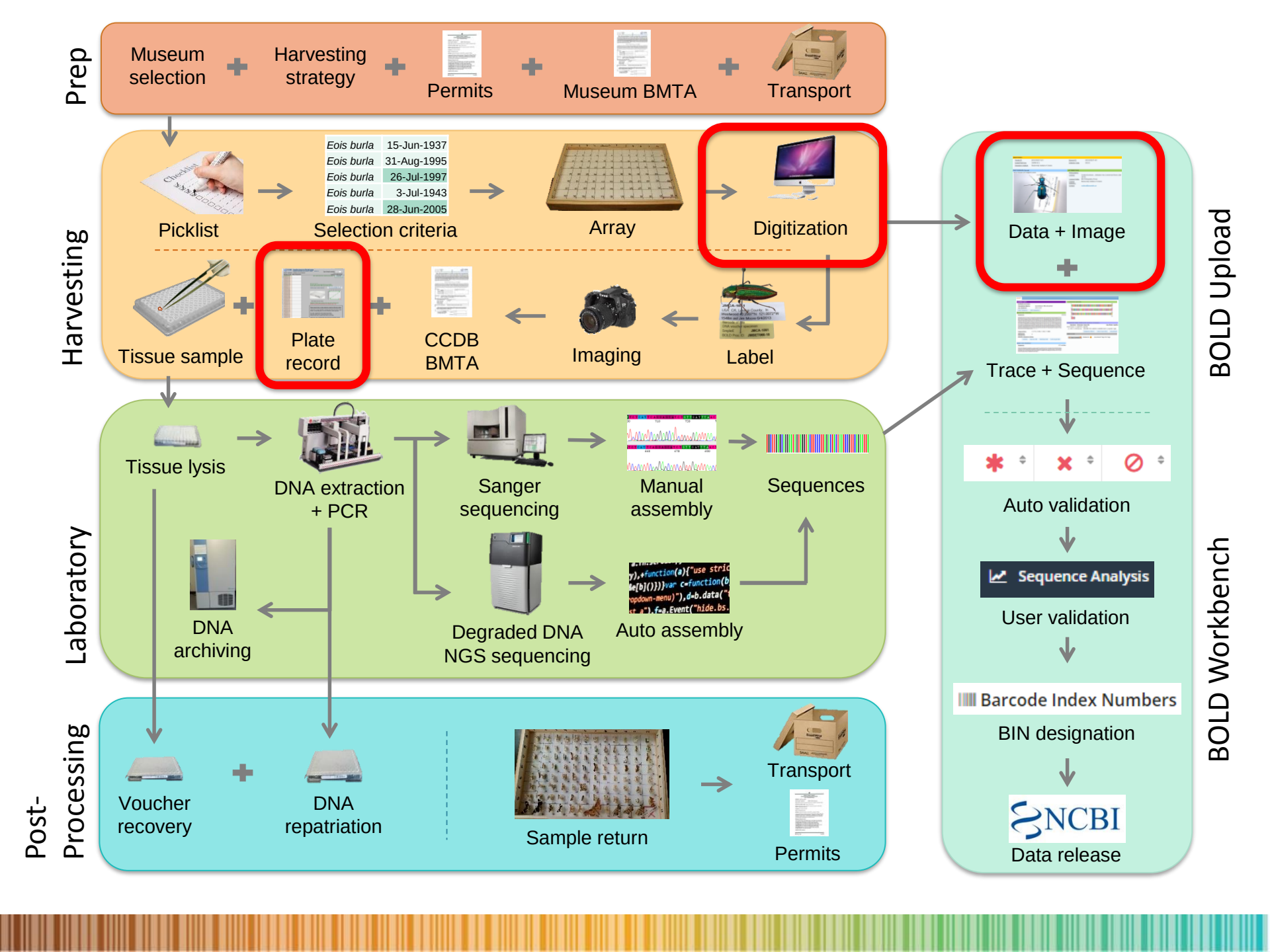
11:00 - 11:45 – Jayme Sones
Specimen Digitization

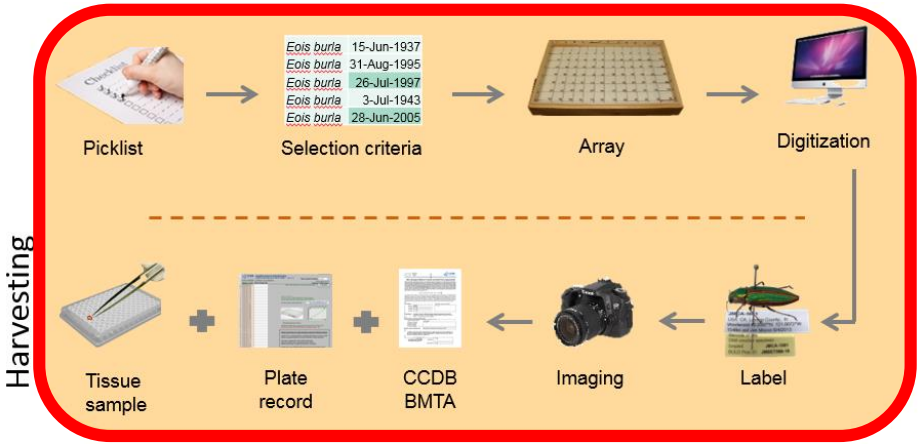
Centre for Biodiversity Genomics

DNA Barcoding Natural History Collections

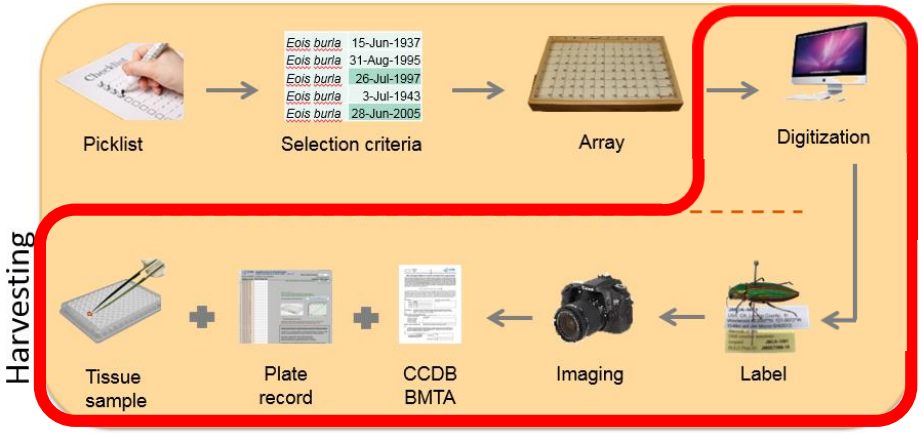

Prep
Museum selection
Harvesting strategy
Permits
Museum BMTA
Transport
Harvesting
Picklist
Eois burla 15-Jun-1937
Eois burla 31-Aug-1995
Eois burla 26-Jul-1997
Eois burla 3-Jul-1943
Eois burla 28-Jun-2005
Selection criteria
Array
Digitization
Tissue sample
Plate record
CCDB BMTA
Imaging
Label
Laboratory
Tissue lysis
DNA extraction + PCR
Sanger sequencing
Manual assembly
Sequences
DNA archiving
Degraded DNA NGS sequencing
Auto assembly
Post-Processing
Voucher recovery
DNA repatriation
Sample return
Transport
Permits
BOLD Upload
Data + Image
Trace + Sequence
BOLD Workbench
Auto validation
Sequence Analysis
User validation
Barcode Index Numbers
BIN designation
NCBI
Data release

Recap

- **Sampling on site**
  - Usually plants and vertebrates
  - Completed at the museum



- **Borrowing specimens**
  - Depends on collection, usually for invertebrates
  - First 3 steps completed at the museum
  - Digitization and pre-lab processing completed at home institution



Specimen Digitization

BOLD Specimen Data & Spreadsheets

Interpreting Museum Data Labels

Museum Data Protocols & Formatting

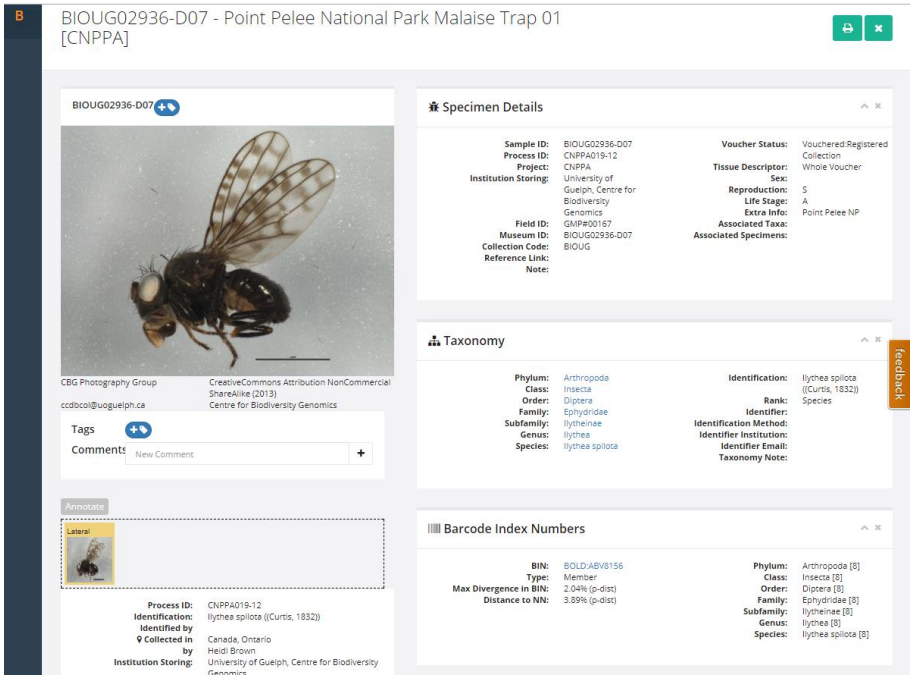
Accessioning & CIMS

BOLD Projects & Uploads

Creating Plate Records & Plate Maps

BOLD Specimen Data & Spreadsheets

- Stores voucher details, taxonomy, specimen details, collection data and photographs



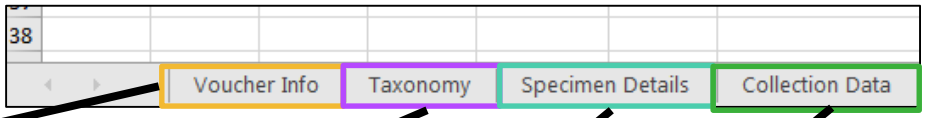
- Each record is assigned a BOLD Process ID when uploaded, linked to sequence data page
- Can upload manually through BOLD project console or through batch excel submissions

BOLD SYSTEMS

BOLD Specimen Data & Spreadsheets

Specimen Data Submission Template

- Batch submissions uploaded via excel template with **four MetaData tabs**



Specimen Info Metadata				
Sample ID	Field ID	Museum ID	Collection Code	Institution Storing
TAB 1				

Taxonomy Metadata												Extende
Sample ID	Phylum	Class	Order	Family	Subfamily	Tribe	Genus	Species	Subspecies	Identifier	Identifier Email	Identification M
TAB 2												

Specimen Details Metadata						Specimen Details Metadata Extended Fields (BOLD 3.1)				
Sample ID	Sex	Reproduction	Life Stage	Extra Info	Notes	Voucher Status	Tissue Descriptor	External URLs	Associated Taxa	Associated Specime
TAB 3										

Collection Info Metadata																
Sample ID	Collectors	Collection Dat	Country/Ocea	State/Province	Region	Sector	Exact Site	Lat	Lon	Elev	Depth	Elevation Precisio	Depth Precisior	GPS Source	Coord
TAB 4															

BOLD Specimen Data & Spreadsheets

Template Locations

1. Within project console on BOLD
   Uploads → Specimen data → Batch Submission
2. BOLD Handbook – Specimen Data submission
   http://v4.boldsystems.org/index.php/Resources
3. CCDB website – http://ccdb.ca/resources/
4. CCDB submission package received via Email

* BOLD requires 4 tab format
* BOLD will only accept .xls file format

BOLD Specimen Data & Spreadsheets

Considerations Prior to Databasing

- Is there any digital data available?
- Does the museum have specific data formats or requirements?
- Will you have multiple persons entering data?
- Will the data be released to another database with specific data requirements in the future?
- Imaging labels for later digitization may be preferable

Establish Databasing Protocol

Interpreting Museum Data Labels

- **Order of labels on pin are very important!**
- Indicates chronological history of specimen

  e.g Multiple taxonomy labels
- Removing labels for imaging etc. must be done with care.
- Labels must be re-attached in **exactly** the same order

Older

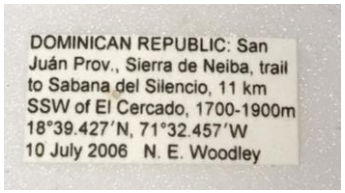
Recent

Most recent identification

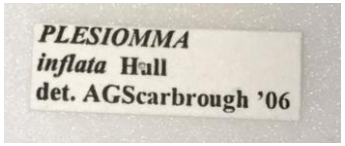
Interpreting Museum Data Labels

Types of Labels - Examples

Data Label

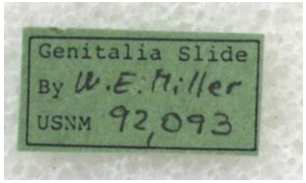


Det. Label

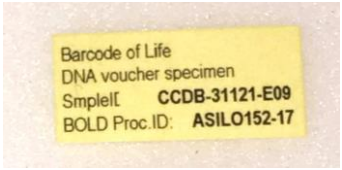


Type Label

Genitalia Slide

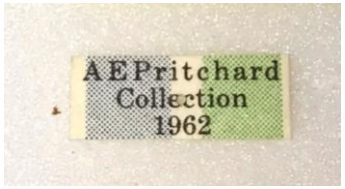


Barcode Label

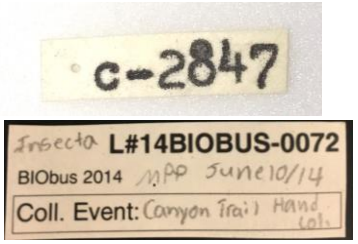


Museum Label

Collection Label



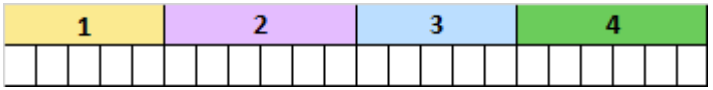
Other Labels



Museum Data Protocols

Suggested Template Setup

- Merge 4 tabs into linear flat file →



- Create one data file per array/plate
- OR Add plate and well locator columns to datasheet →

		Specimen Info Metadata				
Plate	Well	Sample ID	Field ID	Museum I	Collection	Institution
12345	A01	Sample 1				
12345	A02	Sample 2				
12345	A03	Sample 3				
12345	A04	Sample 4				

- Name each file with the corresponding plate barcode(s)
- Pre-fill and reduce columns when possible

Specimen Info Metadata												
Sample ID	Field ID	Museum ID	Collection	Institution Storing	Phylum	Class	Order	Family	Subfamily	Tribe	Genus	Species
Sample 1			USNM	Smithsonian Institute	Arthropoda	Insecta	Lepidoptera					
Sample 2			USNM	Smithsonian Institute	Arthropoda	Insecta	Lepidoptera					
Sample 3			USNM	Smithsonian Institute	Arthropoda	Insecta	Lepidoptera					
Sample 4			USNM	Smithsonian Institute	Arthropoda	Insecta	Lepidoptera					

Museum Data Protocols

Minimum Requirements for Bold Upload

1. Sample ID
2. Field ID OR Museum ID
3. Institution Storing
4. Phylum
5. Country

* **NOTE** character limitations for 1 and 2 0-9, A-Z, ^ . : - _ ( ) #

Museum Data Protocols

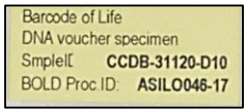
IDEAL Requirements for Bold Upload

1. BOLD requirements
2. Taxonomy to Order
3. Collection date
4. Collection locality
5. Collection coordinates

Museum Data Protocols

Sample ID

Specimen Info Metadata				
Sample ID	**Field ID**	**Museum ID**	**Collection Code**	**Institution Storing**
CCDB-29469-A01		USNM ENT 01343316	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A02		USNM ENT 01343317	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A03		USNM ENT 01343318	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A04		USNM ENT 01343319	USNM	Smithsonian Institution National Museum of Natural History



- Associated with sample being sequenced
- Must be unique identifier, suggest using plate and well however use of museum code may be required
- Case sensitivity critical, considered unique on BOLD

  CCDB-05839-**A**01 vs. CCDB-05839-**a**01

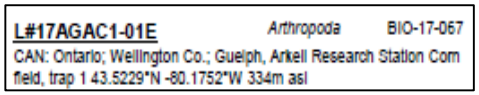
*NOTE only Sample ID/Process ID can be searched on BOLD

Museum Data Protocols

Field ID & Museum ID

Specimen Info Metadata				
Sample ID	**Field ID**	**Museum ID**	**Collection Code**	**Institution Storing**
CCDB-29469-A01		USNM ENT 01343316	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A02		USNM ENT 01343317	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A03		USNM ENT 01343318	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A04		USNM ENT 01343319	USNM	Smithsonian Institution National Museum of Natural History

Field ID:



- Associated with field sample or collection event

  e.g L#17AGAC1-01E

Museum ID:

- Assigned by formal collection, format and case important

  e.g USNM ENT 00037465

- Can be identical to Sample ID
- Museum may ask you to assign during digitization

Museum Data Protocols

Collection Code, Institution Storing

Specimen Info Metadata				
Sample ID	**Field ID**	**Museum ID**	**Collection Code**	**Institution Storing**
CCDB-29469-A01		USNM ENT 01343316	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A02		USNM ENT 01343317	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A03		USNM ENT 01343318	USNM	Smithsonian Institution National Museum of Natural History
CCDB-29469-A04		USNM ENT 01343319	USNM	Smithsonian Institution National Museum of Natural History

Collection Code:

- Associated with given collection e.g USNM
- Required with use of Museum ID Field

Institution Storing:

- Institution where the specimen, tissue or DNA is held
- Must be registered on BOLD and follow syntax

Museum Data Protocols

Taxonomy Guidelines

- **Digital ID** may be most current if available
- **If not use Det. Label**. Most recent Det. label is located lower on the pin than other Det. Labels.
- When no Identifier specified, list as collection curators
- Provisional IDs should aim to be unique. Recommended use of identifier initials

Museum Data Protocols

Taxonomic Fields

Taxonomy Metadata									
Phylum	**Class**	**Order**	**Family**	**Subfamily**	**Genus**	**Species**	**Identifier**	**Identifier Email**	**Identifier Institution**
Arthropoda	Insecta	Lepidoptera	Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators		
Arthropoda	Insecta	Lepidoptera	Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators		
Arthropoda	Insecta	Lepidoptera	Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators		
Arthropoda	Insecta	Lepidoptera	Erebidae	Arctiinae	Cisthene	Cisthene liberomacula	C.B.Knowlton		

- Limited to fields on datasheet, i.e. no subclass or suborder
- **Species:** full binomial name: *Glossina morsitans*
- **Subspecies:** full trinomial name: *Glossina morsitans morsitans*
- In cases of hybrids use ‘x’
  - e.g *Sorbus* × *splendida* = *Sorbus aucuparia* × *Sorbus americana*
  - e.g × *Sorbopyrus auricularis* = *Sorbus aria* × *Pyrus communis*
- In cases of varieties use ‘var’
  - *Escobaria vivipara* var. *arizonica*

Museum Data Protocols

Taxonomic Fields

Taxonomy Metadata							Extended Fields (BOLD 3.1)	
Family	**Subfamily**	**Genus**	**Species**	**Identifier**	**Identifier Email**	**Identifier Institution**	**Identification Method**	**Taxonomy Notes**
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	N.Jacobson			Det Label (1995)	
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	J.D.Holloway			Det Label (1979)	
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators			Det Label (No Year)	
Erebidae	Arctiinae	Cisthene	Cisthene liberomacula	C.B.Knowlton			Det Label (No Year)	

- **Tax Notes**: any notes relating to the ID, e.g colouration, wing span
- Provisional IDs: preferred in Taxonomy Notes or Extra Info

  Should contain non-Linnean characters such as numbers or capitals

  e.g Morpho sp. 1KHR

Museum Data Protocols

Taxonomic Hierarchy

- Upper hierarchy required except subfamily and tribe

Taxonomy Metadata								
Sample ID	**Phylum**	**Class**	**Order**	**Family**	**Subfamily**	**Tribe**	**Genus**	**Species**
Sample 1	Arthropoda	Insecta	Lepidoptera	Geometridae			Eois	Eois tertulia
Sample 2	Arthropoda	Insecta	Lepidoptera	Geometridae			Eois	
Sample 3	Arthropoda	Insecta	Lepidoptera	Geometridae				
Sample 4	Arthropoda	Insecta	Lepidoptera					

- BOLD does validation check during upload. Hierarchy must agree with BOLD checklists
- BOLD will automatically fill subfamily and tribe if part of registered hierarchy

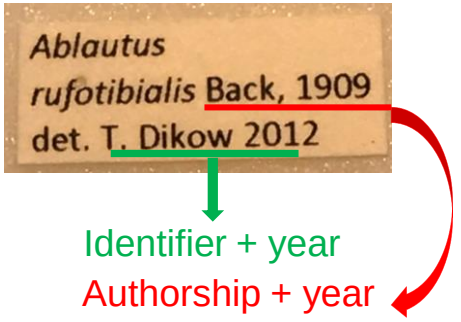
Taxonomy Metadata								
Sample ID	**Phylum**	**Class**	**Order**	**Family**	**Subfamily**	**Tribe**	**Genus**	**Species**
Sample 1	Arthropoda	Insecta	Lepidoptera	Geometridae			Eois	Eois tertulia
Sample 2	Arthropoda	Insecta	Lepidoptera	Geometridae			Eois	
Sample 3	Arthropoda	Insecta	Lepidoptera	Geometridae				
Sample 4	Arthropoda	Insecta	Lepidoptera					

Museum Data Protocols

Identifier & Associated Info

Taxonomy Metadata							Extended Fields (BOLD 3.1)	
Family	**Subfamily**	**Genus**	**Species**	**Identifier**	**Identifier Email**	**Identifier Institution**	**Identification Method**	**Taxonomy Notes**
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	N.Jacobson			Det Label (1995)	J.D.Holloway
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	J.D.Holloway			Det Label (1979)	
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators				
Erebidae	Arctiinae	Cisthene	Cisthene liberomacula	C.B.Knowlton			Det Label (No Year)	

- Only **one identifier** and email allowed
- If more than one present, put **primary or most recent identifier** in Identifier column and add other identifiers in Taxonomy Notes
- Write **exactly as shown** on the label (e.g J.E.Sones), avoid extra spaces



Museum Data Protocols

Identification Method

Taxonomy Metadata							Extended Fields (BOLD 3.1)
Family	**Subfamily**	**Genus**	**Species**	**Identifier**	**Identifier Email**	**Identifier Institution**	**Identification Method**
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	N.Jacobson			Det Label (Jan 1995)
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	J.D.Holloway			Det Label (1979)
Erebidae	Arctiinae	Cisthene	Cisthene kentuckiensis	USNM Curators			Det Label (No Year)
Erebidae	Arctiinae	Cisthene	Cisthene liberomacula	J.E.Sones			BIN Taxonomy Match (Nov 2017)

- Use when Det. label is present on specimen
- **Format**: Det. Label (MMM YYYY) OR Det. Label (YYYY) OR Det. Label (No Year)
- Update Identifier and ID Method with future taxonomy changes

  e.g Tree-Based Identification (Nov 2017)

  BIN Taxonomy Match (Nov 2017)

Museum Data Protocols

Sex, Reproduction & Life Stage

Specimen Details Metadata				
Sex	**Reproduction**	**Life Stage**	**Extra Info**	**Notes**
F	S	A	Paratype	Becker Collection Number 2D339
M	S	A		Kenya National Museum Exchange
M	A	A	Holotype	Genitalia Slide USNM 113,706 by M.A.Metz
M	S	I		Genitalia Slide USNM 36 C.B. Knowlton|Genitalia Slide USNM 120,785 by C.B.Knowlton

- Controlled vocabulary, use abbreviations

Sex

M - male ♂

F - female ♀

H - Hermaphrodite

Reproduction

S - sexual

A - asexual

CP - cyclic parthenogen

Life Stage

*at the time of collection

A - adult

I – immature

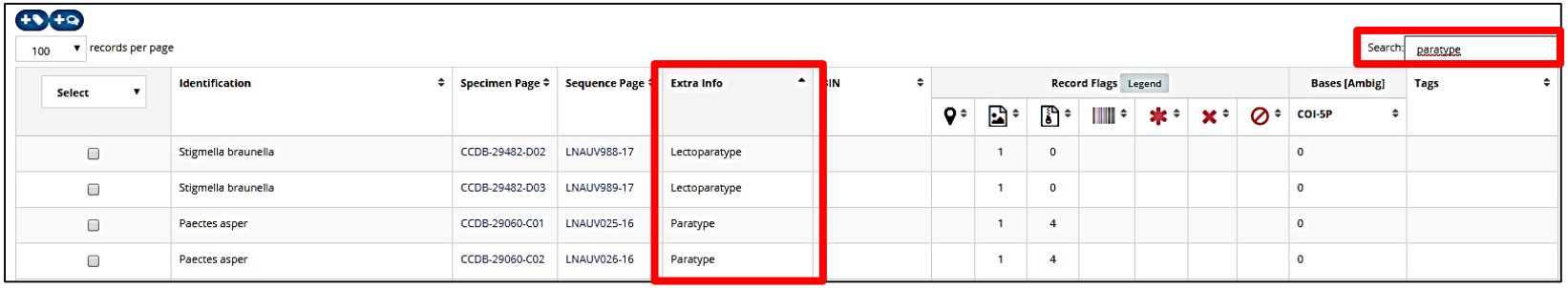
P - pupae

Museum Data Protocols

Extra Info

Specimen Details Metadata				
Sex	**Reproduction**	**Life Stage**	**Extra Info**	**Notes**
F	S	A	Paratype	Becker Collection Number 2D339
M	S	A		Kenya National Museum Exchange
M	A	A	Holotype	Genitalia Slide USNM 113,706 by M.A.Metz
M	S	I		Genitalia Slide USNM 36 C.B. Knowlton|Genitalia Slide USNM 120,785 by C.B.Knowlton

- Can be used for info that will be easily viewable on BOLD workbench for quick evaluation
- e.g type information or host/parasite association



Museum Data Protocols

Notes

Specimen Details Metadata				
Sex	**Reproduction**	**Life Stage**	**Extra Info**	**Notes**
F	S	A	Paratype	Becker Collection Number 2D339
M	S	A		Kenya National Museum Exchange
M	A	A	Holotype	Genitalia Slide USNM 113,706 by M.A.Metz
M	S	I		Genitalia Slide by D.R.D. USNM 91,805|Photograph on file USNM|No. 3934 Becker Collection

- Free Text Field
- Use of delineator between separate pieces of information

  Recommend using **pipe "|"**

- e.g Genitalia Slide by D.R.D. USNM 91,805|Photograph on file USNM|No. 3934 Becker Collection

Museum Data Protocols

Voucher Status & Tissue Descriptor

Specimen Details Metadata Extended Fields (BOLD 3.1)				
Voucher Status	**Tissue Descriptor**	**Associated Taxa**	**Associated Specimens**	**External URLs**
Vouchered:Registered Collection	Tissue			
Vouchered:Registered Collection	Tissue			
Vouchered:Registered Collection	Tissue			
Vouchered:Registered Collection	Tissue			

- Controlled vocabulary

Voucher Status:

Museum Vouchered:Type
Museum Vouchered:Type Series
Vouchered:Registered Collection
To Be Vouchered:Holdup/Private
E-Vouchered:DNA/Tissue+Photo
DNA/Tissue Vouchered Only
No Specimen

Tissue Descriptor:

Leg
Abdomen
Whole voucher
Muscle
Blood

Museum Data Protocols

Associated Taxa & Associated Specimens

Specimen Details Metadata Extended Fields (BOLD 3.1)				
Voucher Status	**Tissue Descriptor**	**Associated Taxa**	**Associated Specimens**	**External URLs**
Vouchered:Registered Collection	Tissue	Host: *Lonicera japonica*		
Vouchered:Registered Collection	Tissue		Host:PLANT23452	
Vouchered:Registered Collection	Tissue			
Vouchered:Registered Collection	Tissue			

- Association with specimen at time of collection
- Should be preceded by relationship, comma delimited

Associated Taxa (Common or Latin name)

- e.g plant host, prey, parasite/host

Associated Specimens

- Use when there is an associated cataloged specimen
- Can be used to associate duplicate records if sequenced twice

Museum Data Protocols

External URLs

Specimen Details Metadata Extended Fields (BOLD 3.1)				
Voucher Status	**Tissue Descriptor**	**Associated Taxa**	**Associated Specimens**	**External URLs**
Vouchered:Registered Collection	Tissue	Host: *Lonicera japonica*		http://www.gigapan.org/viewGigapan.php?id=29271
Vouchered:Registered Collection	Tissue		Host:PLANT23452	
Vouchered:Registered Collection	Tissue			
Vouchered:Registered Collection	Tissue			

- Web accessible links that provide additional information about the specimen
- e.g gigapan image of collecting site

Museum Data Protocols

Collectors

Collection Info Metadata						
Collectors	**Collection Date**	**Country/Ocean**	**State/Province**	**Region**	**Sector**	**Exact Site**
S.E.Miller, P.M.Miller	29-Jun-1970	United States	Arizona	Cochise County		Huachuca Mountains, Ash Canyon Road
R.A.Alexander	5-May-1981	United States	Georgia			Swamp near Stephen Foster State Park
D.C.Ferguson	25-Sep-1969	United States	South Carolina			Wedge Plantation McClellanville
D.Meadows	2-Jul-1952	Mexico	Nuevo Leon			3 miles East Galeana

- **Format**: First initial.Last name, e.g J.Sones (no spaces)
- For multiple collectors separate with comma

Museum Data Protocols

Collection Date

Collection Info Metadata						
Collectors	**Collection Date**	**Country/Ocean**	**State/Province**	**Region**	**Sector**	**Exact Site**
S.E.Miller, P.M.Miller	29-Jun-1970	United States	Arizona	Cochise County		Huachuca Mountains, Ash Canyon Road
R.A.Alexander	5-May-1981	United States	Georgia			Swamp near Stephen Foster State Park
D.C.Ferguson	25-Sep-1969	United States	South Carolina			Wedge Plantation McClellanville
D.Meadows	2-Jul-1952	Mexico	Nuevo Leon			3 miles East Galeana

- **Format**: dd-mmm-yyyy
- Always use 4 digits for year, e.g“09” can be interpreted as 2009 or 1909
- Be cautious of date formats on labels
  - Roman numerals indicate month e.g 4-VI-89 is 4-Jul-89
  - Day and month may be interchangeable e.g 2/7/1952 can be interpreted as Jan 7th or Jul 2nd

Museum Data Protocols

Collection Date Accuracy

Collectors	Collection Date
S.E.Miller, P.M.Miller	29-Jun-1970
R.A.Alexander	31-May-1981
D.C.Ferguson	31-Dec-1969
D.Meadows	

Event Time	Collection Date Accuracy
12:30	-4
13:40	-31
09:50	-365
22:50	

Collection Notes
Reared from larvae
No day specified
No day or month specified
No date

- **Date Ranges**: e.g 25 to 29-Jun-1970
  - Enter end date in Collection Date field and negative (-) # of days in Collection Date Accuracy
- **Incomplete Dates:**
  - Label only contains month and/or year, e.g May 1981 or 1969
  - Enter as date range and make note in Collection Notes

    e.g “no day specified”
- **No Date:** Write “No date” in Notes

Museum Data Protocols

Countries & States

Collection Info Metadata						
Collectors	**Collection Date**	**Country/Ocean**	**State/Province**	**Region**	**Sector**	**Exact Site**
S.E.Miller, P.M.Miller	29-Jun-1970	United States	Arizona	Cochise County		Huachuca Mountains, Ash Canyon Road
R.A.Alexander	5-May-1981	United States	Georgia			Swamp near Stephen Foster State Park
D.C.Ferguson	25-Sep-1969	United States	South Carolina			Wedge Plantation McClellanville
D.Meadows	2-Jul-1952	Mexico	Nuevo Leon			3 miles East Galeana

- Enter **full unabbreviated name**
- List of accepted countries in BOLD drop down menu
- Be cautious of interpreting abbreviations on labels

  e.g the state MN could be mistaken as Montana instead of Minnesota

Museum Data Protocols

Region & Sector

Collection Info Metadata						
Collectors	**Collection Date**	**Country/Ocean**	**State/Province**	**Region**	**Sector**	**Exact Site**
S.E.Miller, P.M.Miller	29-Jun-1970	United States	Arizona	Cochise County		Huachuca Mountains, Ash Canyon Road
R.A.Alexander	5-May-1981	United States	Georgia			Swamp near Stephen Foster State Park
D.C.Ferguson	25-Sep-1969	United States	South Carolina			Wedge Plantation McClellanville
D.Meadows	2-Jul-1952	Mexico	Nuevo Leon			3 miles East Galeana

Region:

- Secondary administrative divisions e.g Counties, Districts, Municipalities
- Parks, e.g Banff National Park

Sector:

- Smaller divisions, e.g within parks or cities

*NOTE: Be consistent according to databasing protocol, consider museum preferences

Museum Data Protocols

Exact Site

Collection Info Metadata						
Collectors	**Collection Date**	**Country/Ocean**	**State/Province**	**Region**	**Sector**	**Exact Site**
S.E.Miller, P.M.Miller	29-Jun-1970	United States	Arizona	Cochise County		Huachuca Mountains, Ash Canyon Road
R.A.Alexander	5-May-1981	United States	Georgia			Swamp near Stephen Foster State Park
D.C.Ferguson	25-Sep-1969	United States	South Carolina			Wedge Plantation McClellanville
D.Meadows	2-Jul-1952	Mexico	Nuevo Leon			3 miles East Galeana

- **All other locality information**, **excluding habitat**
- Be cautious of expanding abbreviations

  e.g R. = Road, River or Ravine?
- Be aware of name changes over historical time
- For illegible labels – write “Illegible locality label” in Notes, take photo for upload if possible

Museum Data Protocols

Latitude, Longitude & Accuracy

			Collection Info Metadata Extended Fields (BOLD 3.1)						
Latitude	**Longitude**	**Elevation**	**Depth**	**Elevation Precision**	**Depth Precision**	**GPS Source**	**Coordinate Accuracy**	**Event Time**	**Collection Date Accuracy**
10.260	84.010	250				GPS	1	12:30	-4
45 056	-74.789	1500		-500		Google Earth		13:40	-31
45.850	-74 279		65		-15	GPS	10	09:50	-365
-29.650	-56.070	180	10			GPS		22:50	

- **Accepted format:**
  - Decimal Degrees: 45.039500 -74.462167 (-/+ very important)

Other label formats:

  - Degrees/Minutes/Seconds**:** 45°02’22.2”N 74°27’43.8”W
  - Degree Decimal Minutes**:** 45°02.37’N 74°27.73’W
  - UTM**:**17T 630084 4833438
- **GPS Source:** Source of Lat & Long measurements, e.g Google Earth
- **Coordinate Accuracy**: Decimal representation of precision of coordinates in metres

Museum Data Protocols

Elevation, Depth & Precision

			Collection Info Metadata Extended Fields (BOLD 3.1)						
Latitude	Longitude	Elevation	Depth	Elevation Precision	Depth Precision	GPS Source	Coordinate Accuracy	Event Time	Collection Date Accuracy
10.260	84.010	1500		-500				12:30	-4
45 056	-74.789	-7						13:40	-31
45.850	-74 279	180	10					11:10-12:10	-365
-29.650	-56.070		65		-15			Morning	

Elevation:

- Relative to sea level, accepted format in metres
- Negative values indicate below sea level (not underwater)
- For an elevation range, e.g 1000-1500m, enter highest elevation in field and write negative (-) value in Elevation Precision to represent range

Depth:

- Collected beneath the surface of water, accepted format in metres
- For inland waters, it is possible to have an elevation AND a depth
- For a depth range, e.g 50-65m, enter lowest depth in field and write negative (-) value in Depth Precision to represent range

Museum Data Protocols

Event Time

			Collection Info Metadata Extended Fields (BOLD 3.1)						
Latitude	Longitude	Elevation	Depth	Elevation Precision	Depth Precision	GPS Source	Coordinate Accuracy	Event Time	Collection Date Accuracy
10.260	84.010	1500		-500				12:30	4
45 056	-74.789	-7						13:40	-31
45.850	-74 279	180	10					11:10-12:10	365
-29.650	-56.070		65		-15			Morning	

Event Time:

- Time when sample was collected
  - Use 24 hour format, e.g 13:10, 11:10-12:10
- Or time of day when sample was collected
  - e.g Morning

Museum Data Protocols

Habitat & Sampling Protocol

Collection Info Metadata Extended Fields (BOLD 3.1)				
Habitat	**Sampling Protocol**	**Collection Notes**	**Site Code**	**Collection Event ID**
Dry Tundra	UV Light Trap	Collected as egg	BIOUG:Churchill	
Swamp	Sweep Net	Collected as larva		
Primary Rainforest	Malaise Trap	Reared|T/25 R/W S 33 NE		
Grassland	Free Hand	Stem of yucca		

Habitat:

- Environmental information that is not related to locality or associated taxa, e.g Forest, Sandy Shore, Dunes

Sampling Protocol:

- Method used to collect sample, e.g Malaise trap, berlese funnel
- Be aware of abbreviations on labels, e.g FIT, MVL, PFT

Museum Data Protocols

Collection Notes, Site Code & Collection Event

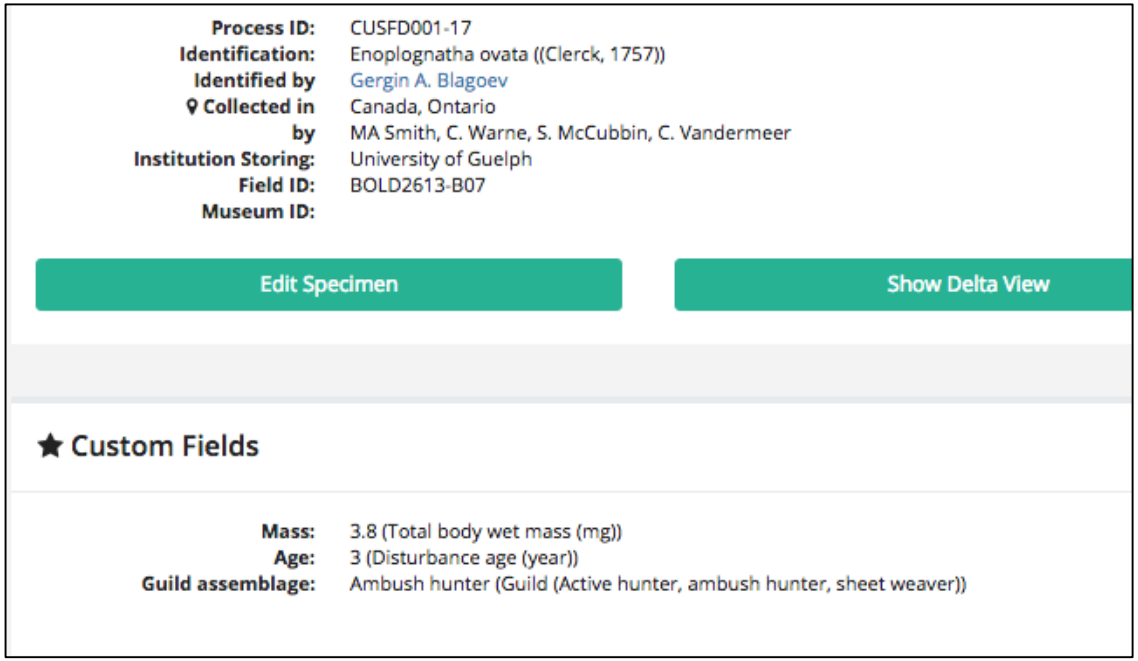
Collection Info Metadata Extended Fields (BOLD 3.1)				
Habitat	**Sampling Protocol**	**Collection Notes**	**Site Code**	**Collection Event ID**
Dry Tundra	UV Light Trap	Collected as egg	BIOUG:Churchill	
Swamp	Sweep Net	Collected as larva		
Primary Rainforest	Malaise Trap	Reared|T/25 R/W S 33 NE		
Grassland	Free Hand	Stem of yucca		

- **Collection Notes:** Any notes related to collection of specimen
- **Site Code**: Name of Sampling Location
- **Collection Event ID:** Optional event ID

Museum Data Protocols

Custom Fields

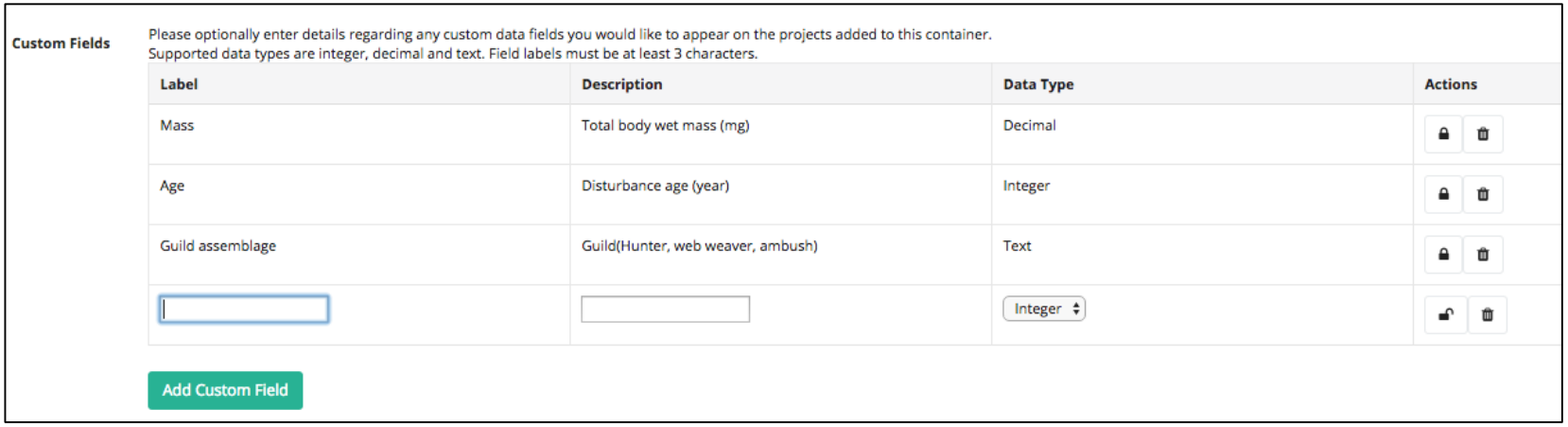
- Option to add additional custom fields on BOLD
  e.g body or weather measurements, genitalia slide #
- **3 supported** data types:
  - decimal
  - integer
  - text
- **Field labels must be at least 3 characters**



Museum Data Protocols

Custom Fields

1. Must add custom field at the container project level



Custom Fields

Please optionally enter details regarding any custom data fields you would like to appear on the projects added to this container.
Supported data types are integer, decimal and text. Field labels must be at least 3 characters.

Label	Description	Data Type	Actions
Mass	Total body wet mass (mg)	Decimal	
Age	Disturbance age (year)	Integer	
Guild assemblage	Guild(Hunter, web weaver, ambush)	Text	
		Integer	

Add Custom Field

* Option to move records into project with existing fields

Museum Data Protocols

Custom Fields

2. Upload standard specimen data using 4 tab spreadsheet
3. Once online, download new specimen data sheet with Custom Field tab to obtain machine readable headers

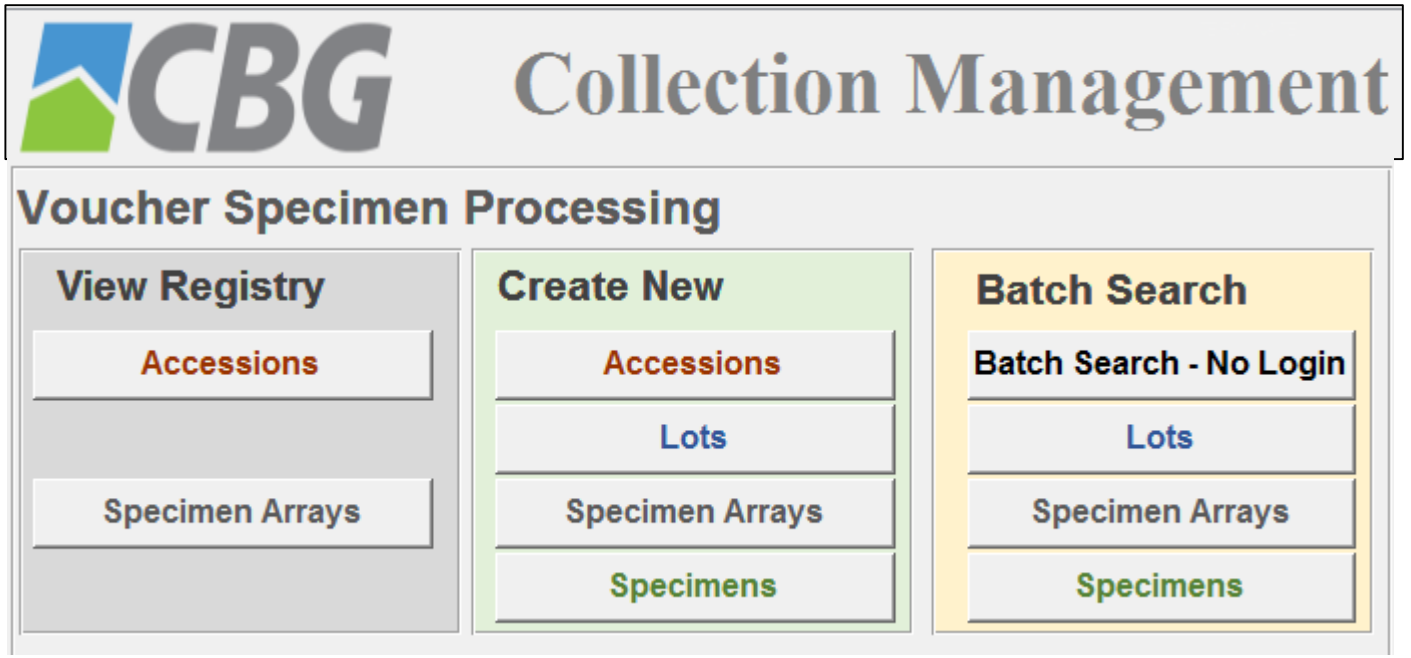
Project:	CUSFD		
Created:	06-Nov-2017		
Machine readable	51212c1d-f7f6-4ec4-eb8a-008d6ab3c435	496fa246-0860-4062-aa89-4eedc95c60fa	55054f71-7f2f-418c-d0f1-19d9e220b876
SampleID	Mass	Age	Guild assemblage
BOLD2613-B07	3.8	3	Ambush hunter
BOLD2613-B06	5.3	25	Active hunter
BOLD2607-H11	1.7	4	Sheet web weaver
BOLD2613-B01	2.3	5	Orb web weaver
BOLD1027-F02	0.2	6	Other
BOLD2613-A09	9.3	7	Space web weaver

4. Upload Custom Field tab to BOLD

* Once online, can be manually edited on specimen page

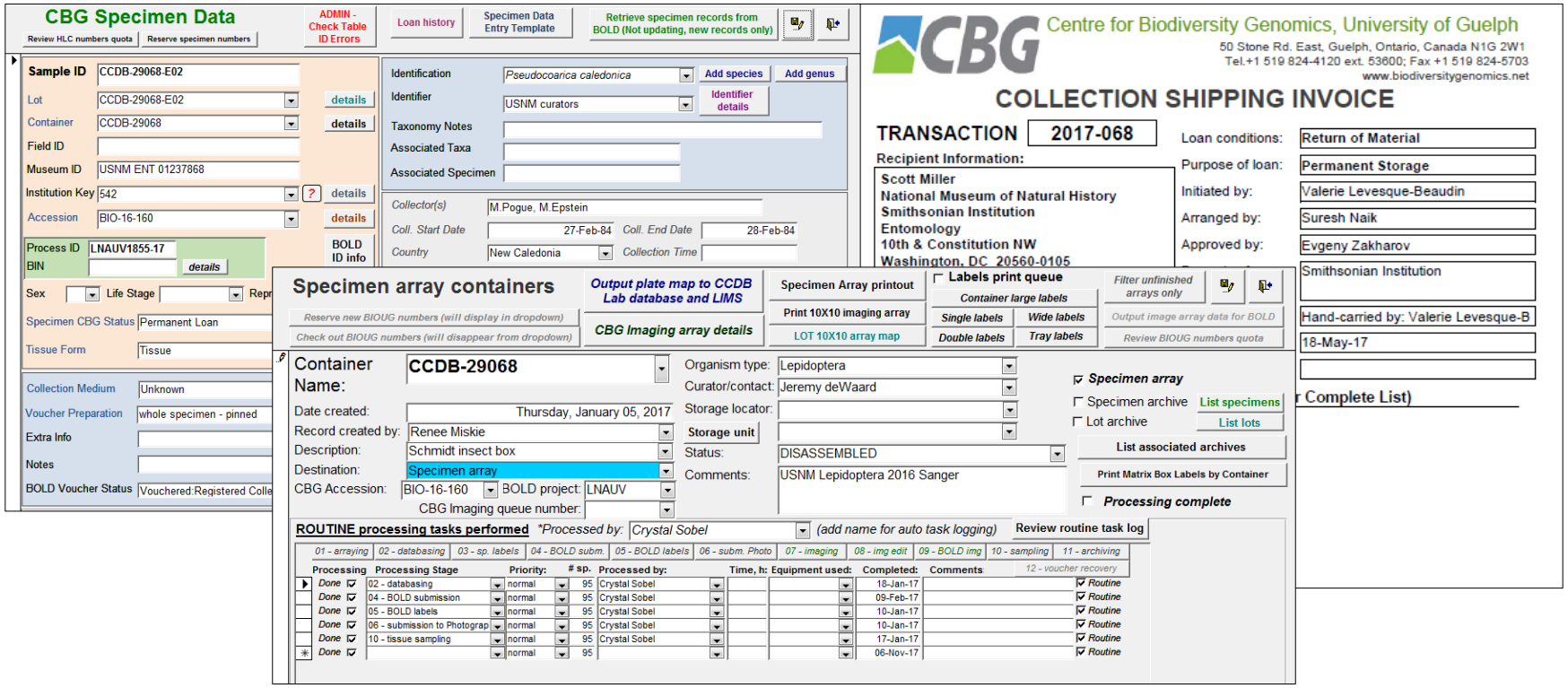
Accessioning and CIMS

- For large scale projects consider using a **Collections Information Management Systems** (**CIMS**)
- Log donor info, loan conditions, and BMTAs



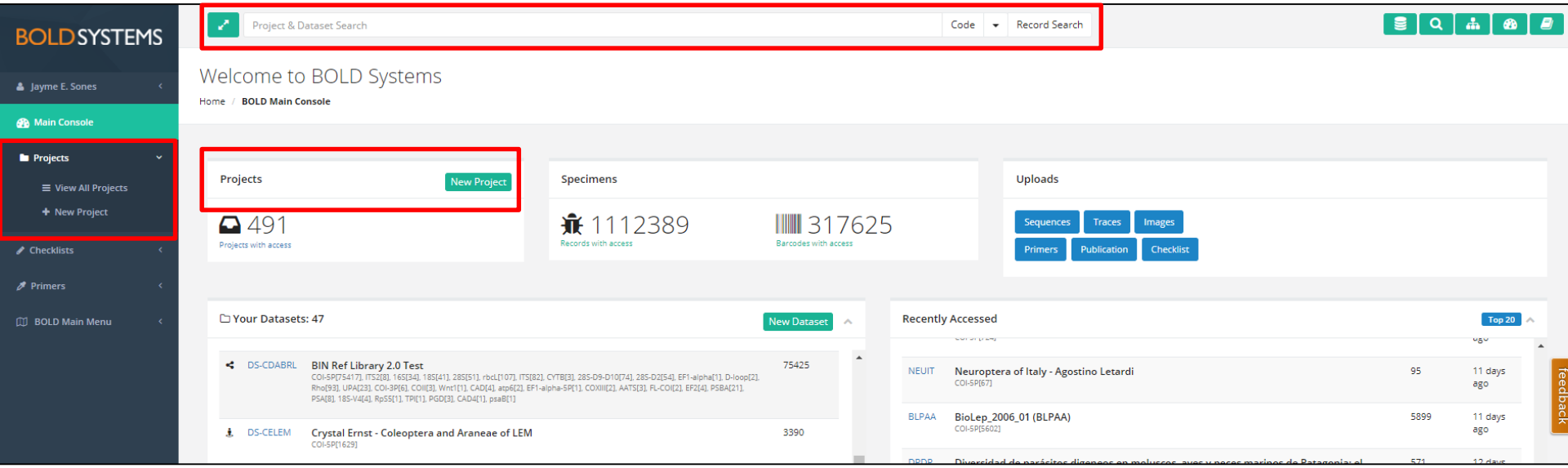
Accessioning and CIMS

- All specimens are registered and linked to their corresponding container arrays
- Archival locations and all loan transactions are recorded



BOLD Projects & Upload

- Registered users have ability to see public projects, projects shared with them and create new projects.
- Projects can be created or searched from the BOLD workbench



* The creator becomes the project manager

BOLD Projects & Upload

Two types of BOLD projects:

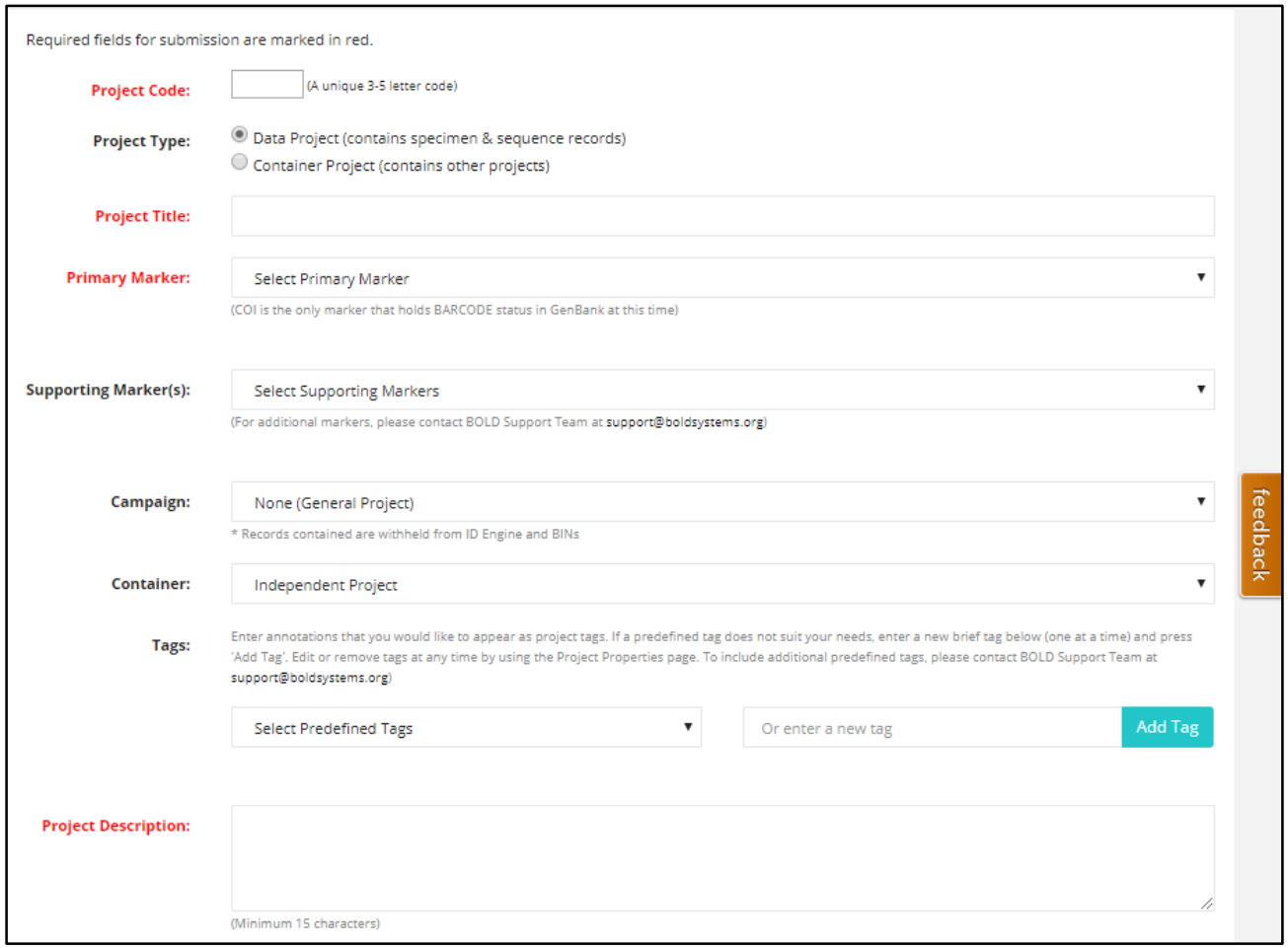
1. Container projects – contains other projects
2. Data project – contains specimen and sequence records

Container project

Data project

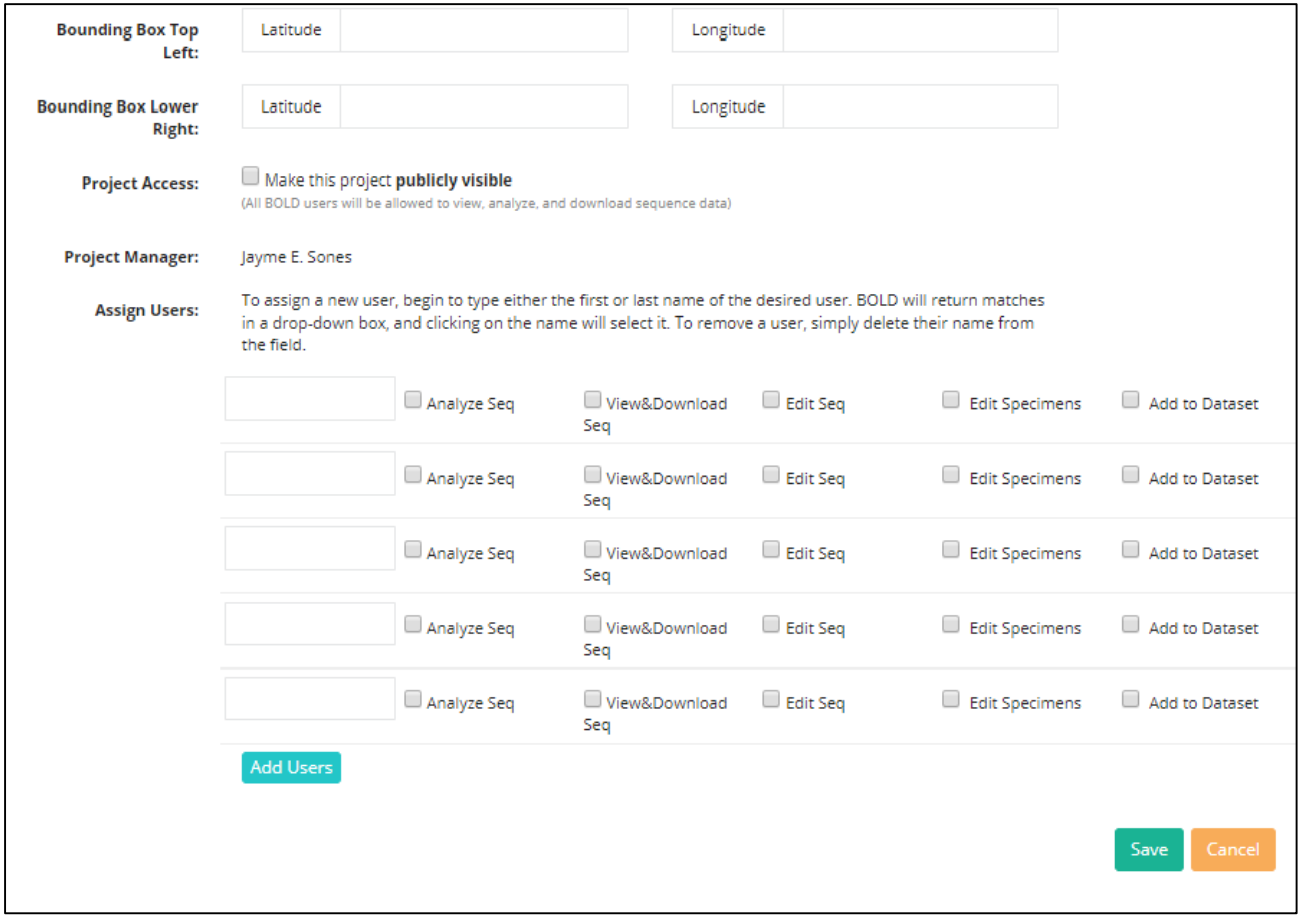
BOLD Projects & Upload

Creating a New Project



BOLD Projects & Upload

Creating a New Project



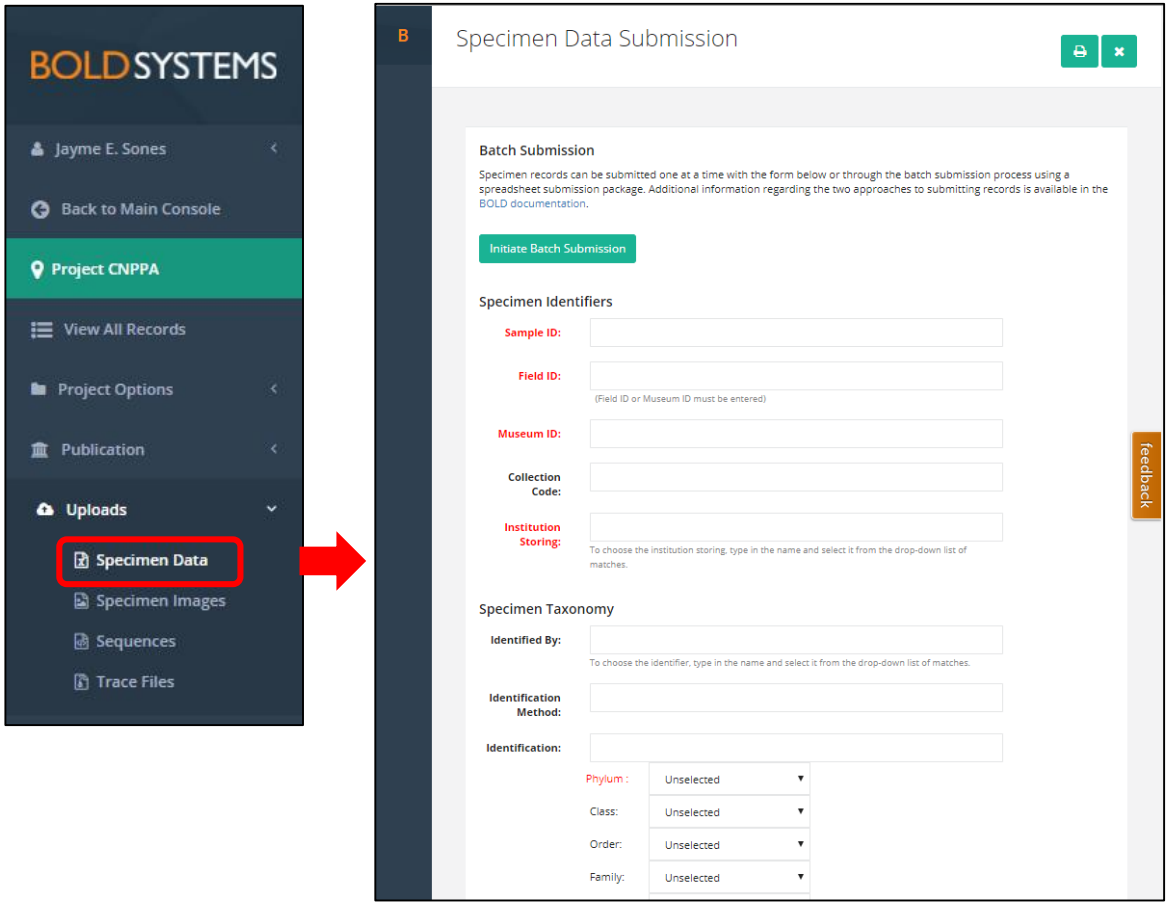
BOLD Projects & Upload

Creating a New Project

- The person who creates the projects is automatically assigned as the **project manager**
- **Project manager** can be updated by contacting BOLD support (support@boldsystems.org)
- **Project parameters and user access** can be updated at any time by the project manager
- Data projects are limited to **10,000 specimen records**
- **Consider separating by marker** e.g plant and animals
- Any user with editing permissions can upload or modify data

BOLD Projects & Upload

Manually Uploading Specimen Data



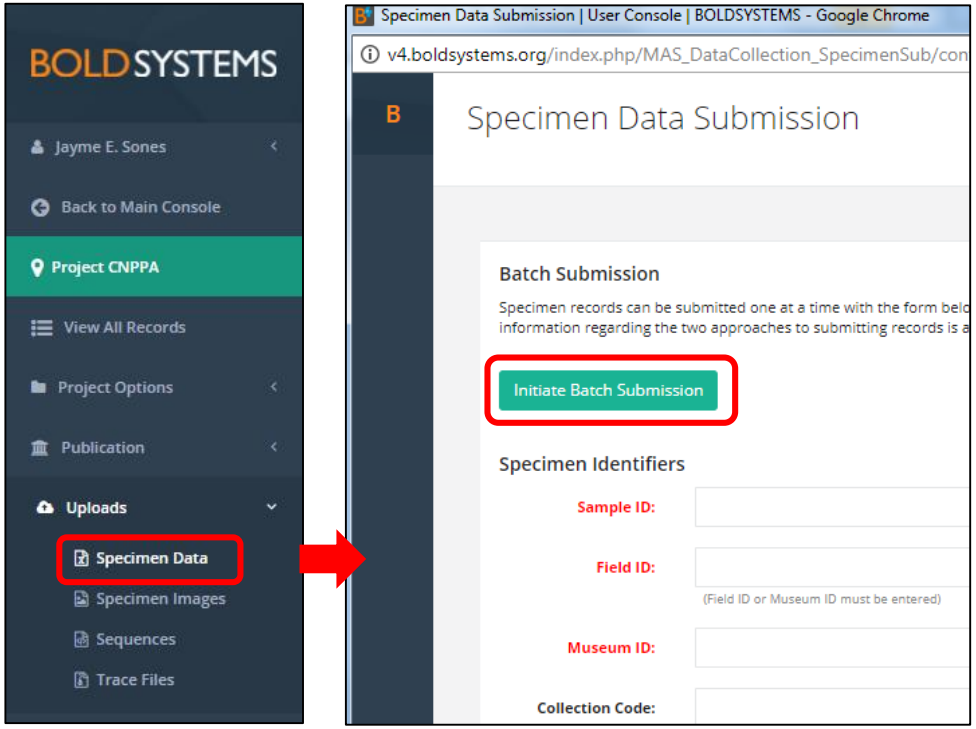
- On BOLD project console select

Uploads→ Specimen Data

- Enter data in relevant fields

BOLD Projects & Upload

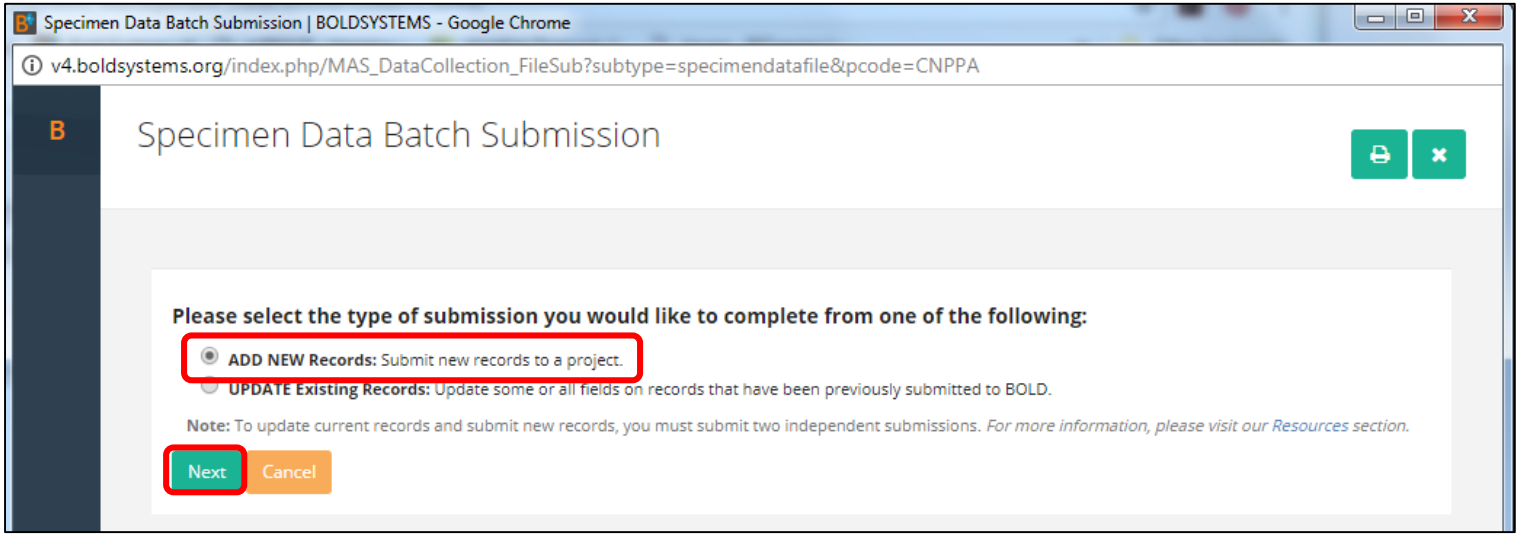
Uploading Batch Specimen Data



- Upload batch specimen data within the project console

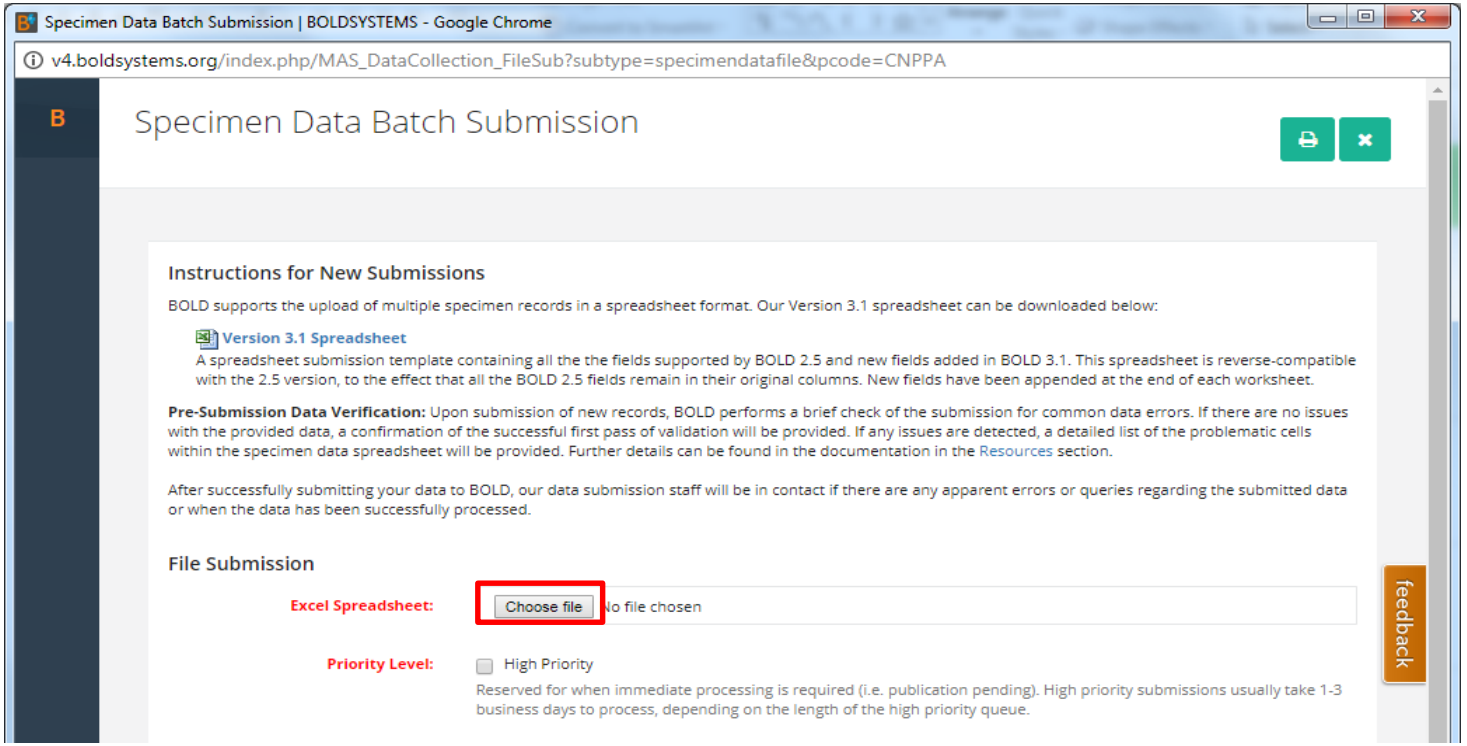
BOLD Projects & Upload

Uploading Batch Specimen Data



BOLD Projects & Upload

Uploading Batch Specimen Data



*NOTE each upload can ONLY contain records for one given project at a time

BOLD Projects & Upload

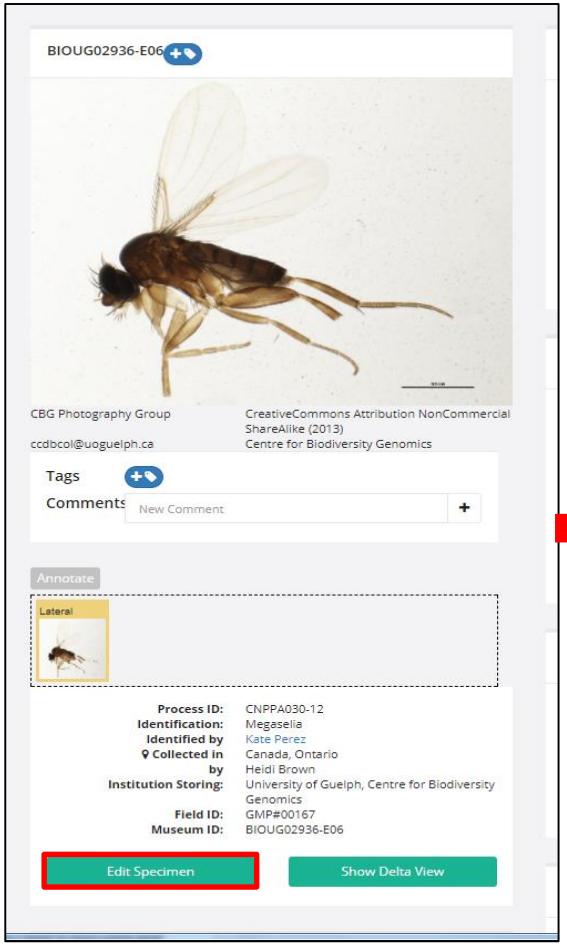
Submission Queue

1. After submission you will receive a confirmation email with ticket number
2. BOLD will run a series of validation checks, any issues are sent back to submitter
3. If no issues, data is uploaded and a BOLD team member will notify you when it is online

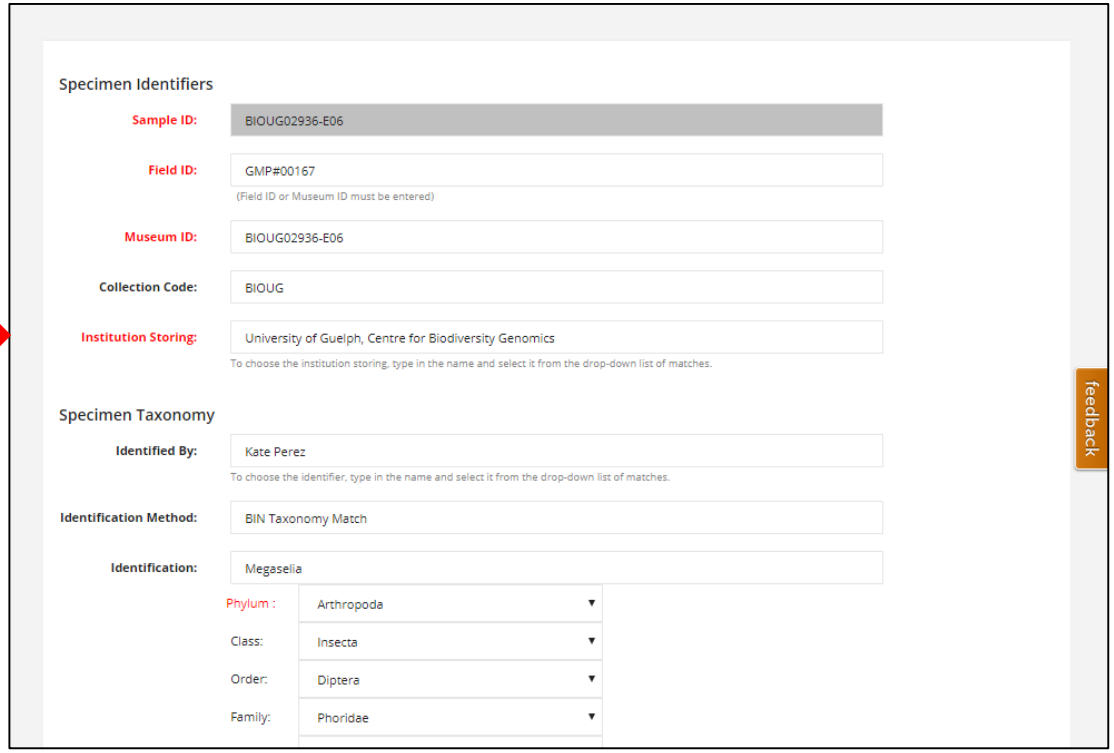
***NOTE** you are unable to search new records until the following day

BOLD Projects & Upload

Updates & Corrections



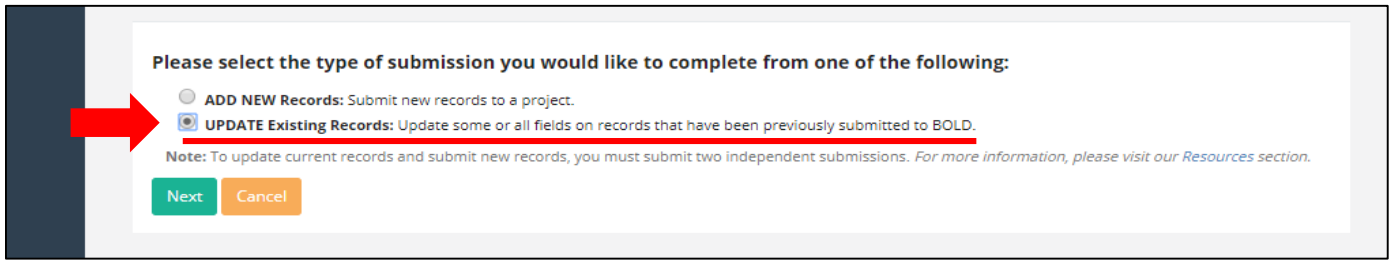
- Minor updates can be made directly on the specimen page



BOLD Projects & Upload

Updates & Corrections

- OR larger updates can be done using the same batch submission method and selecting for updates instead of new records



- Ensure you have downloaded the most up to date specimen data from BOLD (post validation) and then proceed to make necessary updates
- You can update one **or** all metadata tabs at a time

BOLD Projects & Upload

Updates & Corrections

- Updates to Sample IDs require a special request
- Send list of current and revised Samples IDs to BOLD Support (support@boldsystems.org)

e.g

Current Sample ID	Revised Sample ID
CCDB-14573-A1	CCDB-14573-A01
CCDB-14573-A2	CCDB-14573-A02
CCDB-14573-A3	CCDB-14573-A03
CCDB-14573-A4	CCDB-14573-A04
CCDB-14573-A5	CCDB-14573-A05
CCDB-14573-A6	CCDB-14573-A06
CCDB-14573-A7	CCDB-14573-A07
CCDB-14573-A8	CCDB-14573-A08

***NOTE** Process IDs can not be updated

Plate Records & Plate Maps

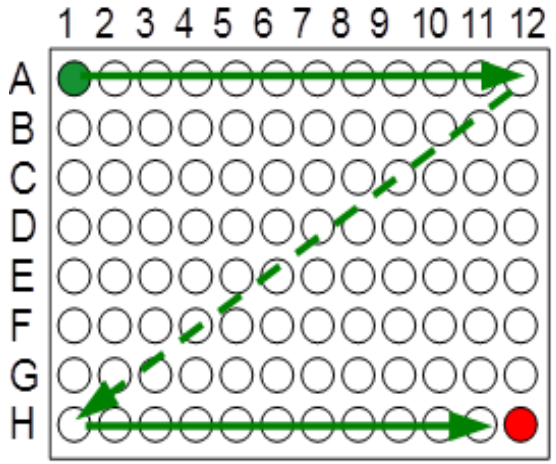
- A plate record provides the linkage between voucher and its tissue/DNA. (well location)
- Best practice is to generate a plate record as soon as samples are arrayed and sample IDs assigned

Plate	**Well**	**Sample ID**
CCDB-14573	A01	USNM ENT 00078676
CCDB-14573	A02	USNM ENT 00078663
CCDB-14573	A03	USNM ENT 00085459

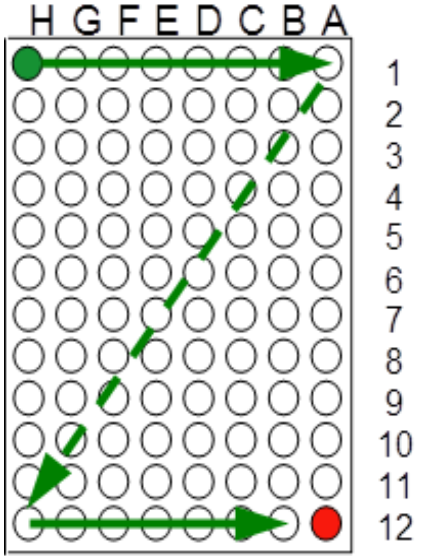
Plate Records & Plate Maps

- Most plates are arrayed in 12 column format - A01 through to A12, however occasionally they are arrayed in 8 column format - H01 to A01 (used for plants)

12 Column Format



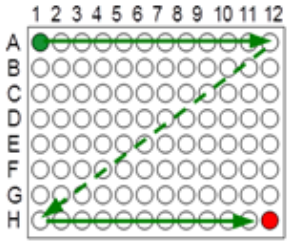
8 Column Format



***NOTE** difference in control location

Plate Records & Plate Maps

- Use plate maps for verification checks during labelling, imaging and tissue sampling



Microplate (animal tissue)

Print layout map

CCDB array number: CCDB-13457

Sample container: *microplate*

Overall samples submitted: **95** *out of 95*

Map of Sample Locations

SAMPLING ORDER: Begin sampling with position A01 and finish at H11

*	01	02	03	04	05	06	07	08	09	10	11	12
A	USNMENT00565484	USNMENT00565485	USNMENT00565486	USNMENT00565487	USNMENT00565488	USNMENT00565489	USNMENT00565490	USNMENT00565491	USNMENT00565492	USNMENT00565493	USNMENT00565494	USNMENT00565495
B	USNMENT00565496	USNMENT00565497	USNMENT00565498	USNMENT00565499	USNMENT00565500	USNMENT00565501	USNMENT00565502	USNMENT00565503	USNMENT00565504	USNMENT00565505	USNMENT00565506	USNMENT00565507
C	USNMENT00565508	USNMENT00565509	USNMENT00565510	USNMENT00565511	USNMENT00565512	USNMENT00565513	USNMENT00565514	USNMENT00565515	USNMENT00565516	USNMENT00565517	USNMENT00565518	USNMENT00565519
D	USNMENT00565520	USNMENT00565521	USNMENT00565522	USNMENT00565523	USNMENT00565524	USNMENT00565525	USNMENT00565526	USNMENT00565527	USNMENT00565528	USNMENT00565529	USNMENT00565530	USNMENT00565531
E	USNMENT00565532	USNMENT00565533	USNMENT00565534	USNMENT00565535	USNMENT00565536	USNMENT00565537	USNMENT00565538	USNMENT00565539	USNMENT00565540	USNMENT00565541	USNMENT00565542	USNMENT00565543
F	USNMENT00565544	USNMENT00565545	USNMENT00565546	USNMENT00565547	USNMENT00565548	USNMENT00565549	USNMENT00565550	USNMENT00565551	USNMENT00565552	USNMENT00565553	USNMENT00565554	USNMENT00565555
G	USNMENT00565556	USNMENT00565557	USNMENT00565558	USNMENT00565559	USNMENT00565560	USNMENT00565561	USNMENT00565562	USNMENT00565563	USNMENT00565564	USNMENT00565565	USNMENT00565566	USNMENT00565567
H	USNMENT00565568	USNMENT00565569	USNMENT00565570	USNMENT00565571	USNMENT00565572	USNMENT00565573	USNMENT00565574	USNMENT00565575	USNMENT00565576	USNMENT00565577	USNMENT00565578	CONTROL