonomy of *Rhinolophus ferrumequinum* complex based on specimens from Europe to Japan (Ikeda et al. 2020)

Phylogeography of *R. nippon* with specimens collected from western Japan (Ikeda & Motokawa 2021)

KYOTO UNIVERSITY

Research of Student: Shinya Okabe, PhD course
Effects of Islands and Altitudinal Distribution for Zoogeography

Part time job on Herpetological specimens collected from Japan, Indochina region, Madagascar and Africa etc.

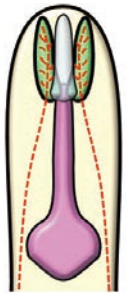


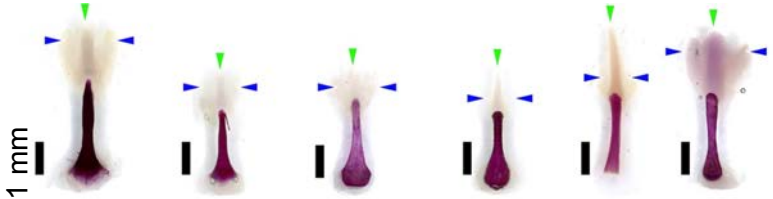
Dental anomalies of shrew mole with specimens collected across Japanese archipelago (Okabe et al. 2021)

KYOTO UNIVERSITY

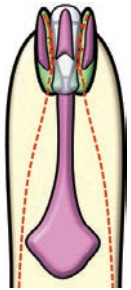
Research of Student: Takashi Yato, PhD course
Comparative morphology of male genitalia in Muroidea

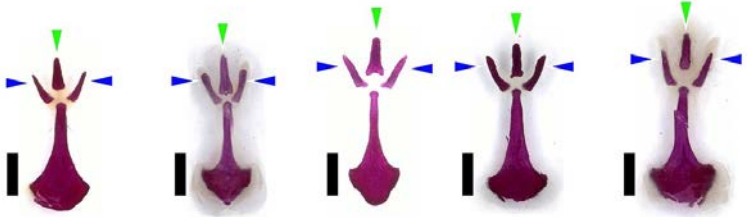

Murinae



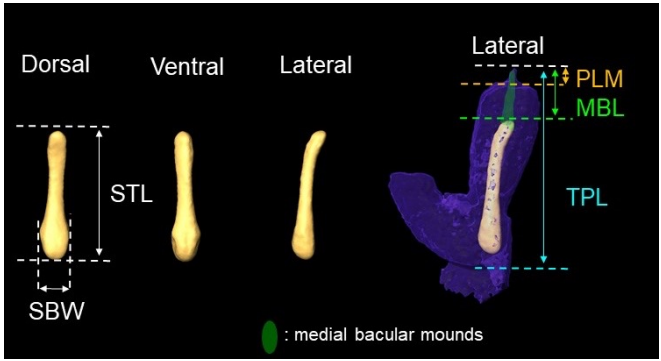


Arvicolinae

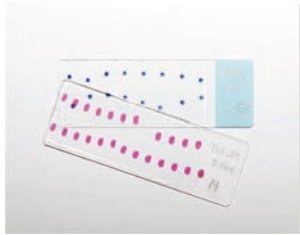


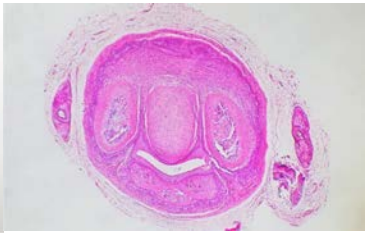


Analysis by micro CT



Tissue sections

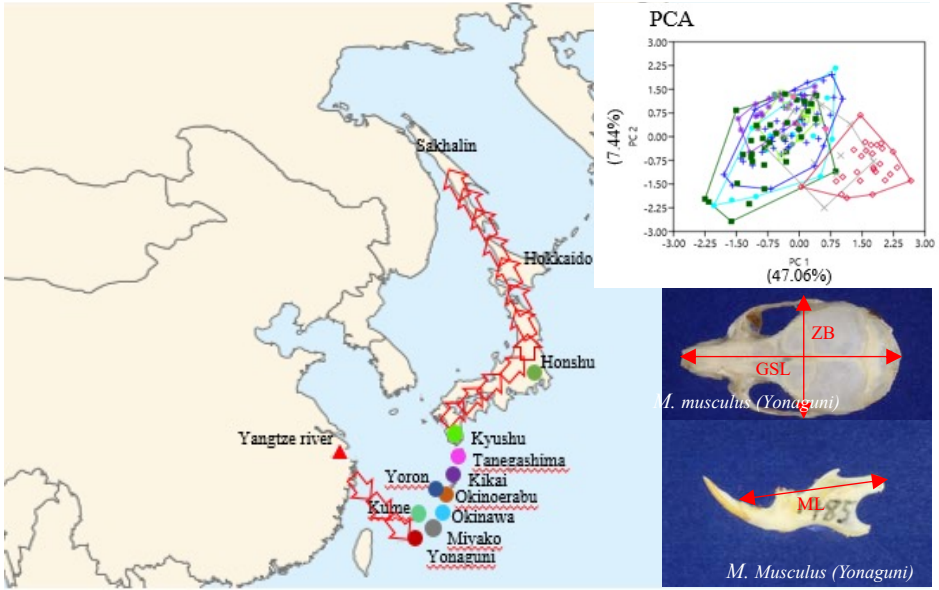




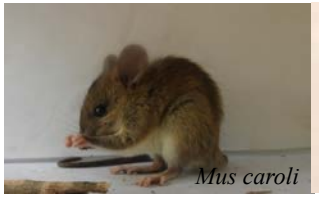
KYOTO UNIVERSITY

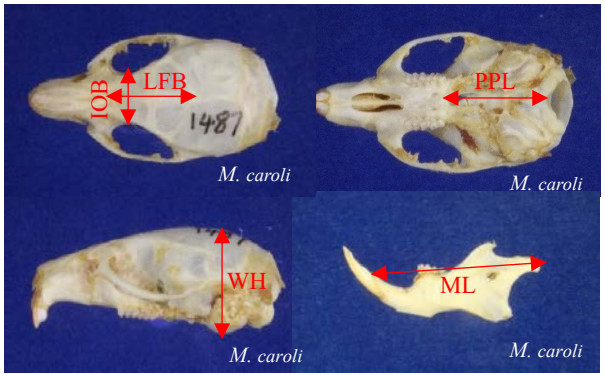
Research of Student: Wai Min Thu, PhD course
Morphological variation of the genus *Mus*

Geographic variation of *M. musculus*



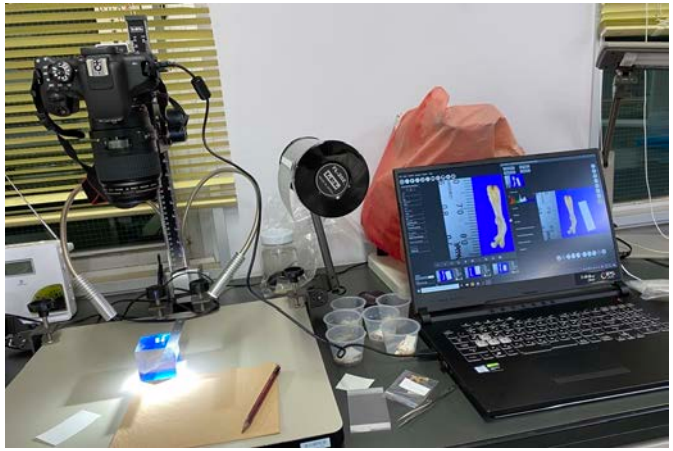
Interspecific variation of two sympatric species in Okinawa Island

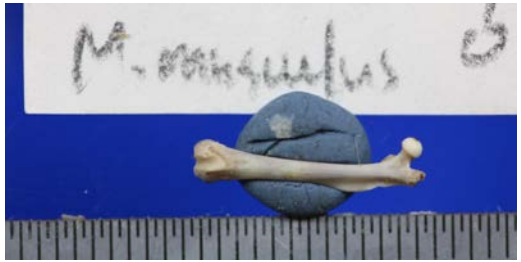




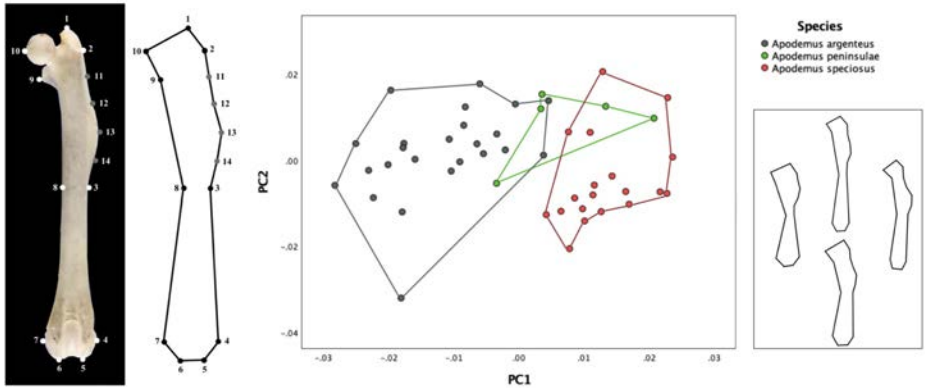
KYOTO UNIVERSITY

Research of Student: Hyeji Kang, Master course
Comparative skeletal morphology of small mammals



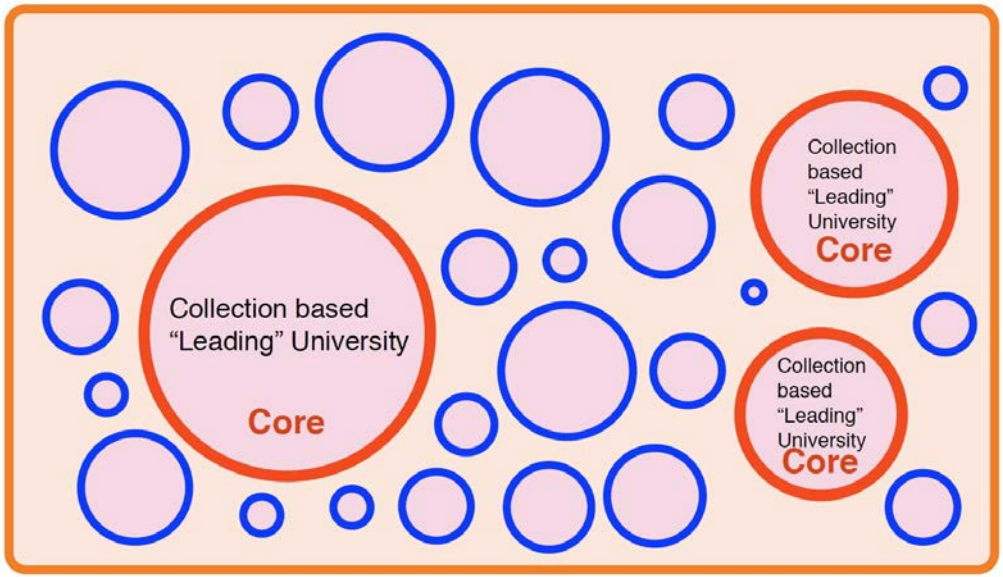


Comparing various species and find morphometric implication
Geometric morphometric analyses



KYOTO UNIVERSITY

uniMuse Global Net: Leader is Necessary, Winner Not in Need.



Global Connection of Collection:
Multilateral & Equal Relationship / Step-by-step

KYOTO UNIVERSITY

Towards Understanding Diversity of Asian uniMuses

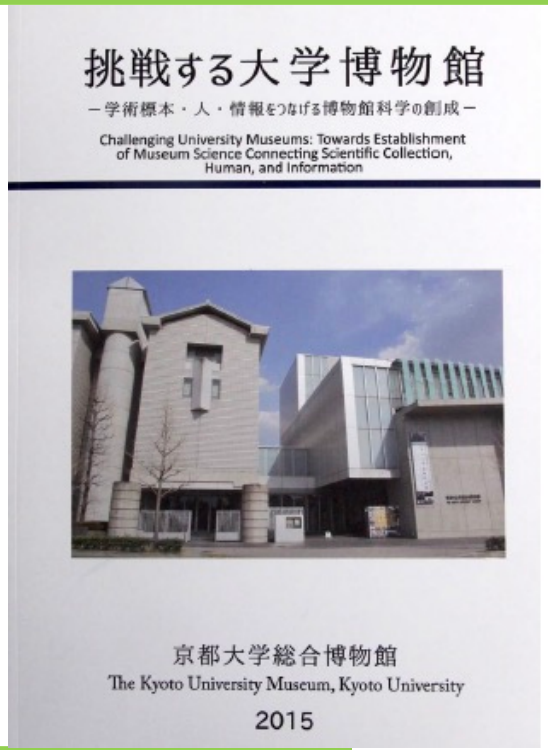
APRU (Association of Pacific Rim Universities)
Research Symposium on University Museums "Forming a University Museum Collection Network as the Core of Frontier Research" (2012)

KYOTO UNIVERSITY

Towards Understanding Diversity of Asian uniMuses

Kyoto 2014-10

Hanoi 2016-10

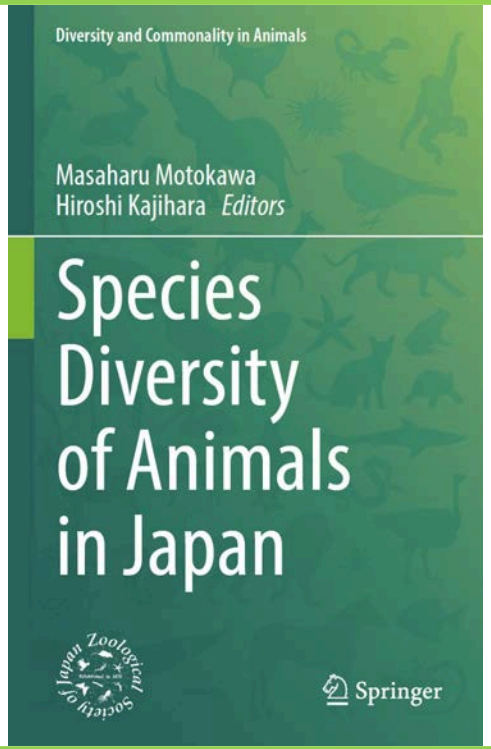


KYOTO UNIVERSITY

Function of uniMuse Compared with Museum and University

	uniMuse	Museum	University
Collection Management	○	○	×
Research	○	△	○
Education: for public	○	○	×
Education: for curator	○	×	△
Education: for master, PhD	○	×	○
Education: fostering researcher	○	△	○
Global Collection Net	○	△	×

Species Diversity of Mammals in Japan



Chapter 1
"Land Emergence" and "Elevation Shift" Affect Diversification: A New Perspective Toward Understanding the High Species Diversity of Terrestrial Animals in Japan

Masaharu Motokawa

Keywords Zoogeography • Glaciation period • Land emergence effect • Land bridge • Elevation shift effect • Cryptic barrier • Cryptic corridor • Connectivity • Island syndrome

Connectivity: 0–1.0
vs 0 or 1

KYOTO UNIVERSITY

Species Diversity of Mammals in Japan: Elevation Effect

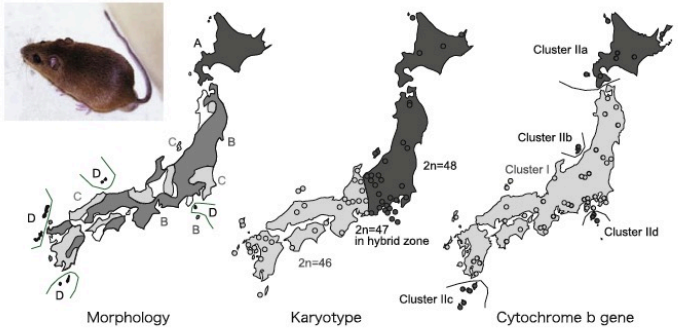


Fig. 1.3 Different patterns of divergence reported for karyotypes (Tsuchiya et al. 1973; Tsuchiya 1974), morphology (Kobayashi 1981), and cytochrome *b* gene (Suzuki et al. 2004)

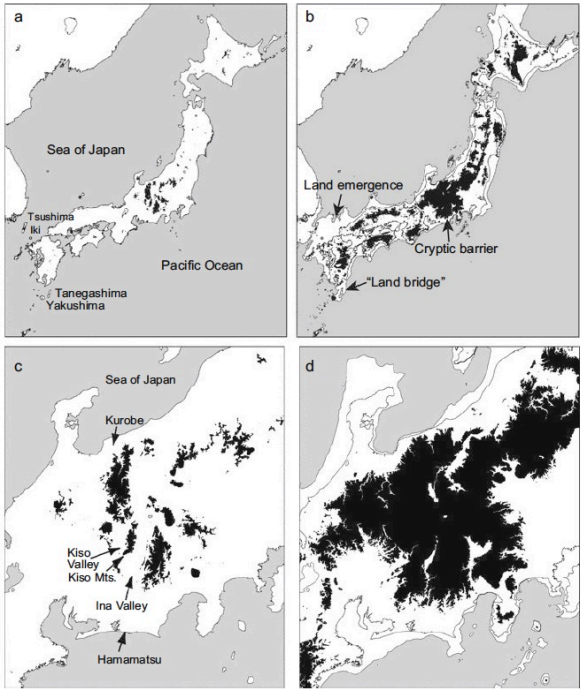


Fig. 1.4 Distribution of lowland species in the Japanese islands with *Apodemus speciosus* as a model (modified from Shintaku and Motokawa 2016). (**a**) Potential distribution (*white*) in areas less than 1600 m in elevation. (**b**) Estimated potential distribution in the last glaciation maximum (LGM) between −130 and 600 m, and 'elevation shift' in the central part (modified from Shintaku and Motokawa 2016). (**c**) Potential distribution in the present (*white*) in areas less than 1600 m in elevation in central Honshu. (**d**) Estimated potential distribution in LGM (*white*) between −130 and 600 m elevation in central Honshu

KYOTO UNIVERSITY

Species Diversity of Mammals in Japan: Land Emergence Effect

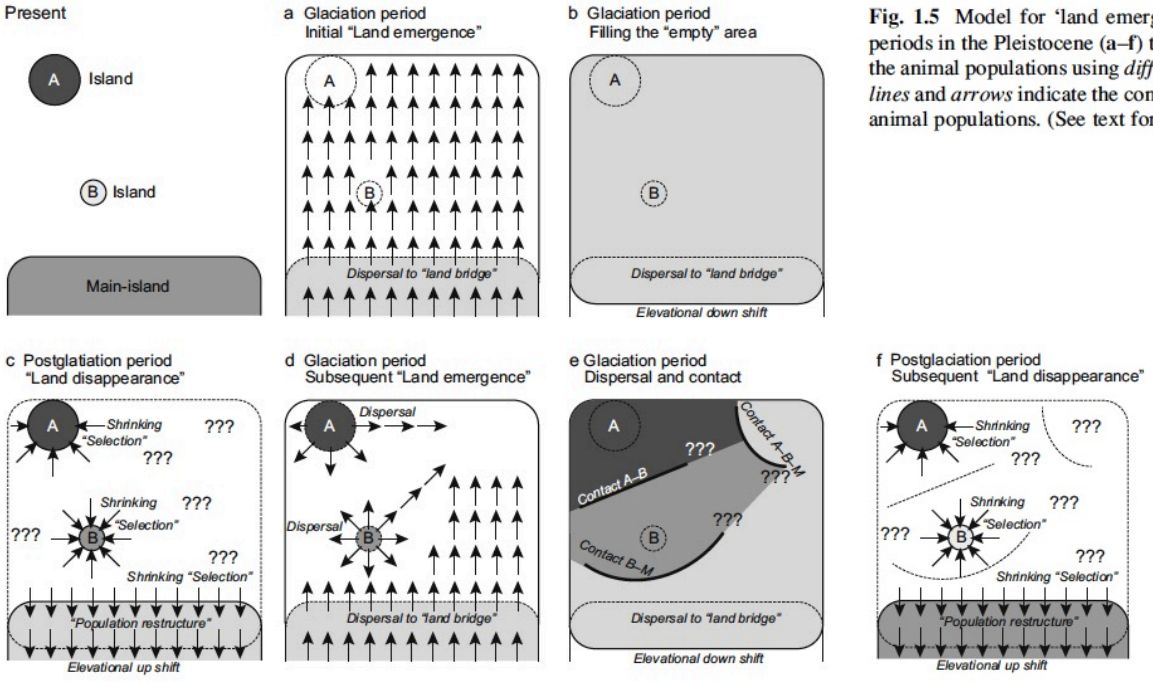


Fig. 1.5 Model for 'land emergence' effect during the repeated glaciation and post-glaciation periods in the Pleistocene (a–f) to the present (*upper left*). *Shaded areas* indicate the existence of the animal populations using *different colors* for morphological and genetic differentiations. *Solid lines* and *arrows* indicate the configurations of land areas and the expansion and contraction of the animal populations. (See text for explanation)

Species Diversity of Mammals in Japan: Land Emergence Effect

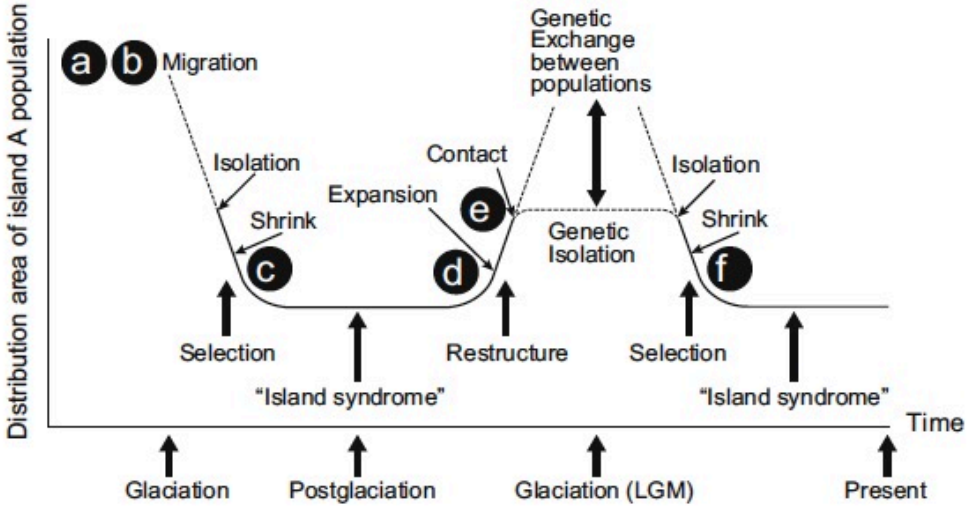
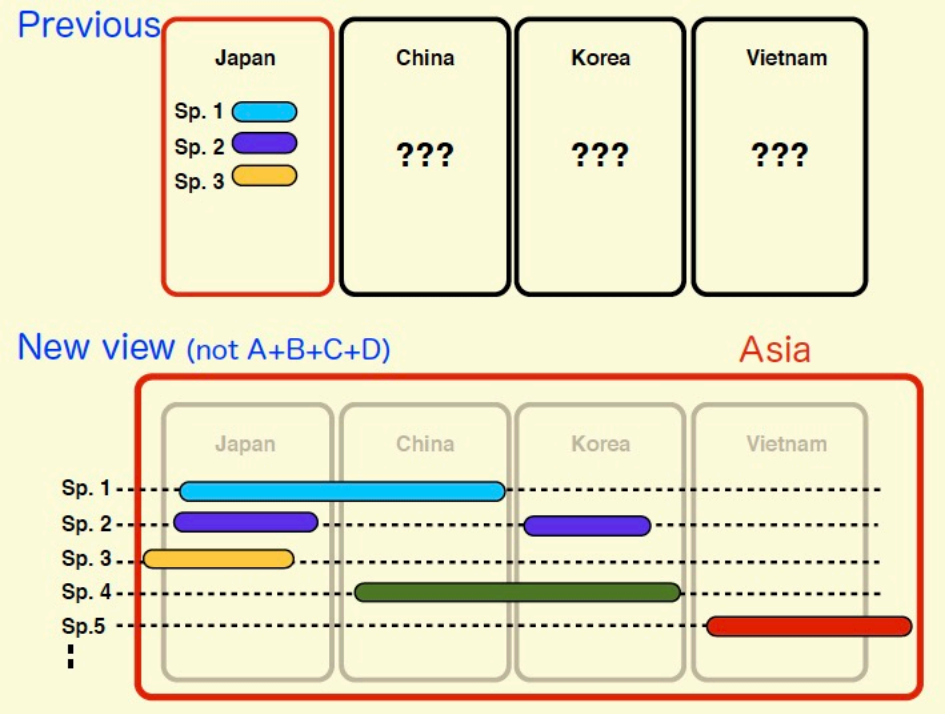


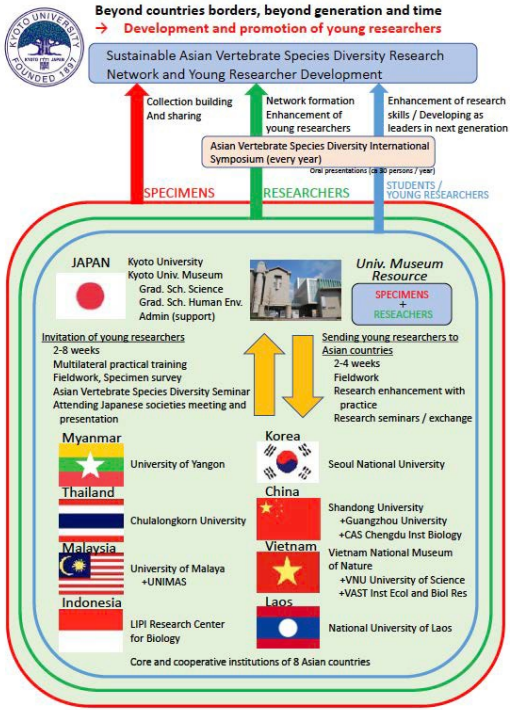
Fig. 1.6 Distribution area changes and expected effects of the adjacent island A population during the repeated glaciation and post-glaciation periods in the Pleistocene. *Letters* a–f correspond to the events in Fig. 1.5

Species Diversity of Mammals in Asia: Strategies



KYOTO UNIVERSITY

Species Diversity of Terrestrial Vertebrates in Asia



Asian Vertebrate Species Diversity Research @ Kyoto University

JSPS Core-to-Core Program B. Asia-Africa Science platforms

Sustainable Asian vertebrate species diversity research network and young researcher development (FY2017-20, Japan+8)
9 countries, more than 170 researchers

Asian vertebrate species diversity network platform with combining researchers, specimens and information (FY2014-16, Japan+7)

Research platform for East Asian vertebrate species diversity and formation of specimen network (FY2011-13, Japan+3)

KYOTO UNIVERSITY

Species Diversity of Terrestrial Vertebrates in Asia

Students and young scientists
Face-to-face
Practical training workshop
International Symposium (2011-2019, every year)

KYOTO UNIVERSITY

★uniMuse specific

Creative and Sustainable as Science Infrastructure!

Team

Motokawa (PI)

Collaborator Coordinator

Principal Supervisor

PostDoc
Visiting Researcher

PhD / Master Students

The Kyoto Univ. Museum

Graduate School of Science [affiliation]

Collaboration

Supervision

Visiting Professor

Other staff

KURRA

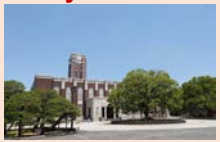
★Interdisciplinary Collaboration

Site: uniMuse

Biodiversity research
★Collection management
★Special Exhibition
★Permanent Exhibition
★Lecture for Public
★Guide Tour
★Museum Seminar

Reference and Voucher

Site: Kyoto Univ.



Research:
Collaboration
Education:
Zoology
★Curator program
★Museum literacy

Site: Outside Kyoto Univ. (Global)

Research:
Collaboration
Publications
Society
Symposium
Outreach
uniMuse
★uniMuse Science
★Global Net
Public relations:
School
★Various outreach

Specimens

★Specimens

★Specimens

uniMuse is Science Infrastructure for Research and Outreach!

Motokawa Group 2022

KYOTO UNIVERSITY

Closing

I thank Dr. Pipat Soisook and Ms. Pimsai Awatsaya
for opportunity to talk about museum management.

If you want to join our team, contact:
motokawa.masaharu.6m@Kyoto-u.ac.jp

KYOTO UNIVERSITY