Information standardization of marine bio resource and Construction of the integrated DB

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1. Business Outline
2. Major Performance
3. Research Summary
4. Research Contents
1. Business Outline
1. Outline

As a national system – performing a role as a messenger of duty of overall acquisition, possession, and management

Standardization of the information of marine bio resource and construction of the integrated DB

**Coping actively with the international situation**
- Coping actively with the overall condition change like conclusion of Nagoya Protocol
- Preoccupancy of international superiority through marine bio resource use technology development

**Support of standardized information**
- Demand of single way to search of scattered species information and gene
- Co-utilization of jurisdiction organ and domestic and foreign marine bio information

**Support of utilization information System**
- Erection of Nation Institute of Marine Biological Resources and providing informatization operating basis function
- Providing integrated information system’s English service considering foreign country users
2. Major Performance
1. Phase 1 1st year Major Performance

A Construction of DB and DB link status

Construction of DB Status

<table>
<thead>
<tr>
<th>DB Status</th>
<th>species</th>
<th>score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coral</td>
<td>128</td>
<td>1,499</td>
</tr>
<tr>
<td>Useful marine plankton</td>
<td>624</td>
<td>1,941</td>
</tr>
<tr>
<td>Marine arthropod</td>
<td>260</td>
<td>23,878</td>
</tr>
<tr>
<td>Marine mollusk</td>
<td>226</td>
<td>10,326</td>
</tr>
<tr>
<td>Marine rhodophyta</td>
<td>435</td>
<td>1,115</td>
</tr>
<tr>
<td>Porifera · Echinoderm · Bryozoa</td>
<td>318</td>
<td>4,342</td>
</tr>
<tr>
<td>Toxic marine life</td>
<td>110</td>
<td>152</td>
</tr>
<tr>
<td>Marine life specimen</td>
<td>4,176</td>
<td>2,223,190</td>
</tr>
<tr>
<td>building business</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Construction of DB Status in 2013 (Nov 11, 2013)

<table>
<thead>
<tr>
<th>DB Status</th>
<th>species</th>
<th>score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coral</td>
<td>100</td>
<td>706</td>
</tr>
<tr>
<td>Useful marine plankton</td>
<td>833</td>
<td>2,284</td>
</tr>
<tr>
<td>Marine arthropod</td>
<td>269</td>
<td>23,943</td>
</tr>
<tr>
<td>Marine mollusk</td>
<td>318</td>
<td>14,556</td>
</tr>
<tr>
<td>Marine rhodophyta</td>
<td>624</td>
<td>3,071</td>
</tr>
<tr>
<td>Porifera · Echinoderm · Bryozoa</td>
<td>589</td>
<td>6,090</td>
</tr>
<tr>
<td>Marine life specimen</td>
<td>3,807</td>
<td>2,336,741</td>
</tr>
<tr>
<td>building business</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※ Reason for difference between building number of species between score in 3rd year:
Because of rerating by correcting repetition and error
1. Phase 1 1st year Major Performance

B  Application of multi classification system and materialization of link service

- Catalogue of Life
- ITIS
- NCBI

Asteropus simplex
1. Phase 1 1st year Major Performance

C DB verification grouping

- Verification of form: verification of agreement or disagreement with collected data information standard form
- Scientific name parsing: Parsing scientific name inputed by filtering by delimiter of specific name
- Mapping category system: Completion of high rank by species categorization system mapping of Catalog of Life
- Granting GUID & Storage: Storage DB after granting GUID by automatic process

Example of scientific name parsing:

Fagus sylvatica subsp. orientalis (Lipsky) Greuter

GUID composition:

nimbr:madbk:20120523:100101

- Donor: National Institute of Marine Biological Resources
- Date of collection
- Number of species
- Storage DB after granting GUID by automatic process
## 1. Phase 1 1\textsuperscript{st} year Major Performance

### D. Integrated Searching Service Implementation

<table>
<thead>
<tr>
<th>Integrated Searching</th>
<th>Search for domestic and foreign resources list</th>
<th>Search for classification system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search for species information, other institution, list of parceling out possibility, literature materials, news, gallery, multimedia by inputting related words</td>
<td>Provide list of domestic jurisdiction institution and foreign data separately &amp; Search by supply institution</td>
<td>Search for multi classification system of CoL/SP2000, GBIF, ITIS, NCBI</td>
</tr>
</tbody>
</table>
1. Phase 1 1st year Major Performance Summary

Building DB & Connecting DB
- building: 6,277
  12,266,443
- connecting:
  1) other department system
  2) multi classification system
  3) related websites

Application of multi classification system and materialization of link service
- SPECISE 2000
  - NCBI
  - ITIS

Materialization of integrated searching service
- Integrated searching Domestic and foreign resources list
- Search for classification system

Securement of discrimination of marine bio resource integrated information system
- Content report written by donation service process
- Approval notice report written by parceling out, rental service process

Automatic reported form
2. Phase 1 2nd year Major Performance

A Application of work shop details

Korea Research Institute of Bioscience and Biotechnology Dr. Jung-Sook, Lee

- Difficult to fix one standard because of the different classification system for each marine life
- Provide classification for each marine life by providing multi classification system

Application of semantic search is generally about person and outcome, and basic expertDB work for finding correlation with marine bio resource should be done when researching
- Need materialization of system consumers like government agency expert and the ocean related expert
- Primarily building personDB and planning ontology
- Change to semantic information by mapping integrated DB

- Drawing inference from marine life expert information
- Building ontology for real time semantic implication

Ulsan University Prof. Chul-Young, Ok

Law firm Darae lawyer Seung-Jong, Oh

- Protection of database makers’ right
- Must pay attention to using personal information without agreement of the subject of the personal information
- Just linking DB doesn’t infringe a copyright

- Service after putting data sources on contents
- Service of professional contents through term purchase

Paranbada director Kyoo-Jin, Song

- under water 3D filming and service for practical use of marine life contents
- Increasing the promotion effects by providing latest 3D marine life contents

3D contents service development besides existing video service
## 2. Phase 1 2nd year Major Performance

### A Application of work shop details (continue)

**National Information Society Agency**  
**Dr. Tae-Dong, Kim**

- Concept and application of KIX
- Registrability of metadata on national DB pedia portal
- Provide service through practical use service site

**Abbott Korea director Hye-Ryun, Bhang**

- Vitalization of developing a new drug by providing chemical library of marine life
- Continuous interest and study for a new drug development

**The Office of Legislation deputy director**  
**Chang-Hee, Cho**

- Fragmentary service of legal information is meaningless because of the change of legal information of the Office of Legislation by establishment and revision of legislation
- Increase in importance of legal basis for management of marine bio resource

**Electronic parts researcher**  
**Dr. Hoon-Jong, Kang**

- Realization of 3D stereo effect with cross section image of 2D
- Expansion of interest and expectation about holographic contents

**Implication**

- Possibility of checking marine bio resource contents on private portal not on independent service
- Additional build-up of traditional knowledge information as a pharmaceutical company’s material of new drug development
- Real time connection with legal information about marine bio resource
- Various form of marine bio resource contents construction
2. Phase 1 2nd year Major Performance

Geographic information search
Species search, collection frequency analysis, and area analysis with marine

<table>
<thead>
<tr>
<th>Species search</th>
<th>Collection frequency analysis</th>
<th>Area analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>➕ After searching location information about species, information about species location is expressed by grid enlarging the service map</td>
<td>➕ Collection frequency analysis about the resource belonged in certain area after area set</td>
<td>➕ Analysis of the resource belonged in certain area after area set</td>
</tr>
<tr>
<td></td>
<td>➕ Make a chart of the top five resources</td>
<td>➕ Provide outcome list by collection year, species outcome watching service, and resource in the area collection information</td>
</tr>
<tr>
<td></td>
<td>➕ Enlarge a map into location information about the searched resources</td>
<td>➕ Make a graph of the collected resources belonged in the area</td>
</tr>
</tbody>
</table>

[Species search and collection frequency analysis screen]  [Area analysis screen]
2. Phase 1 2nd year Major Performance

C Analysis tool connection service
relevant gene resource tool introduction and providing site connection function
by marine bio resource analysis tool connection

- UCSC Genome Bioinformatics screen

output of detail information and analysis tool shortcut button when clicking
2. Phase 1 2\textsuperscript{nd} year Major Performance

D Gallery and multimedia service

\begin{itemize}
  \item provide image of named marine bio resource
  \item provide nationwide service contents by security management like watermark insertion
\end{itemize}

\begin{itemize}
  \item provide multimedia about marine bio resource
  \item watch video by video player
  \item provide auditory service by audio production on video itself
\end{itemize}
2. Phase 1 2nd year Major Performance

Legal information service

- Provide legal information by real time connection with the Office of Legislation
- Provide search function, legislation, administration rule, local statues, treaty, and precedent/case analysis
- Provide transformation function in Korean, English, and a second foreign language in case of treaty
2. Phase 1 2\textsuperscript{nd} year Major Performance

Mobile service

<table>
<thead>
<tr>
<th>Mobile service(WEB)</th>
<th>Mobile service(APP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\beta) provide mobile service adequate to smartphone and smart office environment</td>
<td>(\beta) provide resource searching, location based map searching service, and augmented reality service</td>
</tr>
<tr>
<td>(\beta) provide introduction about marine bio resource integrated information system and marine bio resource</td>
<td>(\beta) support Android, iOS</td>
</tr>
</tbody>
</table>

[Main screen] [Map search screen] [Detail search screen] [Detail information screen]
2. Phase 1 2nd year Major Performance

- Provide link service with a marine bio resource-related overseas system
- Propose global standards of marine bio resource by providing English service
- Provide openness to use service that has been localized nationally worldwide by English service

Main screen

Detail page
2. Phase 1 2nd year Major Performance

H Connective registration of public data portal
- Public data portal meatadating of builded marine life 200 species
- Provide nationwide service with public data portal searching

Connection of public data portal

Provide marine life 200 species link service of marine bio resource integrated information system (www.mbris.kr) on public data portal (www.data.go.kr)

Public data portal registration screen
2. Phase 1 2nd year Major Performance

- Geographic information service
  - Provide classification system and unit location service
  - Provide various analysis function

- Legal information service
  - Provide legal information by real time connection

- Analysis-Statistical Service
  - Provide analysis and statistical service based on various search condition

- Various contents service
  - Provide multimedia hall, gallery hall contents service

- The ocean-tradition knowledge search service
  - Provide reference and tradition knowledge service about marine bio resource

- Parceling out-donation service
  - Provide parceling out and donation service of marine bio resource

- Mobile service
  - Develop mobile WEB/APP and provide augmented reality service

- Connective registration of public data portal
  - Provide nationwide service with public data portal searching

- Multi classification search service
  - Provide multi classification system
  - Link corresponding site by connection with integrated search detail view
    - NCBI - GBIF
    - ITIS - CoL/SP2000

Securement of discrimination of marine bio resource integrated information system
3. Phase 2 3rd year Research Summary
1. Background and Purpose

For encouragement of use of marine bio resource

“Update of integrated DB and enhancement of application”

- Need building integrated DB and operating system according to the enforcement of marine bio resource law
- Need enhancement of constructed integrated information system
- Need construction of marine bio resource application information system proposed in original project research
- Need integrated operating system managing marine life specimen real resources according to the opening of Nation Institute of Marine Biological Resources

Enhancement of resources management system

Construction of infrastructure of marine bio resource use promotion

Supply of Nation Institute of Marine Biological Resources operating basis
MBRIS  user use state (web trend function)
4. Phase 2 3rd year Research Contents
A. Standardization of marine life information raw data input format and tool development

### Analysis of form of report about marine life and validity check tool development

#### 1. Existing report

- **Collection of materials**
  - Preparing and collecting material step

- **Classification of materials**
  - Check informativity, reliability about the collected materials
  - Classify on the basis of publication period and subject, etc.

- **Classification information system display**
  - Display marine life classification information system for each report

- **Expert’s advise**
  - Expert’s advise about classification system display based on materials

- **Analysis of existing report**
  - Analyze existing report about marine life engineering

- **Comparison of data item**
  - Compare MBRIS data item

- **Expert’s advise**
  - Quality assurance by expert’s advise before input of materials

- **Input of materials**
  - Improve credibility when inputting by forming input window for construction of DB as a dual form

#### 2. Validity check tool

- Validity check optimizes the contents that users can input.
- Can check whether the user input correct value in the way of being disturbed if inputted wrong value or warning message

#### 3. Reporting Viewer

- [Images of reporting viewer]

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IV. Phase 2 3rd year Research Contents
A. Standardization of marine life information raw data input format and tool development

- **Standardization of report format**
  - Standardization of format by reviewing application report in the government

- **Development of report Viewer**
  - Marine life related report
    - DB construction
  - By processing as PDF form provide related report Viewer
Construction of gene and protein sequence management system

Example of Sequence comparison/search tool development

- sequence comparison/search tool development
- sequence input/registration service development

- Add ‘sequence input/registration’ menu on low rank menu of ‘analysis tool’
- Registered sequence information is stored on MBRIS database
C Resource utilization current state and management system construction

Process enhancement
- Apply default value ‘0’ about statistical information on ‘ongoing’
- Add ‘mailing step’ on ‘parceling out’
- Change to ‘request/investigation/approval/mailing/rejection’ from ‘request/investigation/approval/rejection’
- ‘cancel request’ function implementation limited items on request step among ‘latest ongoing/history’
C Resource utilization current state and management system construction (continue)

Loading resources history management/statistics/report output function

- Performance of search result detail information (the ocean and tradition knowledge) output function
- Performance of statistics (biodiversity_record statistics, donation/parceling out/rental_record chart) output

- Materialization of report output menu
- Application of report management between producer and manager
C Resource utilization current state and management system construction (continue)

- Gene resource/information connection
  - gene resource/information connection selecting related government like donation registration preservation government and related system
  - ‘sequence search’ menu construction
    - ‘sequence search’ menu construction providing sequence information and sequence search service when gene resource/information connecting

- Enhancement of specimen resources donation/registration/pa rceling out process
  - Related government:
    - Donation registration preservation government
    - Related jurisdiction organization
  - Target system:
    - Marine bioresource Integrated DB
  - DB construction and application development plan
  - Service menu construction
  - Provide service

- Phase 2 3rd year Research Contents
  - 1. Standardization of marine life application information and management system construction
  - Resource utilization current state and management system construction (continue)
C Resource utilization current state and management system construction (continue)

1. Standardization of marine life application information and management system construction

IV. Phase 2 3rd year Research Contents

- The ocean ecology information system connection
  - Load on GIS system and utilize connecting marine bio resource (including fishery resources) DB provided from Marine Environmental Management Corporation with MBRiS

- Marine life species information system connection
  - Load on system and utilize connecting fishery resources DB provided from National Fisheries Research and Development Institute

DB  DB
## 2. Construction of subject DB

DB construction per characteristic about gene resource, ecological information, library information, and application information

<table>
<thead>
<tr>
<th>Classification</th>
<th>Construction information</th>
<th>Construction object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gene resource</td>
<td>• Construction after research on related system and discussion with related government</td>
<td></td>
</tr>
<tr>
<td>Ecological information</td>
<td>• Shape and characteristic • distribution and habitat information</td>
<td>• Underwater Creatures Guide (publisher: Nature &amp; Ecology) • Korean Coastal Fish (publisher: Academy book)</td>
</tr>
<tr>
<td>Library information</td>
<td>• publication ‘Korean organism’</td>
<td>• Korean Organism (publisher: Nation Institute of Biological Resources)</td>
</tr>
<tr>
<td>Application information</td>
<td>• application information in life not simple information</td>
<td>• Edible Oceanic Fish (publisher: Kyohaksa) • The Dining Table of Hope Found in the Ocean (publisher: Jisungsa)</td>
</tr>
</tbody>
</table>
3. Portal system enhancement and data update

B Integrated search function enhancement

**Integrated search function enhancement plan**

- **Synonym error improvement**
  - Synonym table construction
  - If there are relevant species under the synonym table when searching species, print synonym and otherwise, improve current error considering as other species

- **Real time species list construction**
  - Real time species list data connection
  - Provide possibility of real time construction of species list connecting data with MBRIS DB when inputting, correcting, deleting on donate organization DB

- **Regional species occurrence information construction**
  - Regional species occurrence information construction by phased collected number
  - Provide possibility of checking the region of appearance for users by phased visualization of collection species number
3. Portal system enhancement and data update

C Improvement of reliability and search function

- Improvement of system reliability
  - Secure of integrity about DB and system by complete enumeration survey

IV. Phase 2 3rd year Research Contents

3. Portal system enhancement and data update

C Improvement of reliability and search function

- Improvement of system reliability
  - Secure of integrity about DB and system by complete enumeration survey

IV. Phase 2 3rd year Research Contents
IV. Phase 2 3rd year Research Contents

3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

2. Classification system search

- Provide classification system information about integrated information system possession resources by adding resources search function in the classification system search

[current integrated search screen]
3. Geographic information search

Additional development of analysis function service in the geographic information search for application of various information of resources

C Improvement of reliability and search function (continue)

Improvement of search function plan (continue)
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

Improvement of search function plan (continue)

3. Geographic information search (continue)

- Development of subject geographic information service utilizing attribute information by resources WRI Reefs at Risk Revisited: Mapping Threats to Coral Reefs - provide mash-up service according to distribution of coral reef

region expansion
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

Improvement of search function plan (continue)

4. Marine information search/tradition information search

- Additional construction of DB about marine knowledge search/tradition knowledge search
  - Additional supply of service data
  - Reflection

Additional construction of DB about supply information of marine knowledge and tradition knowledge
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

Arc GIS enhancement

1. Arc GIS enhancement

Collection region of nationwide marine arthropod
Collection region of arthropod status on Jeju island
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

Arc GIS enhancement

1. Arc GIS enhancement (continue)

- Change of species collection region on Jeju island
  Indicate directivity of collection region distribution by standard deviational ellipse from regression analysis
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

Arc GIS enhancement

1. Arc GIS enhancement (continue)

- Normal distribution chart of species collection region on Jeju island

<table>
<thead>
<tr>
<th>Clustered</th>
<th>Cluster of species collection region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random</td>
<td>Random distribution</td>
</tr>
<tr>
<td>Dispersed</td>
<td>Uniform distribution</td>
</tr>
</tbody>
</table>

Given the z-score of -12.25, there is a less than 1% likelihood that this clustered pattern could be the result of random chance.
3. Portal system enhancement and data update

C Improvement of reliability and search function (continue)

ArcGIS enhancement

1. ArcGIS enhancement (continue)

- Species collection plan

  Left sided species collection region
  - make balance by mainly right sided species collection
3. Portal system enhancement and data update

D Open field and reinforcement of user access authority setting

Open field and reinforcement of user access authority setting plan

Open field setting

Reinforcement of user access authority setting

<table>
<thead>
<tr>
<th>classification</th>
<th>access authority</th>
<th>Detail authority</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General users(no login)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Member</td>
<td>general</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>researcher</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>business</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Expert</td>
<td>enrollment registration preservation organization</td>
<td>management by taxons</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>except for enrollment registration preservation organization</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Manager</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Add ‘species information opening status’ menu in the manager screen resource management for information opening setting by species information of marine bio resource information

access authority of existing integrated information system

- general user(no login)
- member
- expert
- manager

provide phased service when using information by setting detail authority about 4 steps composition
3. Portal system enhancement and data update

E Statistics system enhancement

Example of variable and result for summons of data statistics status result

<table>
<thead>
<tr>
<th>Variable name</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization name</td>
<td>10 enrollment registration preservation organizations like the Ministry of Maritime Affairs and Fisheries and Seoul National University</td>
</tr>
<tr>
<td>Collection date</td>
<td>Choose calendar</td>
</tr>
<tr>
<td>Classification system</td>
<td>species, genus, family, ¹®, tract</td>
</tr>
<tr>
<td>graph</td>
<td>circle, bar, polygonal line</td>
</tr>
</tbody>
</table>

Visualization of data construction status

- easy by visualization of species data construction status by organization

search result of Ewha womans Univ. on Jan. 2013 ~ Jun. 2013
3. Portal system enhancement and data update

Species appearance information and gene resources analysis tool development

Species appearance information enhancement and gene resources analysis function development

- enhance species appearance information and construct gene resources analysis function to view with gene resources when viewing detail information after 'GIS species search'

![Diagram showingSpecies appearance information enhancement and gene resources analysis function development](image)
3. Portal system enhancement and data update

G Mobile web·app development and enhancement

Mobile web·app enhancement plan

- Public institution mobile menu registration
- Application registration

- User-centered UI and Function improvement
- UI improvement
- App registration

Contents

3. Portal system enhancement and data update
3. Portal system enhancement and data update

Mobile web·app development and enhancement (continue)

Mobile web·app enhancement plan

- Marine bio resource perception & detail information
  - User photo shooting
  - Marine bio resource photo analysis
  - Convenient supply of recognized photo detail information

- Shooting
- Labeling
- Contour detection
- Object detection

- Line angle comparison
- Characteristic comparison
3. Portal system enhancement and data update

Mobile web·app development and enhancement (continue)

Mobile web·app enhancement plan

Existing method

- Search by typing in the scientific name or nations name of marine bio resource in the search box

Improved method

- After searching area of interest by typing region name,
- Search by typing in the scientific name or nations name of marine bio resource in the search box

Search method
3. Portal system enhancement and data update

Library information like various report registration/opening

Library information registration/opening plan

1. Expert network research result service
2. Construction of reference menu

- Add function of download of research result data (related theses) by experts in recent 10 years on expert network
- Provide marine bio resource related reference viewer and download function by adding 'reference' menu on additional service
Article 25 of law for securement, management and use of marine bio-resource

- Article 25 (marine bio resource integrated information system construction) Minister of Fisheries and Oceans should connect information system operated by donation and registration organization and responsibility organization with information system of nation life study resources according to the law for life study resources securement, management and utilization under the first clause of Article 25 of the Constitution when construct and operate integrated information system about marine bio resource. [revised on 2013.3.23.]
sufficient cooperation with responsibility organization and professional management organization when constructing contents

3. Portal system enhancement and data update

I. Negotiation system construction for system enhancement
감사합니다

Thank you
질의 응답

Question & Answer