Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information

A Training Manual

ASEAN CENTRE FOR BIODIVERSITY
www.aseanbiodiversity.org

Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information

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Technical Editors:
Dr. Filiberto A. Pollisco, Jr.
Jerome S. Alano
Lilibeth R. Cabebe

Layout Artist:
Pamela Q. Reblora

Editor-in-Chief:
Rolando A. Inciong

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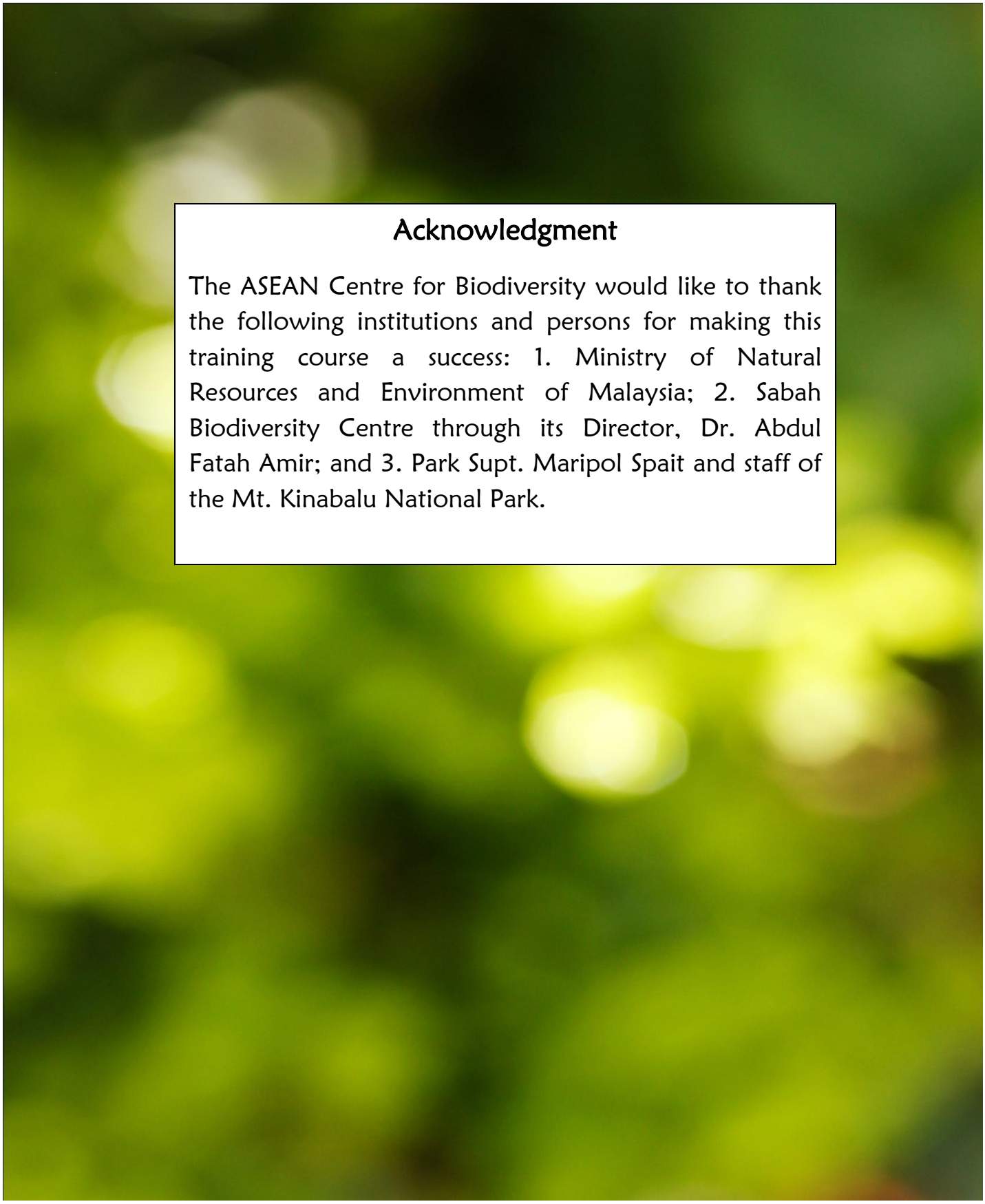


Acknowledgment

The ASEAN Centre for Biodiversity would like to thank the following institutions and persons for making this training course a success: 1. Ministry of Natural Resources and Environment of Malaysia; 2. Sabah Biodiversity Centre through its Director, Dr. Abdul Fatah Amir; and 3. Park Supt. Maripol Spait and staff of the Mt. Kinabalu National Park.

BACKGROUND AND RATIONALE

The project on "Expanded Taxonomic Capacity Building and Governance for Conservation and the Sustainable Use of Biodiversity" was implemented by the ASEAN Centre for Biodiversity (ACB) and the Japan-ASEAN Integration Fund (JAIF). This phase is developing and enhancing capacities of ASEAN Member States (AMS) in taxonomic knowledge, particularly on biodiversity data organization and management for strengthening scientific basis in decision making vital for environmental governance, business and technologies development.

At present, the capacity for biodiversity-related data storage, retrieval and processing into useful information is uneven in the ASEAN region. Some countries are far in advance and are equipped with exceptional skills in taxonomy and database management. However, several AMS are yet to establish their facility to collect, store and share information. Available species and protected area (PA) information are likewise fragmented and is held in different formats, vocabularies and metrics. Making such information interoperable is important to facilitate information sharing and data integration and analysis across locations.

It is in this context that ACB organized a training course on biodiversity information and organization targeting taxonomists in AMS who, by themselves, feel the need to be equipped with such skills. The Training Workshop on Biodiversity Data Organization and Mapping is a three-day mixed approach course that will orient participants on biodiversity-related data organization, data entry and processing and mapping.

OBJECTIVES OF THE TRAINING WORKSHOP

The training workshop aims to enhance capacities of selected AMS to digitize species and PA information, organize species and PA information for species and ecosystems data management, and map species and habitats based on available information with the use of new technologies, e.g., GPS and mobile phones.

ORGANIZATION OF THE TRAINING WORKSHOP

The Training Workshop on Taxonomy of Terrestrial Plants (Monocots) was spearheaded by the ASEAN Centre for Biodiversity (ACB) and the Ministry of Environment, Government of Japan, through the Japan-ASEAN Integration Fund (JAIF).

PARTICIPANTS

AMS staff who are involved in information management, data entry or the Clearing House Mechanism

EXPECTED OUTPUTS

The expected outputs of the short course are the following: partial digitized species and PA information for the country; enhanced awareness and knowledge on new technological developments evolving on GPS and other related tools on geo-referencing; enhanced capacities to manage and share information; and enhanced awareness of the importance of sharing information.

The Training Course

The following program has already been implemented, but could be used as a basis for implementing the training course by following its sequence of activities.

22 July (Sunday) - Arrival of Participants		
23 July (Monday) - Overview of Information Interoperability and the Darwin Core 2 for Species Database Management and Mapping Orientation		
8:00 - 8:30 AM	Registration of Participants	Participants and Guests
8:30 - 8:40 AM	Welcome Remarks	Dr. Abdul Fatah Amir, Director SaBC
8:40- 9:00 AM	Opening Messages	Dr. K. Nagulendran, Ministry of Natural Resources and Environment, Malaysia Dr. Filiberto Pollisco, Jr., ACB
9:00-10:10 AM	Workshop Overview & Mechanics ■ Introduction of Participants ■ Workshop Overview ■ Leveling of Expectations ■ Photo Opportunity	Lilibeth R. Cabebe, ACB
	The Need for Data Interoperability for Biodiversity Conservation	
	Darwin Core 2 Data Structure and Concepts	
10:10 - 10:25 AM	Coffee Break	
10:25 - 11:45 AM	Demo : Darwin Core 2 Offline Encoding Interface	Lilibeth R. Cabebe, ACB
	Hands-On: Darwin Core 2 Offline Encoding Interface	Workshop Participants/ACB
11:45 - 12:00 NN	Demo: Online Species Encoding Interface	Rea Anne R. Rañada, ACB
12:00 - 1:00 PM	Lunch Break	
1:00 - 2:00 PM	Hands On - Online Species Encoding Interface	Workshop Participants/ACB
2:00 - 2:15 PM	Q & A	Workshop Participants
2:15 - 3:15 PM	Orientation on the GBIF, IUCN Redlist,	

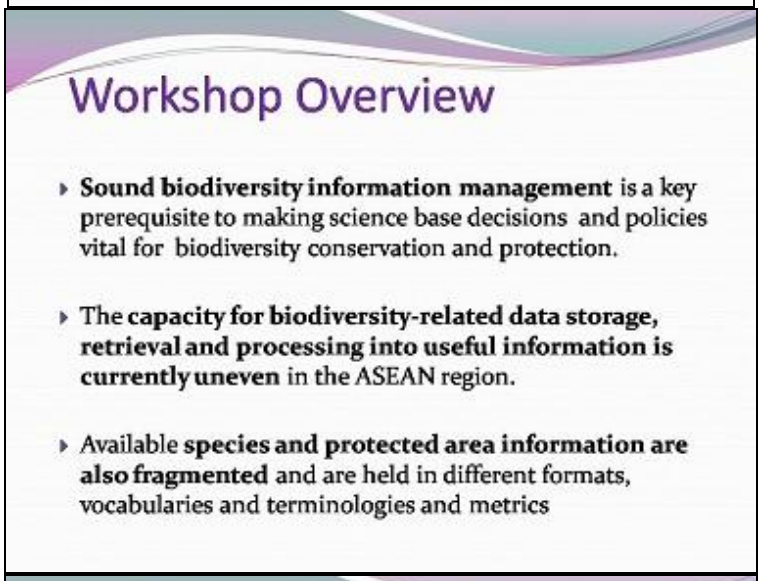
	FishBase/SeaLifeBase and COL Portals as Sources of Species Information	Erica T. Villavelez, ACB
	Q & A	Workshop Participants/ACB
3:15 - 3:30 PM	Coffee Break	
3:30 - 5:00 PM	Orientation on New Technologies Evolving Around Global Positioning System (GPS)	Jerome S.J. Alano, ACB
	Q & A	Workshop Participants
	Tasking for the Field trip	Jerome S. J. Alano, ACB
24 July (Tuesday) -Field Trip - Data Collection Using GPS		
8:00 AM	Leave for Mt. Kinabalu Park	ACB and Workshop Participants
10:00 - 10:15 AM	Coffee Break	
10:15 - 12:00 NN	Hands-On, GPS Applications	Jerome S.J. Alano, ACB Workshop Participants
12:00 - 1:30 PM	Lunch Break	
1:30 - 3:00 PM	Hands-On GPS Applications	Jerome S.J. Alano, ACB Workshop Participants
	Checking of Integrity of GPS Points Collected	
3:00 PM	Leave for Kota Kinabalu	ACB and Workshop Participants
25 July (Wednesday) - Data Harvesting and Processing, Orientation on PA Data Encoding		
8:00 - 8:15 AM	Registration of Participants	Workshop Participants
8:15 - 8:30 AM	Recap of Days 1 and 2	Lilibeth R. Cabebe, ACB
8:30 - 8:45 AM	Clarifications of Days 1 and 2 Lectures	Workshop Participants
8:45 - 10:15 AM	Processing of GPS Data	Jerome S.J. Alano, ACB Workshop Participants
10:15- 10:30 AM	Coffee Break	

10:30- 12:00 AM	Uses of GPS Data - Demo and Orientation on GeoCommons	Jerome S. J. Alano, ACB
12:00 - 1:00PM	Lunch Break	
1:00 - 2:45 PM	Demo and Hands-on: Harvesting of Secondary Species data ■ · Harvesting Species Data from GBIF, IUCN Red List, FishBase/SeaLifeBase, and COL	Erica T. Villavelez, ACB Workshop Participants
2:-45 - 3:30 PM	Demo and Hands-On: Offline and Online PA Encoding	Rea Anne Rañada, ACB Workshop Participants
3:30 - 3:45 PM	Coffee Break	3:30 - 3:45 PM
3:45 - 4:00 PM	Demo and Hands-on: Harvesting of PA Data through the World Database on Protected Areas Website and Protected Planet	Erica T. Villavelez, ACB Workshop Participants
4:00 - 4:15 PM	Q & A	Workshop Participants
4:15 - 5:00 PM	■ · Next Steps	Filiberto A. Pollisco Jr., ACB Workshop Participants
	Closing Programme ■ · Response from the Workshop Participants	Workshop Participants
	■ · Awarding of	Host Country/ACB
	■ · Closing Remarks	Dr. Filiberto Pollisco, Jr., ACB
26 July (Thursday) Homebound		

Master of Ceremonies: Filiberto A. Pollisco Jr., ACB

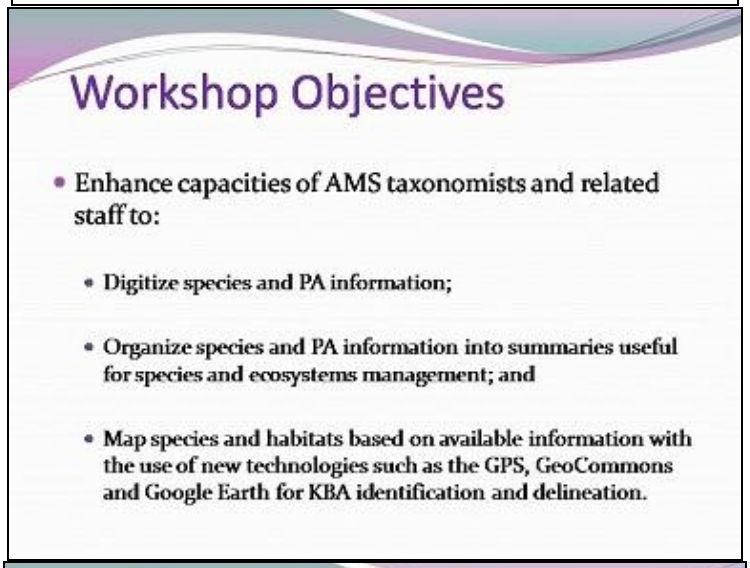
Workshop Overview And Mechanics

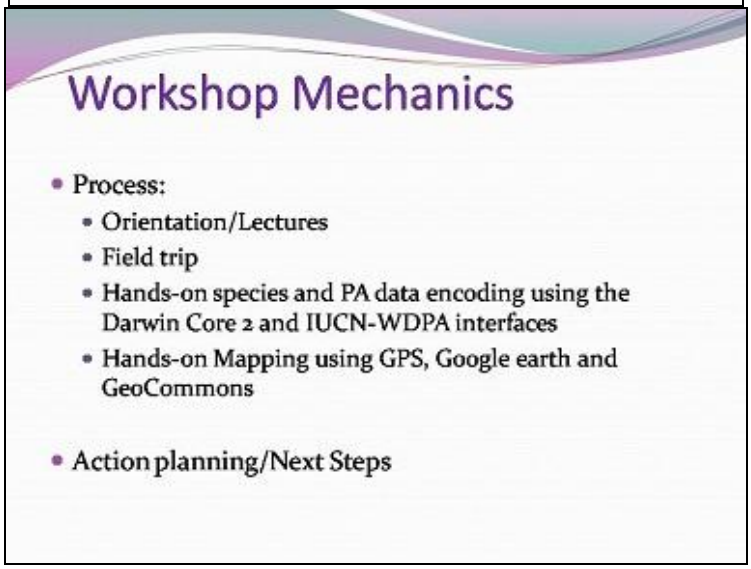
Workshop Overview and Mechanics
Training Workshop on Taxonomic Data Organization and Mapping
23-25 July 2012, Kota Kinabalu, Sabah, Malaysia

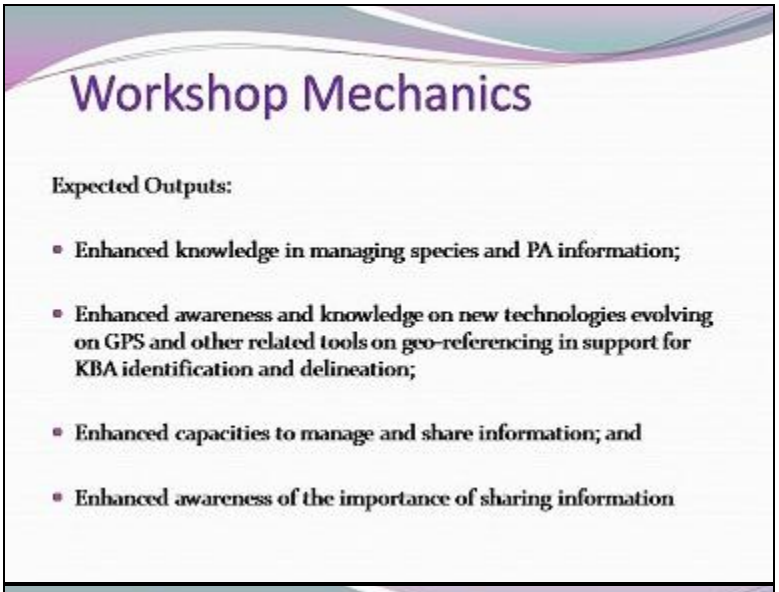

Workshop Overview
Sound biodiversity information management is a key prerequisite to making science base decisions and policies vital for biodiversity conservation and protection.
The capacity for biodiversity-related data storage, retrieval and processing into useful information is currently uneven in the ASEAN region.
Available species and protected area information are also fragmented and are held in different formats, vocabularies and terminologies and metrics

Workshop Overview
It is imperative to make species and protected area information interoperable to:
facilitate information sharing, data integration and analysis across administrative levels and locations
Keep up with the global movement towards the establishment of Key Biodiversity Areas (KBAs) as a tool for identifying effective areas for conservation activities with the use of trigger species (e.g., location of endemic and/or threatened species)

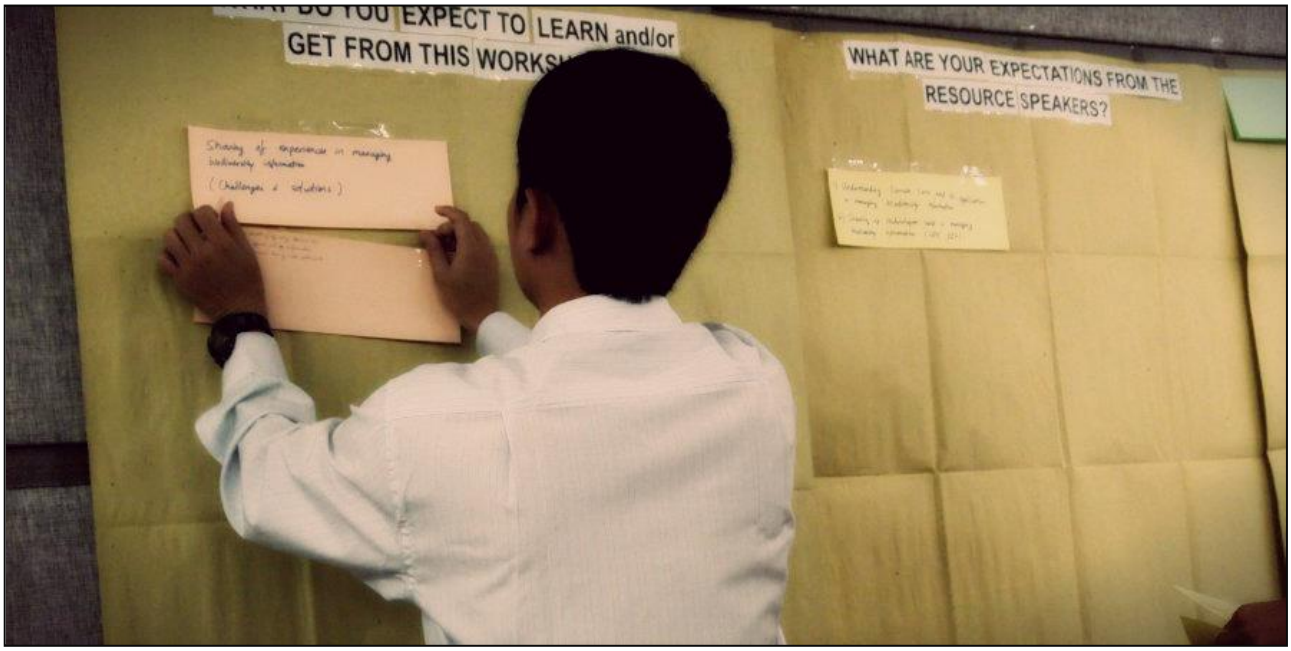
Workshop Overview
Phase 2 of the ACB-JAIF project on Expanded Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity focuses on enhancing AMS (particularly taxonomists) knowledge and/or awareness on:
Biodiversity data organization and management for science base decision making.
Making biodiversity information interoperable so that data will be easy to share, consolidate and analyze in all levels and across countries in the region.
New developments in mapping technologies in support to KBA identification and delineation


Workshop Objectives
Enhance capacities of AMS taxonomists and related staff to:
Digitize species and PA information;
Organize species and PA information into summaries useful for species and ecosystems management; and
Map species and habitats based on available information with the use of new technologies such as the GPS, GeoCommons and Google Earth for KBA identification and delineation.


Workshop Mechanics
Process:
Orientation/Lectures
Field trip
Hands-on species and PA data encoding using the Darwin Core 2 and IUCN-WDPA interfaces
Hands-on Mapping using GPS, Google earth and GeoCommons
Action planning/Next Steps


Workshop Mechanics
Expected Outputs:
Enhanced knowledge in managing species and PA information;
Enhanced awareness and knowledge on new technologies evolving on GPS and other related tools on geo-referencing in support for KBA identification and delineation;
Enhanced capacities to manage and share information; and
Enhanced awareness of the importance of sharing information

Terima Kasih!



Levelling of Expectations

Leveling of Expectations

Training Workshop on Taxonomic Data Organization and Mapping
23-25 July 2012
Kota Kinabalu, Sabah, Malaysia

1. What do you expect to learn and/or get from this workshop?
2. What are your expectations from the resource speakers?
3. What are your expectations from the organizer?
4. What can you contribute to make this workshop a success? (Please use white paper for your answers to Q4)

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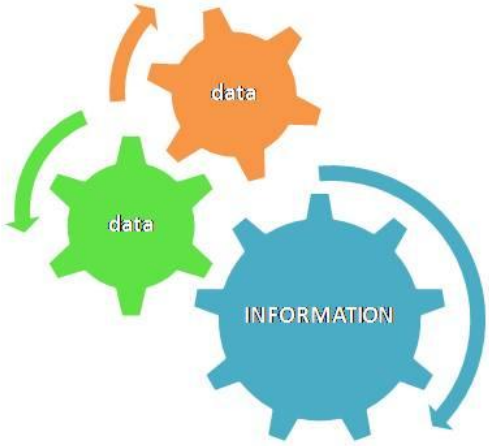
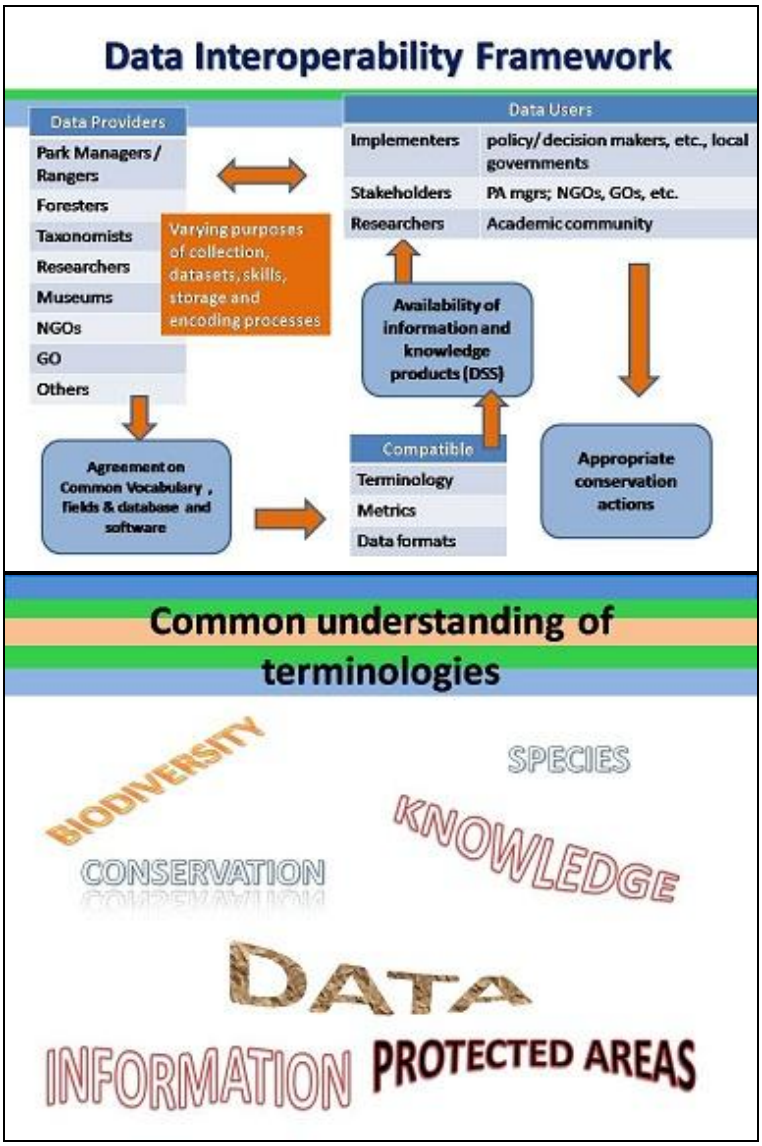


Interoperability of databases for biodiversity conservation, planning and decision making


Data Interoperability Framework
Data Providers
Park Managers/ Rangers
Foresters
Taxonomists
Researchers
Museums
NGOs
GO
Others
Varying purposes of collection, datasets, skills, storage and encoding processes
Data Users
Implementers
policy/ decision makers, etc., local governments
Stakeholders
PA mgrs; NGOs, GOs, etc.
Researchers
Academic community
Availability of information and knowledge products (DSS)
Agreement on Common Vocabulary , fields & database and software
Compatible
Terminology
Metrics
Data formats
Appropriate conservation actions
Common understanding of terminologies
BIODIVERSITY
SPECIES
KNOWLEDGE
CONSERVATION
DATA
INFORMATION
PROTECTED AREAS

What should we use?

- **Common**
  - Base maps
  - Database architecture
    - Fields
    - Metrics
    - Classifications / hierarchies
- **Open source tools**

How is data interoperability achieved?

- Digitize data in common format
  - IUCN Categorization for protected areas
  - Darwin Core 2 for species
- Agree on mechanisms for sharing data
- Identify and integrate data from various holdings
- Encourage data sharing
- Organize partnerships for continued exchange of information

What is available?

- Databases
  - on species – taxonomic classification
  - protected areas
- Protected Area Maps
- Encoded baselines for
  - national and global red list assessments,
  - national reports
- National AMS CHM websites

What can be achieved?

- Available and High integrity scientific data
- Ease of information integration – no resolution issues
- Enable comparison of information across time and across sites
- Ease in establishing species occurrence trends and mapping these
- Ease of referring to similar species groups in the assessment of Key Biodiversity Areas

Usefulness of Reconciled Data and Maps

- Track particular species occurrence, population trends
- Study impacts of particular threats from a visual reference
- Eliminate duplication of research and mapping efforts

Usefulness of Reconciled Data and Maps

- **Improved decision –** making for defining Key Biodiversity delineation and identification and selection of protected areas
- **Improved analysis -** allows comparison of site states across time (area covered by ecosystems, loss of habitats, etc.)
- **Improved planning and monitoring** (planning across the region, monitoring species trading routes, identifies needs for transboundary arrangements, etc.)

Review: Importance of Data Interoperability

- Ease of data integration, manipulation and analysis
- Generate sound statistical bases for planning and decision making
- Promote digitization and collection of fragmented data in different holdings
- Enhances process of data sharing
- Encourage continuous data contribution and analysis
- Eliminates duplication of research and mapping efforts
- Enable comparisons of information across sites
- Resolve data compatibility issues
- Improve digital knowledge management of both users and holders of data

Review: What are the components of interoperable data?

- Common compatible software
- Standard formats/Minimum dataset
- Interfaces for encoding
- Information from data holders (e.g., museums, academe, researchers, NGOs, GOs, etc.)

Review: HOW?

- **Adhere to internationally accepted standards (e.g. taxonomic classification, maps, level of resolution)**
  - Adopt a common database architecture
  - Use compatible organism names and habitat classifications
  - Use of common and easily accessible tools (free ware)
  - Use of map resolutions consistent with policy needs (e.g. PA delineation)
- **Agree to share data (through certain guidelines, mobilize commitments)**
  - Organize into a community of collaborators and have operational agreements for data contribution, use & access, updating, populating, KM products, etc
  - Agree to common objectives and methods (for PA ID and selection, KBAs, etc.)
  - Use information for "good" things only to earn the trust of collaborators
  - Share info by using readily available online and offline databases
  - Integrate common structures in National Clearing House Mechanisms (CHMs)

Terima Kasih
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http://chm. aseanbiodiversity.org

Overview on Darwin Core 2

Data Concepts and Structure

Training Workshop on Taxonomic Data Organization and Mapping

23-25 July 2012, Kota Kinabalu, Sabah, Malaysia

Darwin Core Definition & Features

- The Darwin Core (or DwC) is a standard format for sharing species information based on:
  - taxa
  - geographic occurrence in nature as documented by observations, specimens and samples, and related information
- It includes a glossary of terms that provides reference definitions, examples, and commentaries, including how terms
  - are managed;
  - can be extended for new purposes; and
  - can be used.

Darwin Core Definition & Development

- It **allows data owners to publish species information** in a format that can be understood and used by everyone.
- Developed and implemented by **the Biodiversity Information Management (TDWG)**
- **Spans more than 10 years of development** based on previous works of academic societies focused on cataloguing specimens in natural history collections (e.g., Dublin Core, etc.).
- Ratified in 2009 by the TDWG, and has since undergone several iterations, the **latest version of which is the Darwin Core 2**

Why Should We Use Darwin Core

- **Ensures that data are curated at the source.**
- **Facilitates exchange of interoperable species data** as it uses standard terminologies, format and metrics associated with biological collection data.
- Stores collections of any kind of biological objects or data.
- **Facilitates the addition of components and attributes** of biological data.
- **Streamlines biological specimen data with current data standards** for ease of information exchange with global data holders (e.g. OBIS and GBIF).
- **Facilitates analysis, integration and comparison of species data** at all administrative levels and across locations.
- Shares data among the ACB network in MS Excel format.

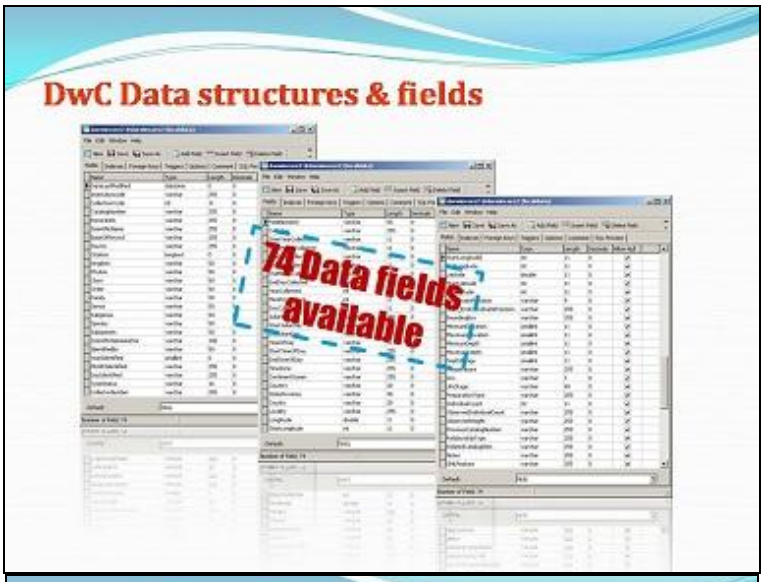
Darwin Core Objectives

- To support the retrieval and integration of primary data that documents the occurrence of organisms in space and time and the occurrence of organisms in biological collections.
- To define a protocol for retrieving structured data from various databases.
- To define a data structure convention based from Darwin Core schema for encoding species information.
- To build a reference implementation of this said protocol.

Scope of Darwin Core

- Consist of a standard format derived from previous standard works (e.g., Dublin Core, etc.)
- Contains concepts ('fields', elements' or 'attributes') that can be used to describe the most common information about a species specimen.
- Contains elements that cover:
  - Species specimen information,
  - Taxonomic classification,
  - Specimen identification,
  - Locality details,
  - Collecting event information (who, why, where, when, how),
  - Biological data about the specimen and references images

More information on Darwin Core can be viewed at
http://rs.tdwg.org/dwc/


DwC Data structures & fields
74 Data fields available

Key Projects Using Darwin Core
Biodiversity Information Sharing Service (BISS - ACB)
The Atlas of Living Australia (ALA)
The Global Biodiversity Information Facility (GBIF)
The Ocean Biogeographic Information System (OBIS)
Online Zoological Collections of Australian Museums (OZCAM)
Mammal Networked Information System (MaNIS)
Ornithological Information System (ORNIS)
HerpNet
FishNet 2
VertNet
FishBase
SeaLifeBase
Canadensys
GBIF INTEGRATED PUBLISHING TOOLKIT
Canadensys
OBIS
MaNIS
ORNIS
FishNet 2
FishBase
ASEAN Centre for Biodiversity
Biodiversity Information Sharing Service

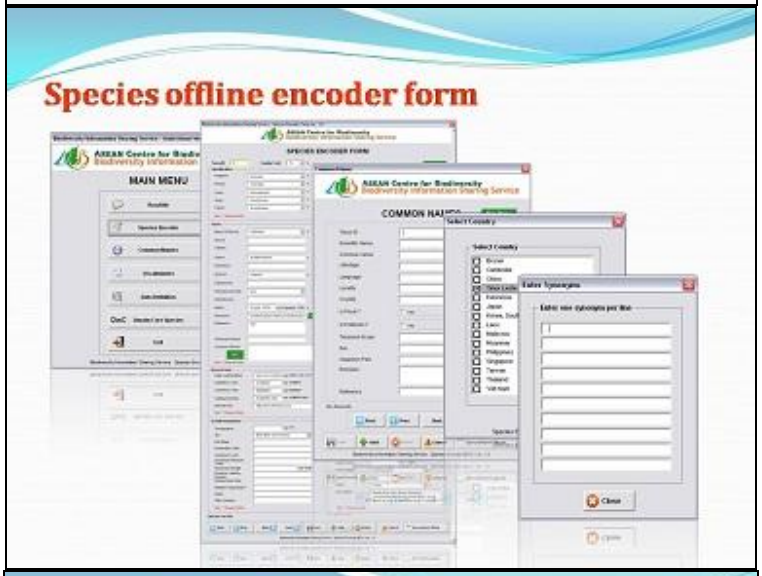
DwC Data fields and definitions

Name	Type	Required	Description
Basis of record	Text	Highly Recommended	An abbreviation indicating whether the record represents an observation (O)
Bounding Box	BOUNDING BOX	Optional	This access point provides a mechanism for performing searches using a bou
Catalog Number	Text / Numeric	Required	A unique alphanumeric value which identifies an individual record within the c
Citation	Text	Highly Recommended	Indicates how this record should be attributed if used. (e.g. "Jones, T. 2005. E
Class	Text	Optional	The class name of the organism
Collection Code	Text	Required	A unique alphanumeric value which identifies the collection within the institutic
Collector	Text	Optional	The name(s) of the collector(s), people or organisation(s) responsible for coll
Collector Number	Text	Optional	An identifying "number" (really a string) applied to specimens (in some discipli
Continent Ocean	Numeric	Optional	The continent or ocean from which a specimen was collected or in which the
Coordinate Precision	Text	Highly Recommended	An estimate of how tightly the locality was specified in the Latitude and Longi
Country	Text	Optional	The country or major political unit from which the specimen was collected or i
County	DateTime	Optional	The county (or shire, or next political region smaller than State / Province) fror
Date Last Modified	Numeric	Optional for OBIS (Required for GBIF/Darwin Core servers)	The date and time the record was last modified. Format: ISO 8601 compliant s
Day Collected	Numeric	Highly Recommended	The day of the month the sample/observation/record event occurred in the fie
Day Identified	Text	Optional	The day portion of the date when the Collection Item was identified; as two di
Depth Range	Text	Optional-not preferred	For data sets that have the depth range expressed in one field (e.g. "150-200
Distribution	Numeric	Optional	Text description of the distribution.
End Day Collected	Numeric	Optional	For samples/observations/record events that were taken over time this gives
End Julian Day	Numeric	Optional	For samples/observations/record events that were taken over time this gives
End Latitude	Numeric	Optional	For samples/observations/record events better represented as line features r
End Longitude	Numeric	Optional	For samples/observations/record events better represented as line features r
End Month Collected	Numeric	Optional	For samples/observations/record events that were taken over time this gives
End Time of Day	Numeric	Optional	For samples/observations/record events that were taken over time this gives

ACB Developments in support to Darwin Core usage by AMS

- The Biodiversity Information Management (BIM) of ACB developed a Graphical User Interface (GUI) to facilitate species encoding using the Darwin Core format in MS Excel template for offline encoding of species information.
- The Darwin Core offline encoding interface includes:
  - Well defined data definitions, vocabularies, and Darwin Core sample datasets .
  - Normalized datasets and data conversions
  - Data compatibility with different data providers and organizations
- An online encoding interface was also developed to facilitate remote species data contribution.

Species offline encoder form

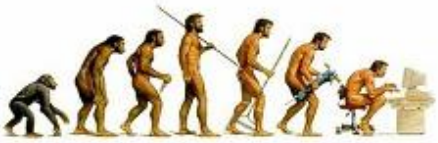


Species online encoder form

Review: Benefits of using Darwin Core 2

- **Ensures that data are curated at the source.**
- Facilitates exchange of interoperable species data as it uses standard terminologies, format and metrics associated with biological collection data.
- Stores collections of any kind of biological objects or data.
- Facilitates the addition of components and attributes of biological data.
- Streamlines biological specimen data with current data standards with potential for information exchange from global data holders such as OBIS and GBIF.
- Facilitates analysis, integration and comparison of species data at all administrative levels and across locations.
- Shares data among the ACB network in MS Excel format.

Terima Kasih!



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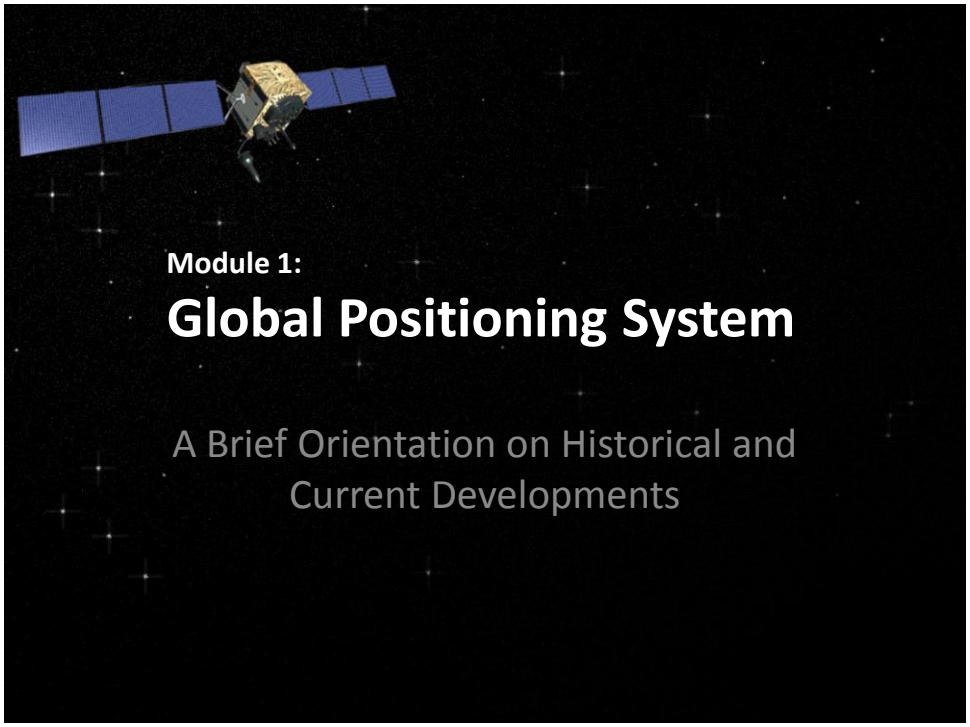
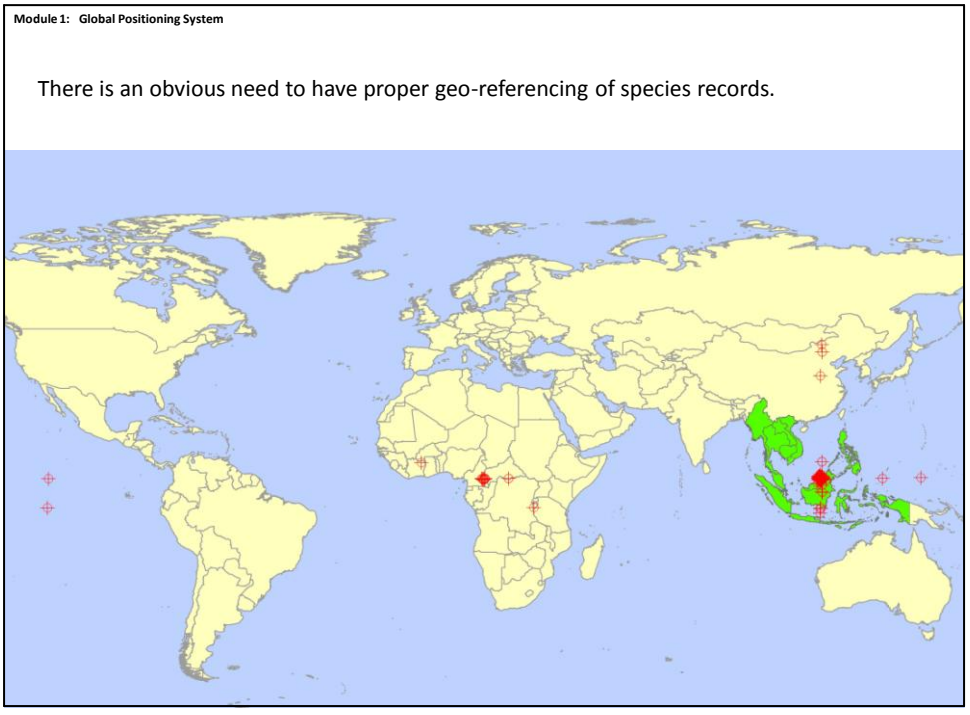
Global Positioning System


Module 1:
Global Positioning System
A Brief Orientation on Historical and Current Developments


Module 1: Global Positioning System
There is an obvious need to have proper geo-referencing of species records.

Module 1: Global Positioning System

The Global Positioning System (GPS)

is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.

Industrial

- **Handheld GPS receiver (Trimble, Garmin, Magellan)**
- **Vehicle Tracking Devices (cargo trucks, shipping vessels, airliners)**

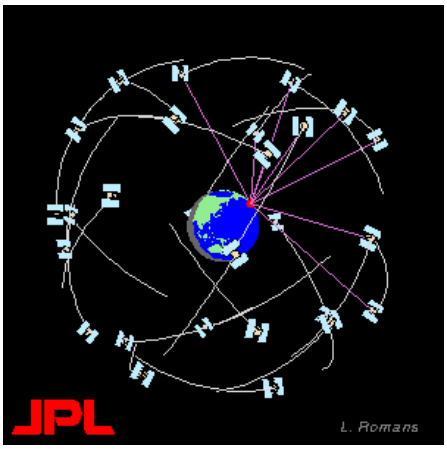
Civilian

- **GPS-enabled mobile phones**
- **GPS-enable cameras**
- **Car navigation**
- **Electronic trainer devices**

Module 1: Global Positioning System

The Global Positioning System (GPS)

How does it work?



GPS Satellites

•A network of GPS satellites are in medium-Earth orbit (31 as of 2008)

•Each of these satellites knows precisely where they are at any given time in relation to the Earth's surface

•Each GPS satellite continuously transmit that data synchronously to any GPS receiver in sight.

Module 1: Global Positioning System

The Global Positioning System (GPS)
How does it work?

GPS Receiver modules

GPS Receivers

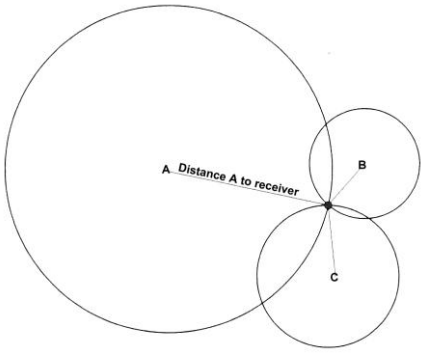
•These contain sensors that decodes information transmitted by GPS satellites.

•They should have unobstructed view of the sky

•They should be bundled with accompanying software to display decoded GPS information to the user

Module 1: Global Positioning System

The Global Positioning System (GPS)
How does it work?



How position is determined

•The GPS receiver calculates the position from the current positions of visible satellites and the time it took the signal to reach from the satellites to the receiver.

•Each of these satellites will produce an imaginary sphere with its radius equal to the distance from satellite to receiver. The area along the surface of the sphere is your "possible location".

•This "possible locations" are fine tuned as more satellites become available in to view.

•Each common point of intersection of these imaginary spheres becomes your present location.

At least 3 satellites needed for 2D positioning.
But you need at least 4 satellites to determine 3D position i.e. altitude.

Module 1: Global Positioning System

The Global Positioning System (GPS)

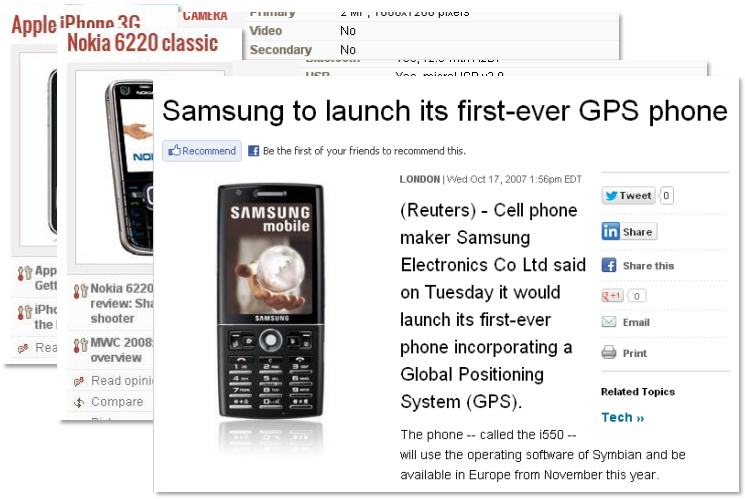
A Brief History

Development stage (strictly for US military use)	*1978*	*The first experimental Block-II GPS satellite was launched*
	1983	*An incident occurred that a Soviet jet shot down a civilian airline that was off course due to navigational errors. U.S. President Ronald Reagan announced that GPS would be made available for civilian uses once it was completed.*
	1985	*10 more experimental Block-I satellites launched*
	1989	*The first modern Block-II satellite was launched*
First large-scale military use	*1990*	*The Gulf War was the first conflict, GPS were extensively used by the military*
	1993	*A full constellation of 24 GPS satellites were available for Standard Positioning Service (SPS)*
Final stages of development	*1995*	*A Full Operational Capability (FOC) was declared for military's Precise Positioning Service (PPS)*
Made available to the public with degraded signal accuracy	*1996*	*Recognizing the importance of GPS to civilian users as well as military users, U.S. President Bill Clinton issued a policy directive declaring GPS to be a dual-use system and establishing an Interagency GPS Executive Board to manage it as a national asset.*
GPS for civilian use made more accurate and simple	*2000*	*Selective Availability" was discontinued as a result of the 1996 executive order, allowing users to receive a non-degraded signal globally.*
	2004	*The United States Government signed an agreement with the European Community establishing cooperation related to GPS and Europe's planned Galileo system.*
GPS technology entered consumer electronics	***Nov 2004,***	***Qualcomm announced successful tests of assisted GPS for mobile phones.***

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today



Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS Apps for your mobile devices:

iOS devices (iPhone, iPOD Touch, iPAD)

Free GPS

This is a simple app that stores and directs the user to waypoints using latitude and longitude coordinates. Free GPS delivers the necessary functionality to utilize the iPhone's built-in GPS in a simple clean interface.

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS Apps for your mobile devices:

iOS devices (iPhone, iPOD Touch, iPAD)

MotionX-GPS

MotionX-GPS was released on the iPhone in October 2008. MotionX-GPS is a handheld GPS application targeted to hikers, runners, geoacachers and other outdoor sports enthusiasts. It utilizes the iPhone's built-in GPS chip. Soon after release, MotionX-GPS became the best-selling navigation solution in the iPhone's App Store. MotionX GPS uses map data provided by OpenStreetMap.

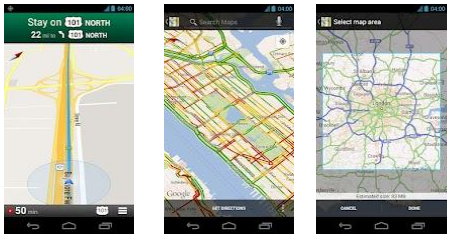
Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS Apps for your mobile devices:

Android devices (Samsung Galaxy series, HTC, Motorola)



Google Maps Mobile

Whether you need directions to your destination, the closest good place for a bite to eat, or just a sense of where you are, Google Maps for Android can help.

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS Apps for your mobile devices:

Android devices (Samsung Galaxy series, HTC, Motorola)

GPS Essentials

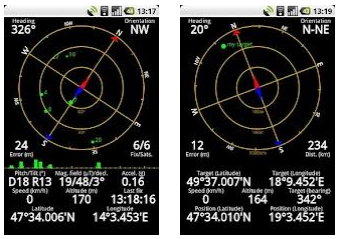
The Swiss army knife of GPS navigation! The most complete GPS tool on market: Navigate, manage waypoints, tracks, routes, build your own dashboard from 45 widgets.

Module 1: Global Positioning System

The Global Positioning System (GPS)
Today

GPS Apps for your mobile devices:

Android devices (Samsung Galaxy series, HTC, Motorola)



GPS Status and Toolbox

Displays your GPS and sensor data: position and signal strength of satellites, accuracy, speed, acceleration, altitude, bearing, pitch, roll and battery state.
Tools included: compass with magnetic and true north, leveling tool, mark or share your location and navigate back later.
Keep your GPS fast: reset it or download A-GPS data regularly for faster fixes.

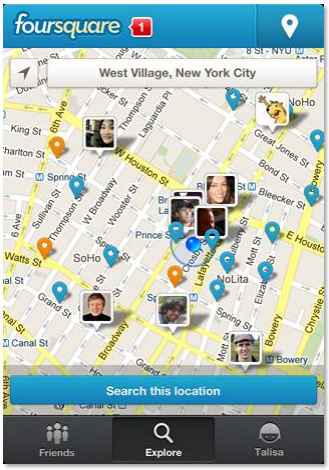
Module 1: Global Positioning System

The Global Positioning System (GPS)
Today

The Global Positioning System (GPS)
Today

Module 1: Global Positioning System

The Global Positioning System (GPS)
Today



Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

Google Earth

NASA World Wind

ArcGIS Explorer

MS Virtual Earth

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

ArcGIS Online

GeoCommons

Module 1: Global Positioning System

The Global Positioning System (GPS)
Today

Global Positioning System is for everybody.

- ***It is now as easy as taking a photo and printing the picture.***
- ***You no longer have to invest on expensive and dedicated hardware like a handheld GPS receiver.***
- ***You don't have to install expensive softwares and use special cables to access and process GPS data***
- ***You don't have to augment GPS accuracy using base stations.***
- ***You don't need to learn more complexities like different geographic projections.***

Module 1: Global Positioning System

The Global Positioning System (GPS)
Today

GPS Apps for your mobile devices:

Smartphones with JAVA support (MIDP)

- **Trackr!**
  trackr! uses GPS and Google Maps. It consists of two parts: the website trackr! and the software on your mobile phone.
- **TrekBuddy**
  - *bluetooth and serial port GPS, internal (JSR-179), simulator*
  - ** offline maps (common grids and projections)*
  - ** smart GPX / raw NMEA logs*
  - ** waypoints and navigation*
  - ** location sharing*

  - ** MIDP and Symbian phones*
  - ** Windows Mobile devices*
  - ** Blackberry devices*
  - ** Palm devices (Garnet OS)*
- **And a lot more!!!**

Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

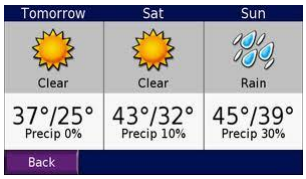
GPS tips for a non-technical person

- Know your device

- Know your GPS app

- Get to know the area BEFORE the tour

- Check the weather forecast



Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS tips for a non-technical person

- Allow adequate time allowance for TTFF (Time To First Fix)

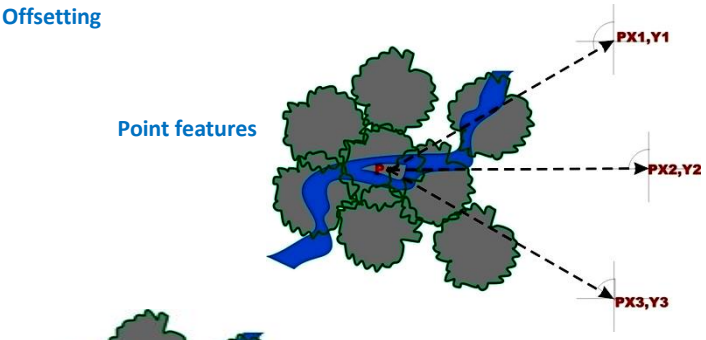
- Make sure your device has adequate power

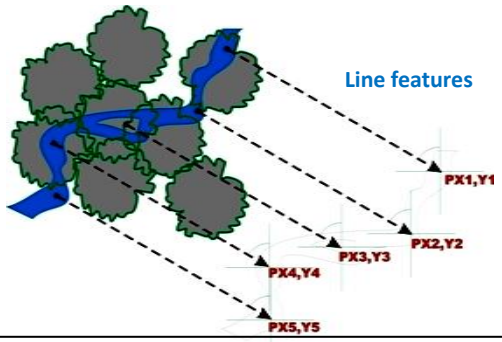
- Document every waypoint or point of interest

- Bring along a compass and measuring tape

Module 1: Global Positioning System

GPS Offsetting





Module 1: Global Positioning System

The Global Positioning System (GPS)

Today

GPS tips for a non-technical person

- Take pictures
- Be sure to turn off camera function after taking photos to save battery
- Double-check your journal entries
- Keep accurate position readings
- Reduce the precision before publishing data.
- Precise location of species is important to correlate it with the environment where it was found.

End of module 1

Module 2:

Getting to Know Geographic Coordinate System

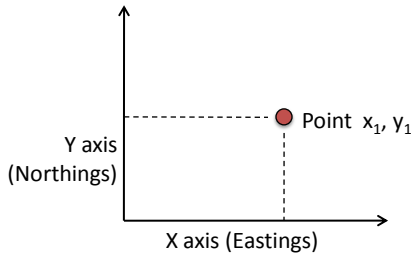
- A brief orientation on the data you collect using GPS

Geographic Coordinates System

Module 2: Getting to Know Geographic Coordinate System

Geographic Coordinates System

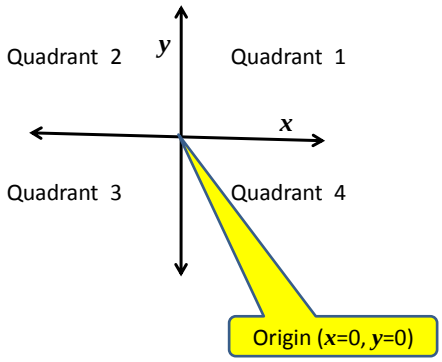
Geographic coordinates are representations of a point along a Cartesian plane reference



Module 2: Getting to Know Geographic Coordinate System

Geographic Coordinates System

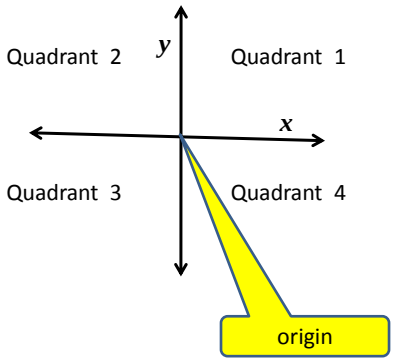
Geographic coordinates are representations of a point along a Cartesian plane reference



Module 2: Getting to Know Geographic Coordinate System

Geographic Coordinates System

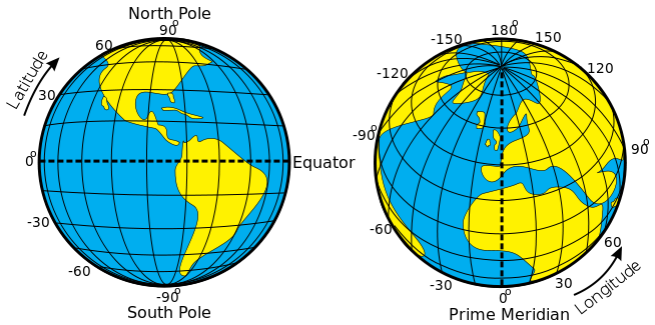
Geographic coordinates are representations of a point along a Cartesian plane reference



Module 2: Getting to Know Geographic Coordinate System

Geographic Coordinates System

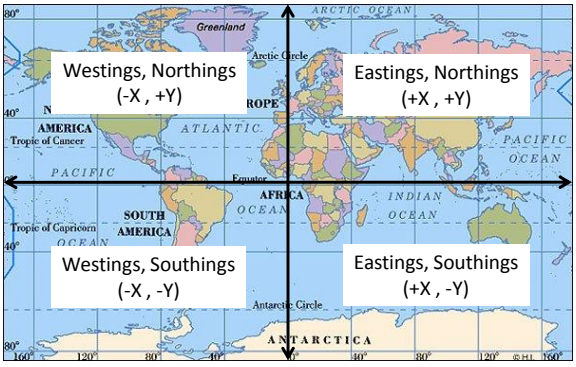
Imaginary ***x*** and ***y*** axes are drawn across the earth



Module 2: Getting to Know Geographic Coordinate System

Geographic Coordinates System

Geographic coordinates are representations of a point along a Cartesian plane reference



Module 2: Getting to Know Geographic Coordinate System

Handling Geographic Coordinates

Notations and Conventions used in geographic coordinate systems:

Since coordinate variables are often expressed as (x, y), it is therefore more convenient to express positions in longitude, latitude order.

It is also more convenient to use values in decimal degrees format (DD) instead of degrees-minutes-seconds (DMS)

DD = D + ((M/60) + (S/3600))

Positions expressed with E/W and N/S suffix to denote its position among the four quadrants of the cartesian plane instead of the +/- number notation

End of module 2

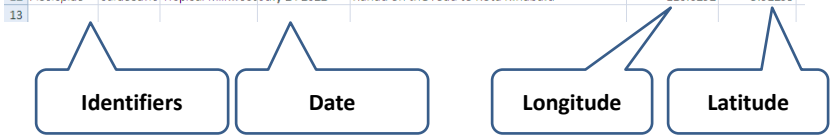
Module 3:

Managing Collected GPS Data

- A brief orientation on processing, plotting and sharing collected GPS data

- Compile your data in to a matrix
- Your matrix should have identifiers and separate columns for longitude and latitude along with all other information associated with each record

	A	B	C	D	E	F	G
1	Genus	Species	Common Name	Date Recorded	Locality	Longitude	Latitude
2	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2012	Ranau on the road to Kota Kinabalu	116.6258	5.92226
3	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2013	Ranau on the road to Kota Kinabalu	116.6247	5.92244
4	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2014	Ranau on the road to Kota Kinabalu	116.6225	5.92217
5	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2015	Ranau on the road to Kota Kinabalu	116.6284	5.92272
6	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2016	Ranau on the road to Kota Kinabalu	116.6213	5.92295
7	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2017	Ranau on the road to Kota Kinabalu	116.6278	5.92222
8	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2018	Ranau on the road to Kota Kinabalu	116.6276	5.92292
9	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2019	Ranau on the road to Kota Kinabalu	116.6222	5.92211
10	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2020	Ranau on the road to Kota Kinabalu	116.6204	5.92386
11	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2021	Ranau on the road to Kota Kinabalu	116.6241	5.92306
12	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2022	Ranau on the road to Kota Kinabalu	116.6292	5.92295
13							



Module 3: Managing Collected GPS Data

- Check the pattern of GPS data
- Depending on the extend of your transect, positions should only differ in their decimal values
- 0.01 decimal degrees is approx 1.11 kilometer equivalent

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7	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2017	Ranau on the road to Kota Kinabalu	116.6278	5.92222
8	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2018	Ranau on the road to Kota Kinabalu	116.6276	5.92292
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11	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2021	Ranau on the road to Kota Kinabalu	116.6241	5.92306
12	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2022	Ranau on the road to Kota Kinabalu	116.6292	5.92295
13							

Module 3: Managing Collected GPS Data

- Check the pattern of GPS data
- Depending on the extend of your transect, positions should only differ in their decimal values

Accuracy versus decimal places at the equator

decimal places	degrees	distance
0	1.0	111 km
1	0.1	11.1 km
2	0.01	1.11 km
3	0.001	111 m
4	0.0001	11.1 m
5	0.00001	1.11 m
6	0.000001	0.111 m
7	0.0000001	1.11 cm
8	0.00000001	1.11 mm

Module 3: Managing Collected GPS Data

Plotting data selections in Google Earth

- Verify location of your data
- Do distance measurements
- Export data as KML

	A	B	C	D	E	F	G
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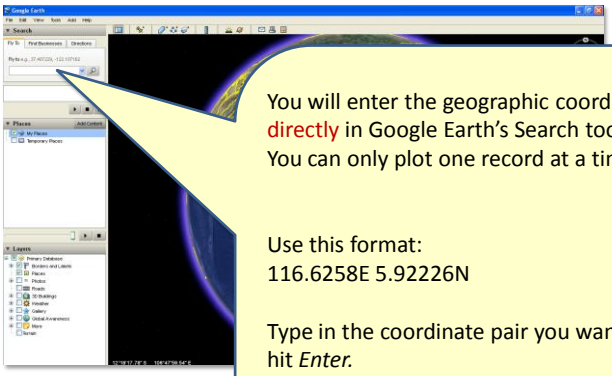
Note: This presentation will not discuss Google Earth in details. For tutorial in using Google Earth, please see this file *(Manuals & References\References and Supplimental Resorces [Mapping]\Mapping Module.pptx Slide 26 to 47)*.

Module 3: Managing Collected GPS Data

•Run Google Earth



You will enter the geographic coordinates directly in Google Earth's Search tool here. You can only plot one record at a time.

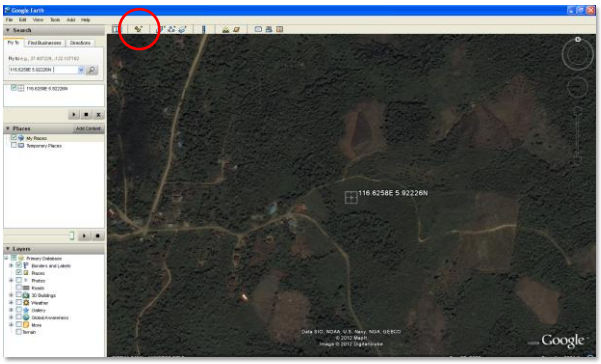
Use this format:
116.6258E 5.92226N

Type in the coordinate pair you want to plot then hit *Enter.*

Google Earth will then locate the position and will zoom in on it.

Module 3: Managing Collected GPS Data

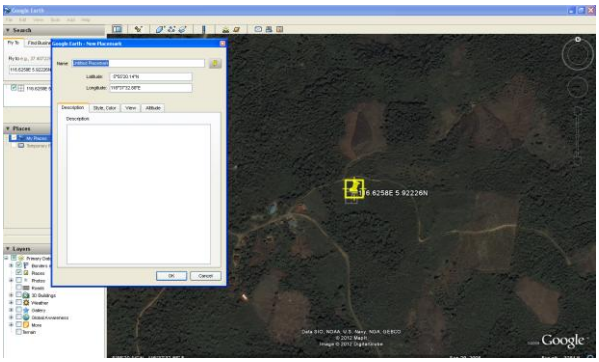
•Putting a marker on the plotted position



Click the Add Placemark icon to put a marker on the plotted coordinates.

Module 3: Managing Collected GPS Data

•Putting a marker on the plotted position

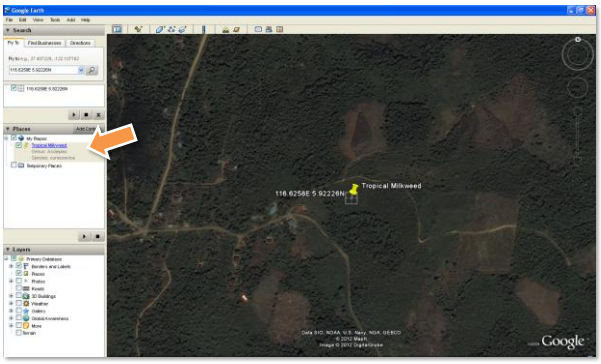


A yellow pushpin marker will appear over the potted location and a dialog box Where you can input the details about the location.

Go ahead and put some description about the location. Then click *Ok*.

Module 3: Managing Collected GPS Data

•Putting a marker on the plotted position



Your new marker will be listed under the Places list and the marker on the map will display its given name.

Module 3: Managing Collected GPS Data

Sharing (publishing) your collected GPS data using GeoCommons

- Upload data to GeoCommons

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12	*Asclepias*	*curassavic*	Tropical Milkweed	July 24 2022	Ranau on the road to Kota Kinabalu	116.6292	5.92295
13							

Go back to your data matrix, save it as a comma separated values (CSV) file. Make sure you supplied a Longitude and Latitude columns with numeric values

Note: This presentation will not discuss GeoCommons in details. For tutorial in using GeoCommons, please see this file *(Manuals & References\References and Supplimental Resorces [Mapping]\Mapping Module.pptx Slide 48 onwards)*.

Module 3: Managing Collected GPS Data

Sharing (publishing) your collected GPS data using GeoCommons

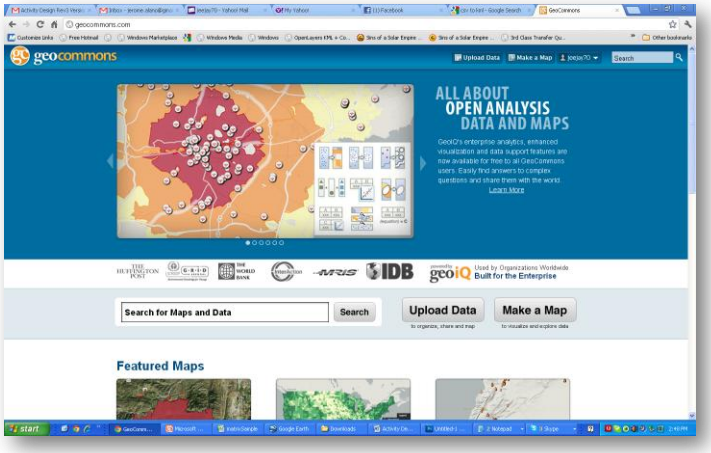
- Upload data to GeoCommons

```
Genus,Species,Common Name,Date Recorded,Locality,Longitude,Latitude
Asclepias,curassavica,Tropical Milkweed,July 24 2012,Ranau on the road to Kota Kinabalu,116.6258,5.92226
Asclepias,curassavica,Tropical Milkweed,July 24 2013,Ranau on the road to Kota Kinabalu,116.6247,5.92244
Asclepias,curassavica,Tropical Milkweed,July 24 2014,Ranau on the road to Kota Kinabalu,116.6225,5.92217
Asclepias,curassavica,Tropical Milkweed,July 24 2015,Ranau on the road to Kota Kinabalu,116.6284,5.92272
Asclepias,curassavica,Tropical Milkweed,July 24 2016,Ranau on the road to Kota Kinabalu,116.6213,5.92295
Asclepias,curassavica,Tropical Milkweed,July 24 2017,Ranau on the road to Kota Kinabalu,116.6278,5.92222
Asclepias,curassavica,Tropical Milkweed,July 24 2018,Ranau on the road to Kota Kinabalu,116.6276,5.92292
Asclepias,curassavica,Tropical Milkweed,July 24 2019,Ranau on the road to Kota Kinabalu,116.6222,5.92211
Asclepias,curassavica,Tropical Milkweed,July 24 2020,Ranau on the road to Kota Kinabalu,116.6204,5.92386
Asclepias,curassavica,Tropical Milkweed,July 24 2021,Ranau on the road to Kota Kinabalu,116.6241,5.92306
Asclepias,curassavica,Tropical Milkweed,July 24 2022,Ranau on the road to Kota Kinabalu,116.6292,5.92295
```

Example of a CSV text file with Longitude and Latitude values.

Module 3: Managing Collected GPS Data

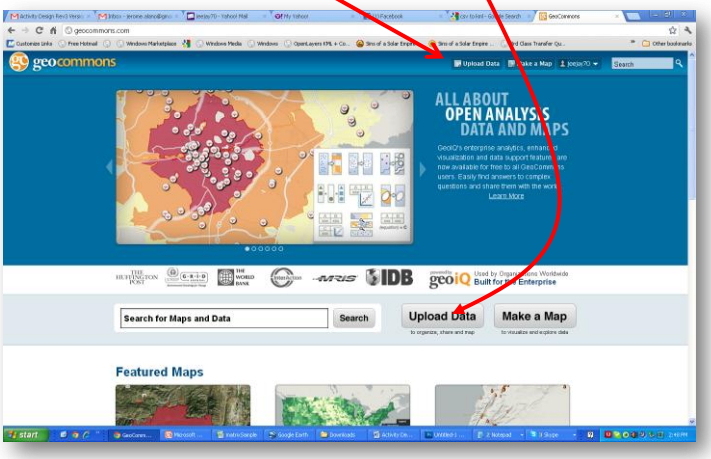
- In your internet browser, go to ***http://www.geocommons.com*** and login to your account



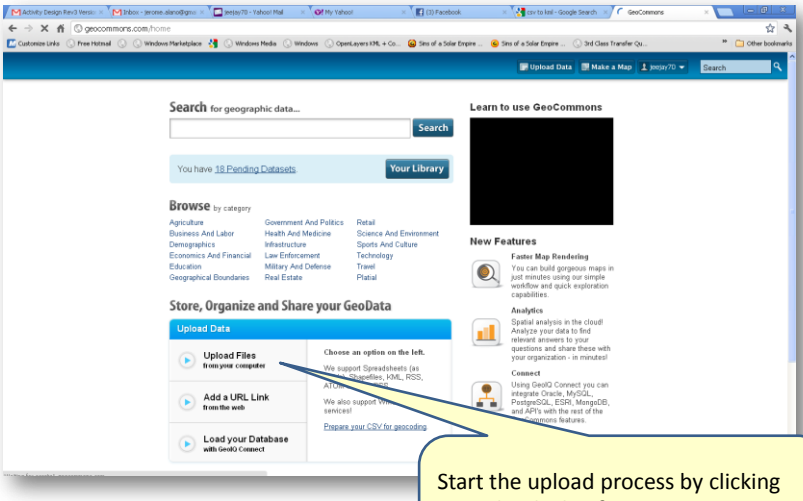
Note: You were advised to create a GeoCommons account prior to the conduct Of this workshop.

Module 3: Managing Collected GPS Data

• After login, click the Upload Data or the Upload Data to organize, share and map

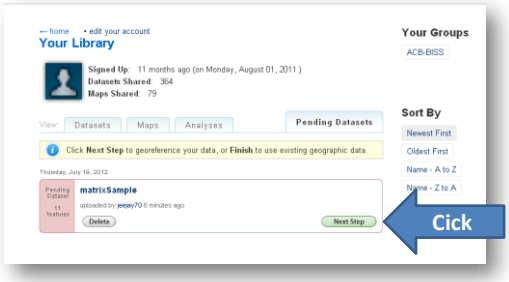


Module 3: Managing Collected GPS Data



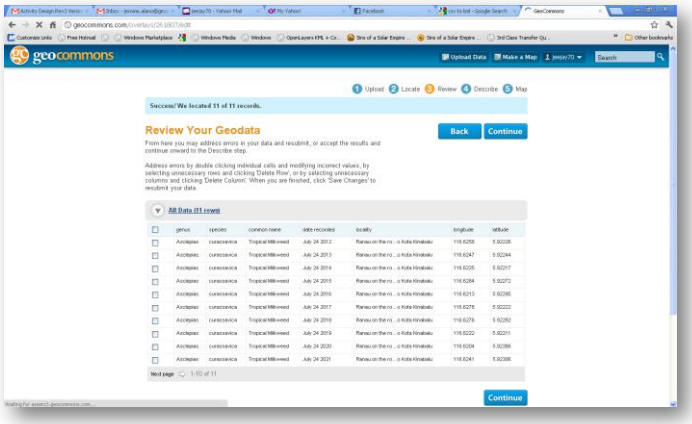
Start the upload process by clicking on **Upload Files *from your computer*** link and browse to the location of your CSV file.

Module 3: Managing Collected GPS Data



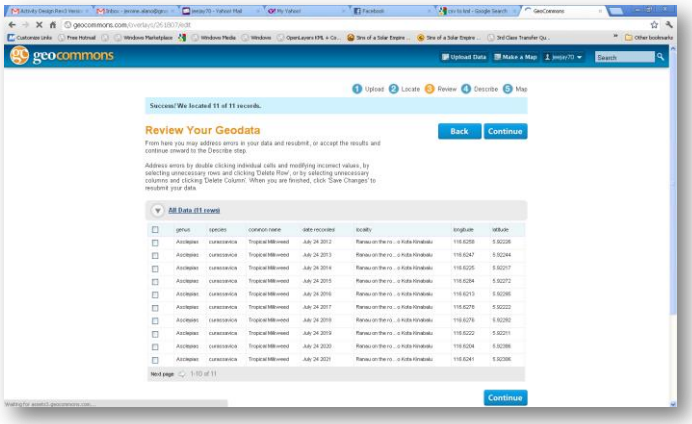
Since our data have its own Longitude and Latitude, choose this option

Module 3: Managing Collected GPS Data



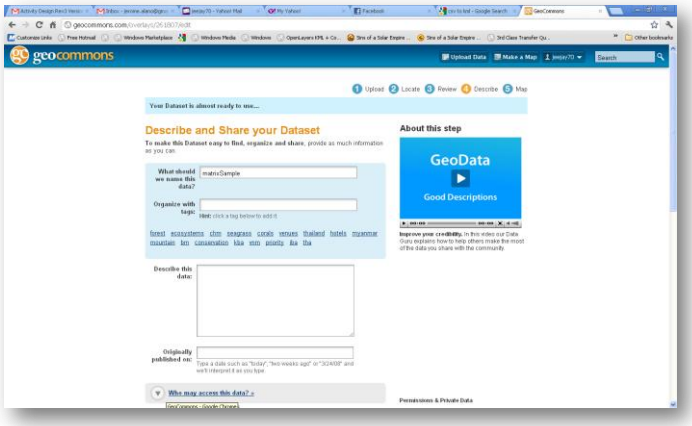
You will be then asked to review your data. Click ***Continue*** to go to the next step.

Module 3: Managing Collected GPS Data



You will be then asked to review your data. Click ***Continue*** to go to the next step.

Module 3: Managing Collected GPS Data

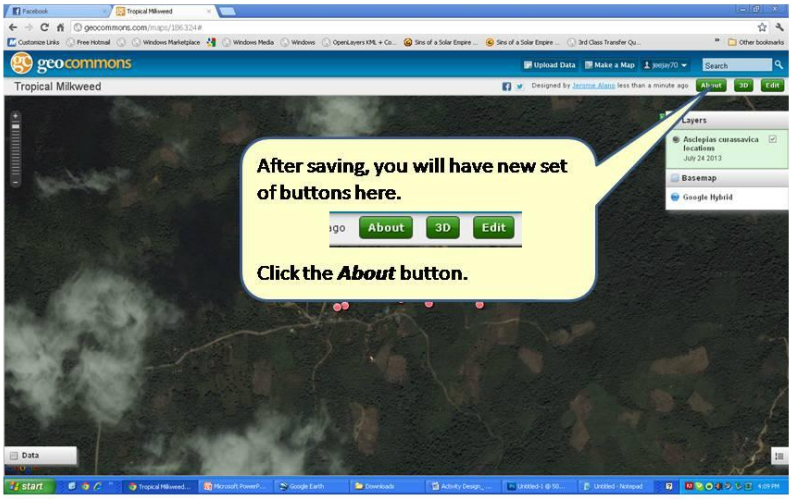


This step allows you to describe your data. You can fill in as much details as you want then click ***Save***.

Module 3: Managing Collected GPS Data

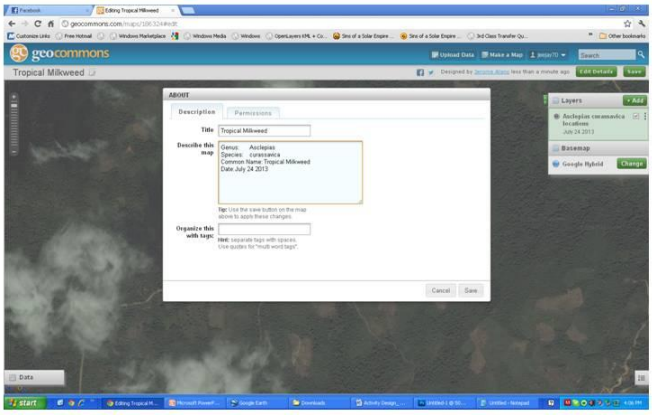
End of module 3

Module 3: Managing Collected GPS Data



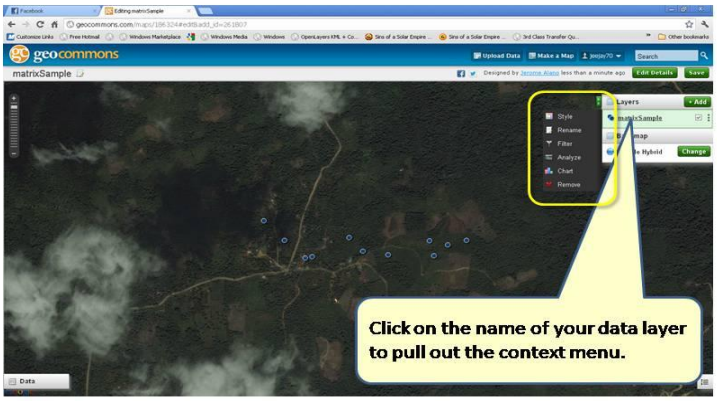
Module 3: Managing Collected GPS Data

- Save you map and Share



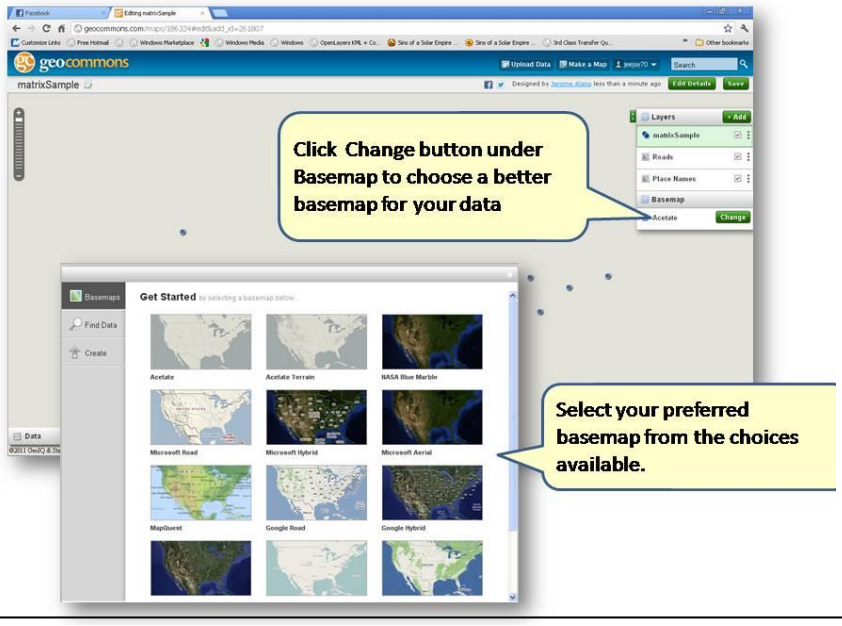
Click ***Save*** and supply the map name and description. Then click Save in the ABOUT input dialog.

Module 3: Managing Collected GPS Data



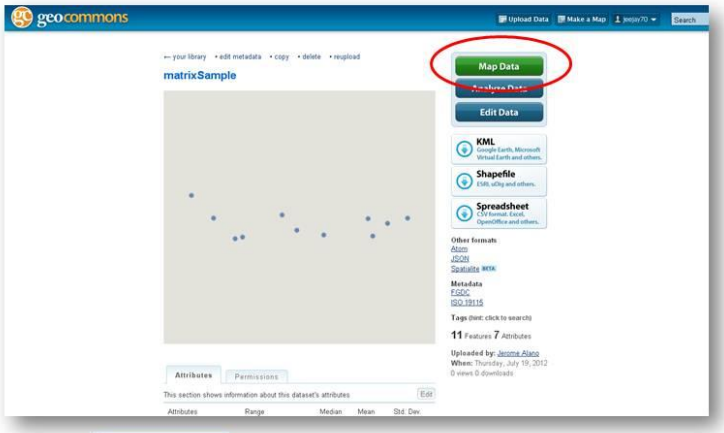
Style - Allows you to change the appearance of your data markers
Rename – Allows you to change the name of your layer
Filter, Analyze, Chart – are advanced features and functions
Remove - Deletes this layer from the map.

Module 3: Managing Collected GPS Data



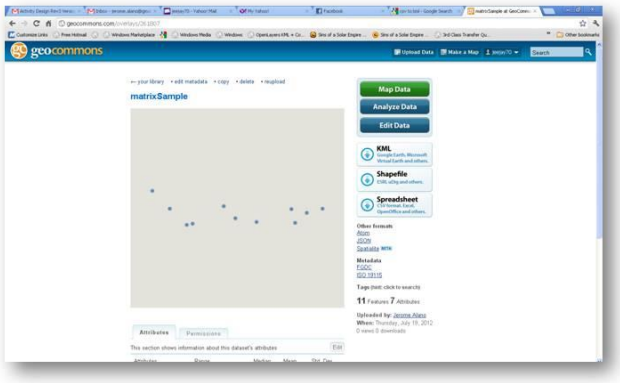
Module 3: Managing Collected GPS Data

- Making a map in GeoCommons



Click the Map Data

Module 3: Managing Collected GPS Data



After saving, you will be able to see a preview of your data. This data is now available in your GeoCommons personal Library. You can either proceed to map this data now, or upload more datasets to your personal library.