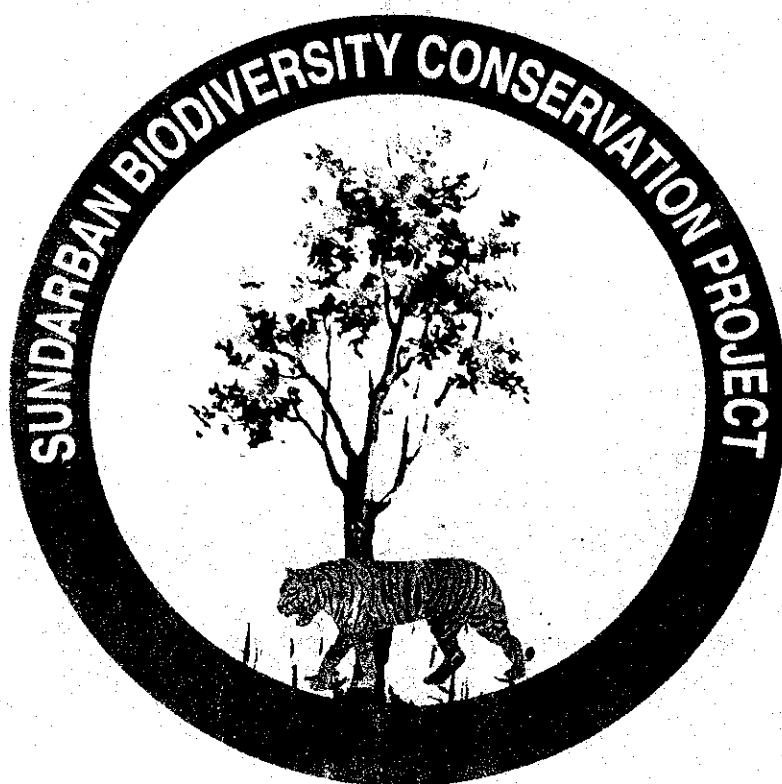


**Government of Bangladesh
Ministry of Environment and Forests
Dhaka, Bangladesh**

**Asian Development Bank
Global Environment Facility
Government of the Netherlands**



**Species Database User Manual
Technical Reports – TR No. 07**

By Mr. Walther Warnaar, MIS Specialist

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**ARCADIS Euroconsult, The Netherlands
Winrock International, USA
Kranti Associates Ltd., Bangladesh
Nature Conservation Management, Bangladesh**

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Introduction

For a biodiversity conservation project like SBCP, information on the various species is of great importance. Therefore, a computer program has been developed to store this information in a structured way.

The development of the program started with several discussions with experts from the Forest Department and the TAG. Subsequently, a pilot version was developed according to their recommendations. The pilot software was demonstrated, and some more suggestions came up. The software was then modified accordingly.

It was decided that the first version of the software should mainly include the answers to three questions: what, how many and where.

'What' means the taxonomy of the species, 'how many' is answered by giving the status, and 'where' by including the ecology and distribution. Some general information about the species is also included.

In a later stage, the function and use of the various species can be included.

During the discussions, consensus was also reached on photographs. The need for an organised system of photographs of all species was acknowledged. Such a system could also include drawings. It was decided that separate software for photographs has to be developed, that will be linked with the Species Database.

The remainder of this document describes how to operate the software.

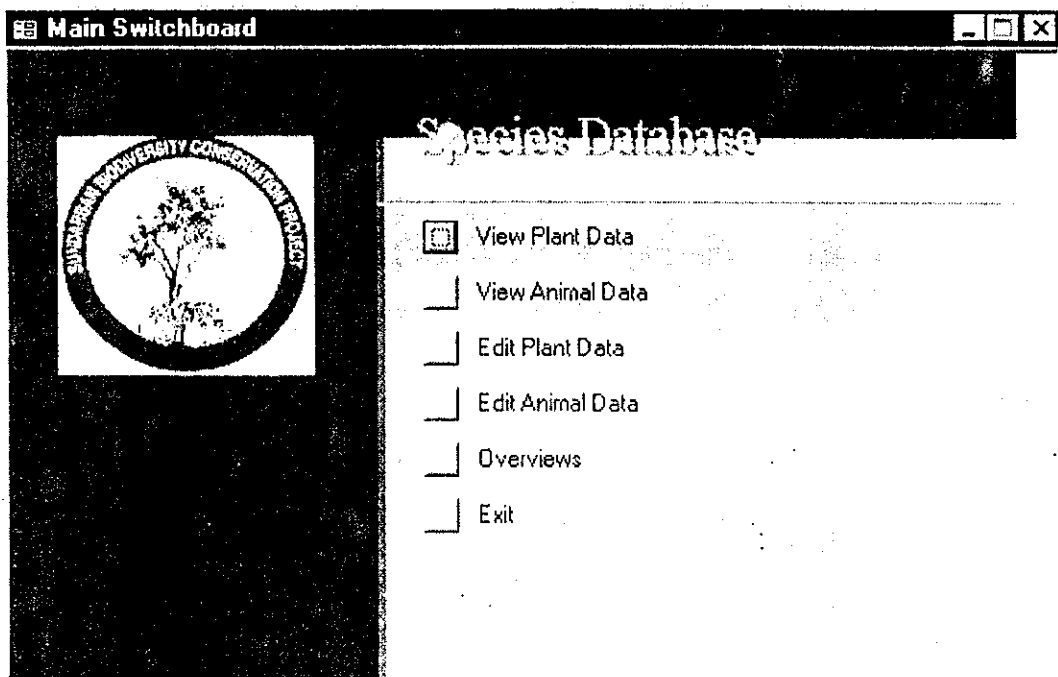
Appendix gives some technical documentation, appendix B describes the initial data that has been included, and appendix C gives the outline of a plan for continuation.

1. Starting the program

The program is a MS Access program. Therefore, to start the program, you have to start MS Access and then select the species database.

If the software has been installed as described in the appendix, a desktop icon, called Species Database, should have been created. In that case, double click on the icon to start the program.

After starting, you get a menu as follows:



The various options in this menu will be described in the rest of the document.

To close the program, the Exit option in this menu can be used. MS Access will remain open, you can subsequently either start another application in MS Access, or close MS Access by selecting File and Exit from the pull down menu.

2. Viewing data

The menu options 'View Plant Data' and 'View Animal Data' can be used to view and search the data. After selecting the plant data, the following screen is shown:

The screenshot shows a web-based form titled 'Plants : Form' with three tabs: 'Taxonomy & Status', 'Ecology', and 'Distribution'. The 'Taxonomy & Status' tab is active. The form contains the following fields and values:

Scientific Name	Heritiera fomes		
Species ID	20	Source of information	FRMP
Phylum	Tracheophyta	CITES Category	
Class	Dicotyledonae	IUCN Global Status	Least Concern
Order	Malvales	IUCN National Status	Least Concern
Family	Sterculiaceae	Sundarban Status	Least Concern
English Name	Sundri	Origin	Native
Bengali Name	Sundri		
Description	A moderate sized evergreen tree up to 20m or more tall with buttressed base and sword-like breathing roots		
References			

At the bottom of the window, there is a record navigation bar: 'Record: 1 2 3 4 5 of 63'. The number '3' is highlighted in the middle of the bar.

This screen can be used to browse through the plant species in the SRF. For animals, an analogous screen is used.

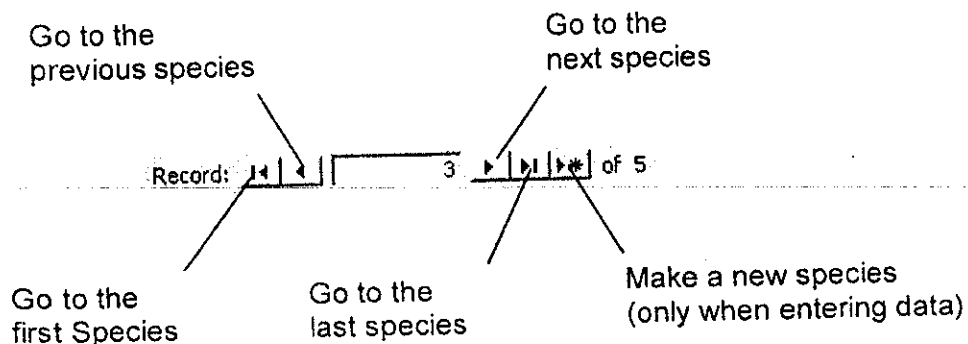
For each species three screens with information are stored:

1. Taxonomy and status (see the example above)
2. Ecology
3. Distribution

By clicking with the mouse on 'Ecology' in the top of the window, the ecology information is shown. Likewise, by clicking on 'Distribution' a map appears showing where the species occurs.

Browsing through the species

The buttons in the bottom of the form can be used to browse through the species. These buttons work as follows:



Finding a species

A species can be found in three different ways:

1. By using the scientific name
2. By using the English name
3. By using the Bengali name

If you type a species name in the field: 'scientific name', and then press the Enter key, the computer searches the information of that species.

It is not necessary to type the whole name, e.g. after typing 'Heri', the computer automatically completes it to 'Heritiera Fomes'.


Alternatively, you can select a species by clicking on the small arrow at the end of the field.

Taxonomy & Status | Ecology | Distribution |

Scientific Name

Click here to select a species 

Analogously, it is possible to find a species using the English or Bengali name. This works in exactly the same manner: if you type 'Sundri' in the English name field, the data on Sundri will appear.

Remark: another way to find data is to use the find button, 


This button is mainly necessary to find species when entering data, since the methods described above do not work in that case. Therefore, the workings of this button are described in the section on entering data.

Filtering

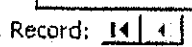

Filtering means that only the species are shown that meet certain conditions.


Filtering is a mechanism that is standard provided by MS Access, and explained in more detail in the MS Access documentation. Below follows a brief description of the most common method of filtering. This method is called "filter by form".

In order to start filtering by form, click on the respective icon in the toolbar: .


The form will be made empty, and you can enter conditions. In each field, you can enter a value on which you want to filter. E.g., if you want to see only species of the family Rhizophoraceae, you type "Rhizophoraceae" in the family field. To execute the filter, you click on the 'Apply Filter' icon: .

The computer will search the species. In the bottom of the form, you can see how many species were found, as in the following example, where 7 species were found.


Record:  1  of 7 (Filtered)

In order to end the filter and get all species, click again on the  icon.

In the same way, you can select all globally endangered species (start filter by form, enter "Endangered" in the 'IUCN Global Status' field, and apply the filter), or all epiphytic species (start filter by form, click on 'Ecology', and click on 'Epiphytic'). It is also possible to filter on combinations (e.g. all epiphytic species in the saline zone) by filling in both fields.


Note: When you start filtering by form, the previous filter conditions are shown. To clear them, click on  in the toolbar.

Printing

To print out detailed information on a species, the print button is used: . A so-called 'Print Preview' is shown.

The small printer icon in the toolbar can be used to send the printout to the printer.

Closing

The form can be closed by clicking on the close button in the top left of the screen: .

3. Data entry

The menu options 'Edit Plant Data' and 'Edit Animal Data' can be used to enter and modify the data.

3.1. Plant species

After selecting the plant data, a screen like the one for viewing the data is shown:

Taxonomy & Status		Ecology	Distribution
Scientific Name	Heritiera fomes		
Species ID	20	Source of information	FRMP
Phylum	Tracheophyta	CITES Category	
Class	Dicotyledonae	IUCN Global Status	Least Concern
Order	Malvales	IUCN National Status	Least Concern
Family	Sterculiaceae	Sundarban Status	Least Concern
English Name	Sundi	Origin	Native
Bengali Name	Sundi		
Description	A moderate sized evergreen tree up to 20m or more tall with buttressed base and sword-like breathing roots		
References			

Record: 50 of 63

The data of all three sections, Taxonomy and Status, Ecology and Distribution can be entered.

Most fields are self-explanatory.

The fields in grey – species ID, phylum, class and order – are filled in automatically. 'Species ID' is an internal ID number, which is automatically allocated when a new species is entered. The family can be selected from a list; phylum, class and order are automatically filled in after the family is selected.

The IUCN status can be selected from a list, according to the IUCN red list categories, version 3.1.

The 'origin' field indicates whether the species occurred originally in the SRF. It can be one of the following values: native, endemic, exotic, naturalised.

Remark: if a family does not exist in the list of families, a new family has to be entered into the system. This is described in the section 'system tables'.

For information on the ecology, the following screen is used. You get this screen by clicking on 'Ecology' in the top of the screen.

Plants : Form

Taxonomy & Status Ecology Distribution

Scientific Name: Heritiera fomes

Land form:

- Primary water body
- Levee
- Silted Creek
- Sandbar
- Backswamp
- Beach
- Intertidal zone
- Oxbow Lake
- Beach wall

Ecozone:

- Terrestrial
- Aquatic (emerging)
- Epiphytic
- Aquatic (submerged)
- Aquatic (floating)

Salinity Zone:

- High
- Moderate
- Low

Soil:

- Sand
- Clay Loam
- Sandy Loam
- Silty Clay
- Loam
- Organic

Hydrology:

- Tidal
- Standing Water
- Seasonal flooding
- Other

Regeneration Guild:

- Pioneer
- Secondary
- Mature

Life form: tree

Degree of Association:

- Scattered individuals
- Clumped
- Homogeneous stand
- Mixed

Lifespan: Perennial 100 years

Pollination: Air

Regeneration: Seeds

Seed Dispersal: Water

Germination: [dropdown]

Vegetation Types:

- Baen
- Gewa
- Goran
- Keora
- Passur
- Sundri
- Grass & bare ground
- Sandbars

Germination Period: J F M A M J J A S O N D

Flowering Period: [checkboxes]

Fruiting Period: [checkboxes]

Record: 20 of 63

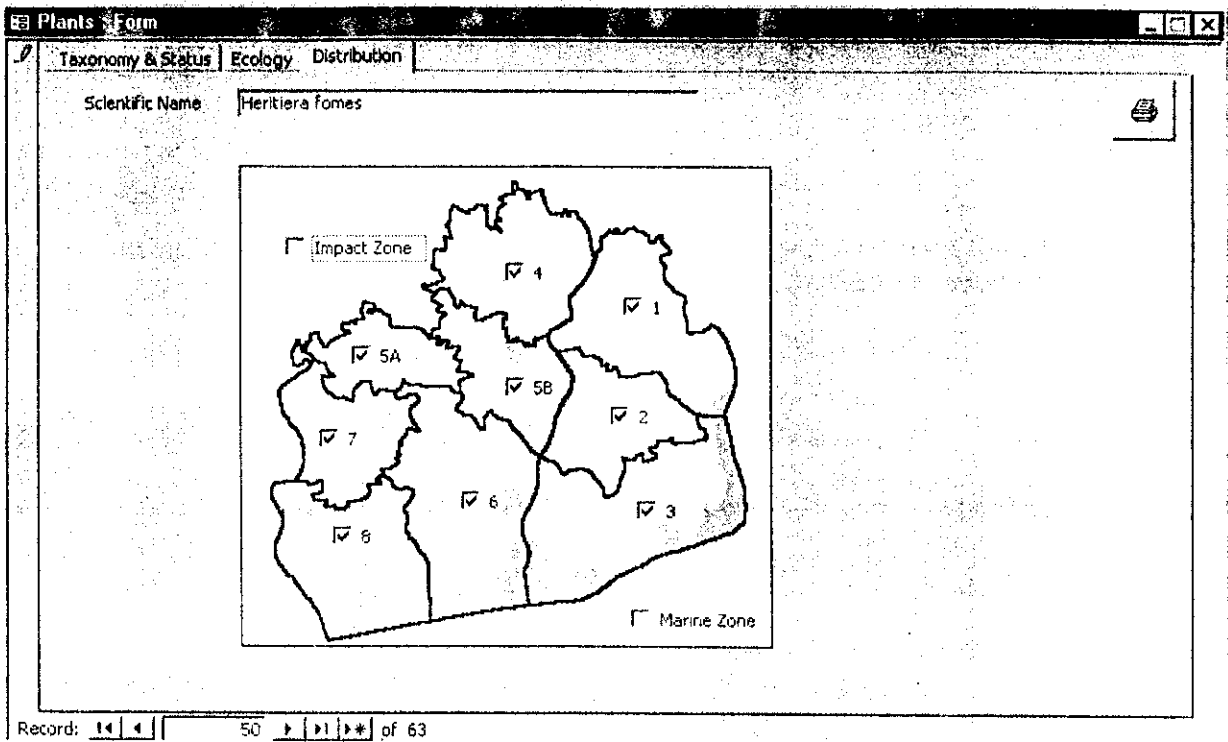
In most categories, you can click the applicable categories. In the above example, *Heritiera fomes* grows on levees and in backswamps.

The life forms can be selected from a list according to Du Rietz (1931). The vegetation types indicate in which vegetation type(s) the plant occurs.

The fields 'Pollination', 'Regeneration', 'Seed Dispersal' and 'Germination' can be selected from a list. However, it is possible to change the values or type a text that is not in the list. For the distribution, a screen is used with a map of the SRF. On the map it can be indicated in which blocks the species occurs.


For 'Germination Period', 'Flowering Period' and 'Fruiting Period', the respective months in which the plant germinates, flowers and fruits can be selected.


For the distribution of the species, a simple map of the SRF is used:



The map shows all SRF blocks, and two more areas: Impact Zone and Marine Zone. The Marine Zone may not be applicable for most plants, but it can be used in case it is decided to enter phytoplankton or other marine species.


Miscellaneous operations

To enter a new species, click on  in the bottom of the screen.

To delete a species, click on  in the toolbar. The software will then ask for a confirmation, because once you delete a record you cannot undo the operation.

It is not necessary to save your changes. Normally, the software automatically saves all changes.

When you make a mistake, you can use the Esc-key to undo your changes. Sometimes, you have to press Esc twice.

Printing a record works just like when viewing the data; use the print button. 

Searching

The method for finding a species that was used when viewing data is not applicable here. When you type anything in the fields for scientific, English or Bengali name, the data is changed. Therefore, another method for finding species is used. This method works by

clicking the find button: 

When you click this button, a small form appears:

The 'Find' dialog box contains three dropdown menus. The 'Bangla Name' dropdown menu is selected and shows the text 'Keora'. Below the dropdowns are two buttons: 'Find' and 'Cancel'.

In this form, you can enter one of the three names, and then click on Find. In the example above, the Keora data will be displayed.

3.2. Animal species

Entering animal species works the same as plant species. Again, the data is divided into three sections, taxonomy & status, ecology and distribution.

The first and the third section are exactly the same for animals and plants. The second section, however, is markedly different and is therefore shown below.

The data entry form for animal ecology depends on whether the species is terrestrial or aquatic. For terrestrial species, the following form is used:

The 'Animals : Form' dialog box has three tabs: 'Taxonomy & Status', 'Ecology', and 'Distribution'. The 'Ecology' tab is active. It contains the following fields and options:

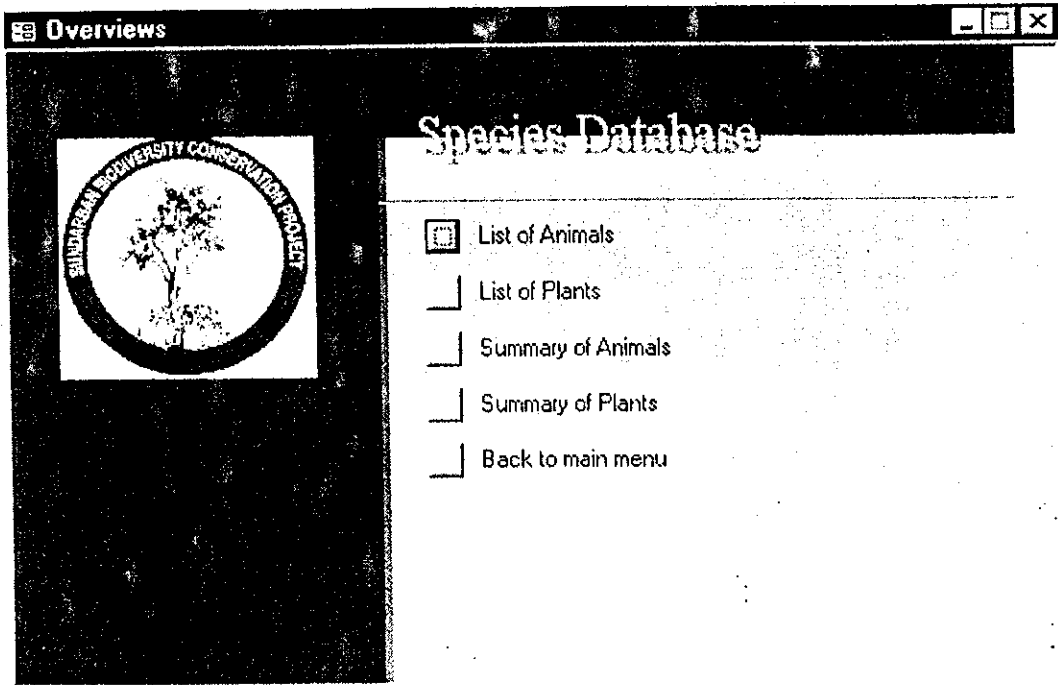
- Scientific Name: Panthera tigris
- Category: Terrestrial Aquatic
- Average Weight (kg): 300
- Head body length (cm): 220
- Tail Length (cm): 80
- Lifespan (years): 20-25
- Degree of Association: Solitary Couples Social/groups
- Presence: Permanent Migratory
- Period of Presence: A row of 12 checkboxes for months J, F, M, A, M, J, J, A, S, O, N, D, all of which are checked.
- Reproduction Period: A row of 12 empty checkboxes for months J, F, M, A, M, J, J, A, S, O, N, D.
- Reproduction Area: Interior forest
- Food: Deer, Boar, Monkey
- Salinity Zone: High Moderate Low
- Vegetation Types (checkboxes):
 - Baen
 - Gewa
 - Goran
 - Keora
 - Passur
 - Sundri
 - Grass & bare ground
 - Sandbars

At the bottom, it shows 'Record: 14 of 235' with navigation arrows.

4. Printouts

As explained above, a printout of the information of one species can be made by viewing the data, searching for the species you want to print, and clicking on the print button.

The software also has an option for species lists and a species summary. If you select 'Overview' in the main menu, a second menu appears:



With the first two options, 'List of Animals' and 'List of Plants', species lists are printed. The next two options, 'Summary of Animals' and 'Summary of Plants' give the total number of species for each class, as in the following example (the number of species shown is not the full number).

Summary of Animal Species

<u>Class</u>	<u>Number</u>
Amphibia	8
Aves	181
Mammalia	21
Reptilia	<u>25</u>
Total	235

All those reports are shown as a print preview, like explained earlier. In the print preview, the printer icon in the toolbar can be used to print the report.

For aquatic species, some different fields are used:

Animals : Form

Taxonomy & Status Ecology Distribution

Scientific Name

Category Terrestrial Aquatic Fresh Coastal Marine

Weight (kg) Average Maximum

Length (cm) Average Maximum

Lifespan (years)

Degree of Association Solitary Couples Social/groups

Presence Permanent Migratory Spawning Season

Period of Presence J F M A M J J A S O N D

Reproduction Period

Reproduction Area

Feeding habit

Salinity Zone High Moderate Low

Nursery Ground

Record: 14 | 236 | of 236

Automatically, when a species is marked as aquatic, the aquatic fields will appear.

Appendix A: Technical documentation

A1. System Requirements

The software runs on MS Access 2000. This MS Access version should be installed on the computer first.

Minimum hardware requirements are the same as for MS Access; if MS Access 2000 runs reasonably well on your computer, the species database will also run.

It is possible to install the software on a Local Area Network. In that case, it is recommended to split the data from the application; this can be done automatically with the MS Access 'Database Splitter'.

A2. Installation

To install the software, simply make a copy on the local hard disk. It is recommended to make an icon (shortcut) on the desktop. In Windows 98, this can be done as follows:

In Windows 98, you can make a shortcut on the desktop as follows:

1. Click with the right mouse button on the desktop.
2. Select 'New' and select Shortcut.
3. You get a window to create a shortcut. Click Browse.
4. Select the file "Species Database.mdb" in the folder where you copied it to.
5. Click next, and fill in a name for the shortcut (e.g. Species Database).

A3. Data Dictionary

Below follows a list of tables in the system. The tables have not completely been normalised, since that would make the data structure very complex, and therefore harder to maintain after departure of the Technical Assistance.

Full details of the tables can be obtained by opening them in design view in MS Access. In the overview below, the following abbreviations are used:

PK: Primary Key

FK: Foreign Key

Phylum_Animals, Phylum_Plants

Field	Remarks
PhylumID	PK, Autonumber.
Phylum	

Class_Animals, Class_Plants

Field	Remarks
ClassID	PK, Autonumber.
Class	
PhylumID	FK

Order_Animals, Order_Plants


Field	Remarks
OrderID	PK, Autonumber.
Order	
ClassID	FK

5. System Tables

No specific software has been developed to edit the system tables. This is on purpose, to discourage editing these tables without proper knowledge. However, it is possible (and sometimes necessary) to edit these tables.

Taxonomy tables

The first set of tables that can be edited are the tables indicating the phyla, classes, orders and families. These tables can be edited directly in MS Access.

Click on  in the toolbar to get the so-called Database Window. In this window, click on 'Tables' (on the left side of the Window), and then double click on the table you want to edit.

The relevant table names are:

Phylum_Animals, Phylum_Plants, Class_Animals, Class_Plants, Order_Animals, Order_Plants, Family_Animals and Family_Plants. The names are self-evident.

The records of each table have an ID, that is automatically assigned when you enter a new record. These IDs are only needed for the internal workings of the software.

Lookup Tables

There are five lookup tables you may wish to edit:

Germination, Life Form, Pollination, Regeneration and Seed Dispersal. These tables are used as lookup tables. Editing other tables may disrupt the workings of the software, and is therefore strongly discouraged.

6. Error Messages

When entering data, MS Access can generate an error message. The most common messages, together with the recommended action, are given below.

The changes you requested to the table were not successful because they would create duplicate values in the index, primary key or relationship. Change the data in the field or fields that contain duplicate data, remove the index, or redefine the index to permit duplicate values and try again.

In normal situations this message shouldn't occur. Press the Esc key to undo your changes; sometimes you have to press Esc twice.

This record cannot be deleted because table '.....' includes related records.

For instance, families cannot be deleted if species from these families exist. In such a case, change the species data first.

The field '.....' can't contain a Null value because the Required property for this field is set to True. Enter a value in this field.

Some fields should always be filled in, e.g. the scientific name. If you do not fill them in, you get this message. The solution is simple: fill in the field.

In some cases, this error occurs due to inadvertent changes. In that case, press the Esc button to undo the changes.

The text you entered isn't an item in the list.

Select an item from the list, or enter text that matches on the listed items.

E.g., the family field is a list. You can only enter a family from the list. If you want to enter a species of a family that is missing in the list, you have to edit the corresponding system table first.

Family_Animals, Family_Plants

Field	Remarks
FamilyID	PK, Autonumber
Class	
FamilyID	FK

Species_Animals

Field	Remarks
SpeciesID	PK, Autonumber.
Family	FK
Scientific Name	Mandatory
English Name	
Bangla Name	
Source	
CITES Category	FK
IUCN Global Status	FK, references IUCN category
IUCN National Status	FK, references IUCN category
Sundarban Status	FK, references IUCN category
Origin	FK
Description	Memo
Reference1	Not normalised for simplification
Reference2	
Reference3	
EcoZone	FK, references Ecozone Animals
AquaticZone1	Yes/No, indicates whether species occurs in 1 st Aquatic Zone
AquaticZone2	idem, for 2 nd zone
AquaticZone3	idem
Average Weight	
Maximum Weight	only for aquatic species
Head Body Length	for aquatic species, this is used for average length
Maximum Length	only for aquatic species
Tail length	only for terrestrial species
Lifespan	
Distribution	FK, references Distribution Animals. Degree of association
Migratory	FK, references presence
Period of presence1	Indicates whether species is present in January
.	
.	
Period of presence12	Indicates whether species is present in December
Reproduction Period1	Indicates whether species reproduces in January
.	
.	
Reproduction Period12	Indicates whether species reproduces in December
Reproduction Area	
Food	For aquatic species: feeding habit
Salinity Zone1	Indicates whether species is present in 1 st salinity zone
Salinity Zone2	
Salinity Zone3	
Nursery Ground	Only for aquatic species
Vegetation Class1	Indicates whether species occurs in 1 st Vegetation Class
.	
.	

Vegetation Class16	Indicates whether species occurs in 16 th Vegetation Class
Occurrence1	Indicates whether species occurs in block 1
.	
.	
Occurrence8	Indicates whether species occurs in block 8
OccurrenceIZ	Indicates whether species occurs in the Impact Zone
OccurrenceMZ	Indicates whether species occurs in the Marine Zone

Species_Plants

Field	Remarks
SpeciesID	PK, Autonumber.
Family	FK
Scientific Name	Mandatory
English Name	
Bangla Name	
Source	
CITES Category	FK
IUCN Global Status	FK, references IUCN category
IUCN National Status	FK, references IUCN category
Sundarban Status	FK, references IUCN category
Origin	FK
Description	Memo
Reference1	Not normalised for simplification
Reference2	
Reference3	
Land Form1	Indicates whether species grows on 1 st landform
.	
.	
Land Form9	
Ecozone1	Indicates whether species occurs on 1 st ecozone
.	
.	
Ecozone5	
Salinity Zone1	Indicates whether species is present in 1 st salinity zone
Salinity Zone2	
Salinity Zone3	
Vegetation Class1	Indicates whether species occurs in 1 st Vegetation Class
.	
.	
Vegetation Class16	
Life Form	FK
Soil1	Indicates whether species grows on soil type 1
.	
.	
Soil6	
Hydrology1	Indicates whether species grows under 1 st hydrological conditions
.	
.	
Hydrology4	
LifespanCategory	Annual, Biennial or Perennial
LifeSpan	In years
Pollination	

Regeneration	
Seed Dispersal	
Germination	Method for germination
RegenerationGuild1	Indicates whether species is present in 1 st regeneration guild
RegenerationGuild2	
RegenerationGuild3	
Distribution	FK, references Distribution Animals. Degree of association
FloweringPeriod1	Indicates whether species flowers in January
.	
.	
FloweringPeriod12	
FruitingPeriod1	Indicates whether species fruits in January
.	
.	
FruitingPeriod12	
GerminationPeriod1	Indicates whether species germinates in January
.	
.	
GerminationPeriod12	
Vegetation Class1	Indicates whether species occurs in 1 st Vegetation Class
.	
.	
Vegetation Class16	Indicates whether species occurs in 16 th Vegetation Class
Occurrence1	Indicates whether species occurs in block 1
.	
.	
Occurrence8	Indicates whether species occurs in block 8
OccurrenceIZ	Indicates whether species occurs in the Impact Zone
OccurrenceMZ	Indicates whether species occurs in the Marine Zone

CITES Category

Field	Remarks
Code	PK, CITES list number
Category	

IUCN Category

Field	Remarks
Code	PK, Code used according to IUCN red list version 3.1
Category	Corresponding category

Distribution Animals, Distribution Plants

Lookup table for degree of association

Field	Remarks
DistributionID	PK, Autonumber
Distribution	

Life form

Field	Remarks
LifeFormID	PK, Autonumber
Life Form	

Origin

Field	Remarks
OriginID	PK, Autonumber
Origin	

Presence

Field	Remarks
Code	PK, Autonumber
Class	

Germination, Pollination, Regeneration, Seed Dispersal

Those four tables are only used to fill combo-boxes, but selecting one of the values from the table is optional. All tables contain only one field.

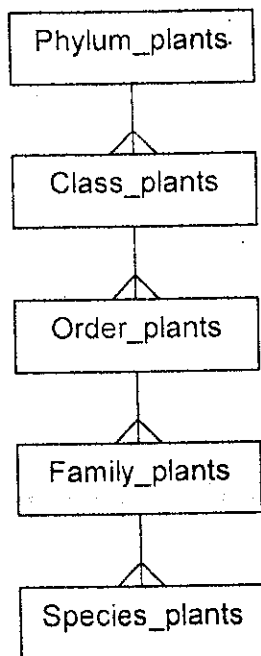
Switchboard Items

Internal table for the software

A4. Entity Relationship Diagram

The application contains many tables that are only used as lookup tables. However, the main relationships exist between the various taxonomic levels, phylum, class, order, family and species.

For plants, the relationships are as follows:



For animals exactly the same hierarchical table structure is used.

Appendix B: Initial data

Initially, the data from the EIMS (Environmental Information Management System) and ENRS (Extended Natural Resource Survey) surveys by FRMP were converted and imported into the system, according to the following table:

Table	Data Imported	Remarks
Animals		
Phyla	All phyla from the ENRS family list	
Class	All classes from the ENRS family list	
Order	All orders from the ENRS family list	
Family	All families from the ENRS family list	
Species	All species recorded in the SRF by the EIMS and ENRS surveys.	The fields family, scientific name, English name (derived from the ENRS common name) were derived from the species list. The distribution was imported using the individual plot data. The source was recorded as 'FRMP'.
Plants		
Phyla	One phylum entered manually	
Class	All classes from the ENRS family list	
Order	All orders from the species in the SRF according to EIMS and ENRS	Some orders were unknown and were entered as 'unknown'. These have to be changed.
Family	All orders from the species in the SRF according to EIMS and ENRS	
Species	All species recorded in the SRF by the EIMS and ENRS surveys.	The fields family, scientific name, English name, Bengali name (both derived from the ENRS common name) were derived from the species list. The distribution was imported using the individual plot data. The source was recorded as 'FRMP'. Undetermined 'species' like 'Unknown fern' were omitted.

Appendix C: Continuation

For the continuation the following steps are suggested:

1. Data Validation

The data from FRMP has to be checked.

2. Observation database

An observation database should be developed and linked to the species database. The observations recorded by the Forest Department can subsequently be entered into the computer.

3. Data Collection

Further data has to be collected. This has been discussed during a demonstration of the pilot version. It is intended to include data collection in some contracts with external agencies.

Below an overview of groups of data, a person within SBCP or FD who has assumed responsibility, and external agencies that could assist.

Category	Responsible Person	External agencies
Plants	Floris Deodatus	National Herbarium, Khulna University
Animals	Zahir Uddin Ahmed	Dhaka University, or use IUCN Red Books
Birds	Zahir Uddin Ahmed	Jahangirnagar University, Dhaka University
Fish, Molluscs, Crustaceans	Emdadul Haque	Khulna University, Fisheries Research Institute, Department of Fisheries, Institute of Marine Biology (Chittagong)
Insects	Floris Deodatus	Bangladesh Forest Research Institute?

4. Extension of the system

Data on use and ecological function has to be added. This can be done in the same way as the development of the current version: through interaction with experts in the FD and TAG.

5. Development of a system for photographs

A system for photographs and possibly drawings should be developed. By linking this to the species database, photographs of each species can be shown on the forms and printouts.

6. Dissemination through the Internet

Once the information in the species database has been entered, it can be included in the SBCP Web Page, so that external parties can get access to the data.