



# TCN Quarterly Progress Report

## TCN Name

Building a global consortium of bryophytes and lichens: keystones of cryptobiotic communities (GLOBAL)<sup>1</sup>

## Person Completing the Report

Miranda Zwingelberg (GLOBAL Project Manager)

## Share Progress in Digitization Efforts

This report covers progress completed during the period of October 1 - December 31, 2020.

Digitization progress at our collaborating institutions continued to be significantly constrained by COVID restrictions during 2020-Q4. Access to collections spaces, specimens, and imaging equipment was in many cases severely limited and most teams were unable to onboard any of the student workers who will be responsible for the majority of the digitization work. In spite of this, GLOBAL collaborators made progress in a number of areas.

### Imaging Equipment

Five institutions (ASU, COLO, DUKE, NY, TENN) purchased imaging equipment, software, and/or supplies, including barcodes. Six additional institutions (F, FLAS, MSC, NY, PH, YU) made progress modifying existing equipment and workstations for imaging the physical specimens inside bryophyte and lichen packets.

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<sup>1</sup> Throughout this report, herbaria are referred to by their Index Herbariorum acronyms, which correspond to institutional names as follows: ALA = University of Alaska, Fairbanks, ASU = Arizona State University, BRY = Brigham Young University, CINC & MU = University of Cincinnati & Miami University, COLO = University of Colorado, DUKE = Duke University, F = The Field Museum, FLAS = University of Florida, ILL & ILLS = University of Illinois at Urbana-Champaign & Illinois Natural History Survey, LSU = Louisiana State University, MICH = University of Michigan, MIN = University of Minnesota, MO = Missouri Botanical Garden, MSC = Michigan State University, NY = New York Botanical Garden, OSC = Oregon State University, PH = The Academy of Natural Sciences of Drexel University, TENN = University of Tennessee, Knoxville, UC = University of California, Berkeley, WIS = University of Wisconsin, YU = Yale University



## **Workflow Development**

Many institutions (ASU, BRY, CINC & MU, DUKE, F, LSU, MO, MSC, NY, PH, TENN, YU, WIS) spent time in 2020-Q4 drafting, updating, and refining their imaging workflows to include the physical specimen, a step not required in the earlier Bryophyte and Lichen TCN in 2011. Pre-digitization activities also included preparing specimens, printing labels (BRY, CINC & MU, MSC), auditing existing data (F), and adding functionality to local databases (MO).

## **Personnel**

The GLOBAL Georeferencing (WIS) and Project (TENN) Managers were hired and began work in October and December 2020. The GLOBAL Portal Manager (ASU) and a Lead Digitizer at NY were selected and will start in January 2021. PH, BRY, and FLAS made progress toward recruiting and hiring undergraduate technicians.

## **Digitization**

Eight institutions (COLO, DUKE, F, LSU, TENN, CINC & MU, FLAS, WIS) reported progress on digitization deliverables, with a total of 4,611 specimens barcoded (133 bryophytes and 4,478 lichens), 4,024 labels imaged (89 bryophytes and 3,935 lichens), 3,000 specimens imaged (32 bryophytes and 2,968 lichens), 309 specimen records uploaded to the portal (114 bryophytes and 195 lichens), 14,414 labels transcribed (10,359 bryophytes and 4,055 lichens), and 32,391 specimens georeferenced (3,383 bryophytes and 29,008 lichens).



Table 1: Digitization progress by GLOBAL collaborators in 2020-Q4, separated by Bryophyte (B) and Lichen (L) specimens.

	# Barcodes Added		# Labels Imaged		# Specimens Imaged		# Uploaded to Portal		# Labels Transcribed		# Georeferenced	
	B	L	B	L	B	L	B	L	B	L	B	L
ALA												
ASU												
BRY												
CINC & MU	114		70				114		3,230	459	2,192	1,221
COLO		1,500		769		186						
DUKE					13	2,782			11			
F		1,950		1,950					7,086	1,950		
FLAS				157				157		157		
ILL & ILLS												
LSU		38		69				38		1,489		3
MICH												
MIN												
MO												
MSC												
NY												
OSC												
PH												
TENN	19		19		19				32		34	
UC												
WIS		990		990							1,157	27,784
YU												
<b>Totals</b>	<b>133</b>	<b>4,478</b>	<b>89</b>	<b>3,935</b>	<b>32</b>	<b>2,968</b>	<b>114</b>	<b>195</b>	<b>10,359</b>	<b>4,055</b>	<b>3,383</b>	<b>29,008</b>
<b>B+L Totals</b>		<b>4,611</b>		<b>4,024</b>		<b>3,000</b>		<b>309</b>		<b>14,414</b>		<b>32,391</b>

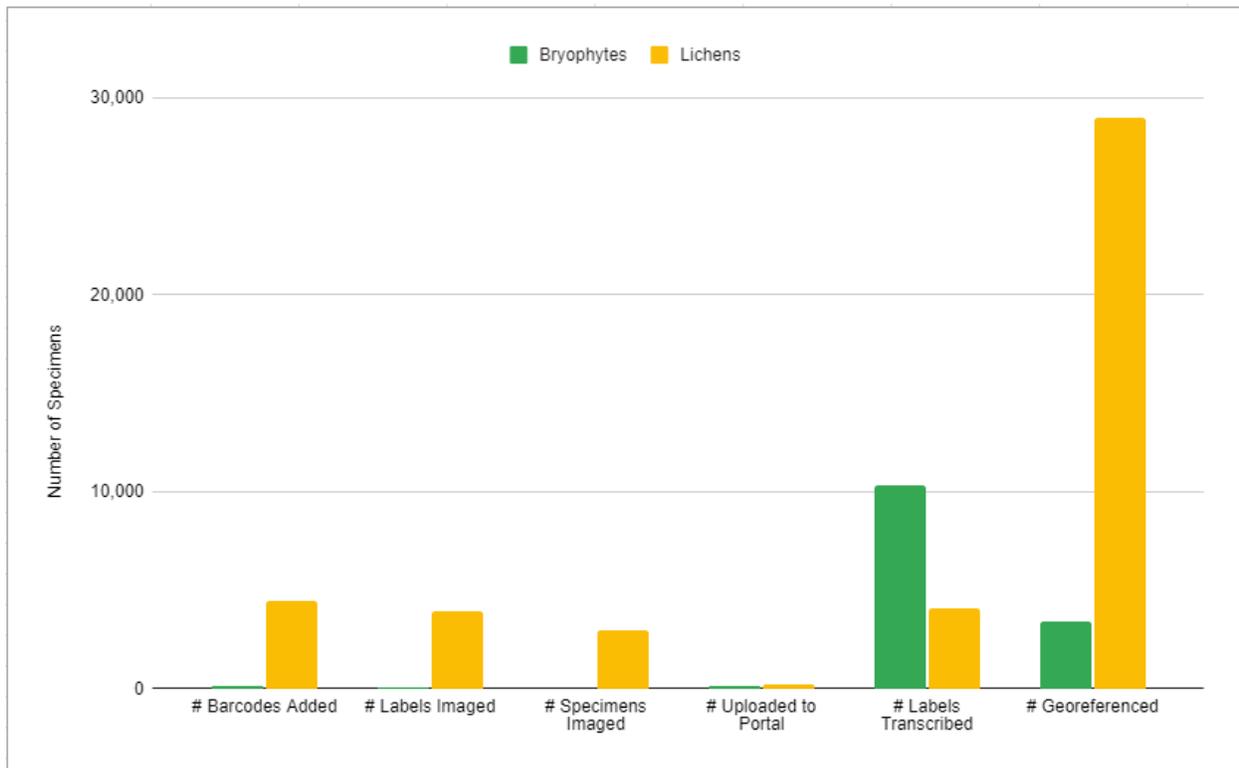


Figure 1: Digitization progress for GLOBAL collaboration in 2020-Q4, separated by Bryophyte and Lichen specimens.

## Share Best Practices, Standards, and Lessons Learned

### Flexible Workflows

COVID restrictions have forced many collaborators to adjust their timeline and workflow. Some institutions have been adapting imaging stations for at-home use (F, DUKE), while others are delaying imaging in favor of remote activities like transcribing existing label images (CINC & MU, LSU). To maximize the use of their limited time on-site, some collaborators are separating the process of imaging labels from imaging specimens (COLO). This will provide a steady source of label images for remote transcription, keeping students busy until they are approved to physically work in the collections. They will capture the specimen images later in the project, allowing additional time to improve workflows to increase specimen image quality. The majority of collaborators are using this time to test and optimize their setups and workflows, and will begin GLOBAL digitization work once they can fully access their collections in concert with decreased COVID restrictions.



## Minimum Standards

With a wide range of specimen storage, equipment, workflows, and experience on the GLOBAL team, it has been important to establish clear minimum expectations for the group. Virtual meetings and online discussions coordinated by the Lead PI (TENN) and Project Manager (TENN) were used to establish a living Google document of GLOBAL Project Standards. The document includes requirements and best practices for image content, image size and resolution, file naming standards, and skeletal data.

## Collaboration

Basecamp, Zoom, and email were used to collaboratively problem-solve workflow challenges and share alternative methods and tools across institutions. The working group for Specimen Imaging held two Zoom meetings in 2020-Q4 where several participants demonstrated their workflows. The group asked questions, offered feedback, and discussed their own challenges. Recommendations for equipment, tools, and software, along with training documents and tracking tools, were shared and discussed in meetings and online (ASU, CINC & MU, COLO, DUKE, F, LSU, NY, OSC, TENN, WIS). Collaborators began posting test images of specimens on Basecamp for feedback on image content and quality (DUKE, F, LSU, NY, TENN). This practice leverages the wealth of technical knowledge on the GLOBAL team and helps ensure quality and efficient products.

## Leveraging Institutional Expertise

The level of technical photographic experience varies widely in the GLOBAL group. LSU recommended that institutions reach out to their in-house photography department and seek guidance on optimizing their imaging equipment and set up. DUKE took advantage of a graduate student with established photographic experience to improve their lichen imaging. F coordinated internally with FMNH Photography, Archives & the Library who have inventoried photographic material, supplies, assets and equipment in order to re-evaluate purchasing of digital assets and creation of remote imaging stations.

## Share Identified Gaps in Digitization Areas and Technology

### Imaging Uploading

The most pressing technological challenge for the GLOBAL project during 2020-Q4 was the lack of batch image uploading capabilities to the Bryophyte and Lichen portals. Only two institutions



were able to upload new images to the portals during this time (FLAS, LSU), and many have a backlog of images waiting to be uploaded (BRY, CINC & MU, TENN, WIS), which has delayed transcription efforts. The GLOBAL IT Team (ASU and ILL) met in December with the Lead PI (TENN), Project Manager (TENN), and the Bryophyte portal managers (F, DUKE) to plan and prioritize technology needs and deliverables. Batch image uploading was flagged as the highest priority. ILL and ASU began work on a dropbox-like image submission tool. The basic code was shared in 2020-Q4 but needs further development and integration into the portals that will be carried out during 2021-Q1.

### **Barcode Renaming**

Another challenge identified was renaming image files with the specimen barcode. Automated renaming is problematic for images taken inside a specimen packet, in which the barcode may not be visible. Improvements were made to the “BarcodeRenamer” tool that offer a possible solution to this issue. Development also began on a prototype program, “PhotoWatcher,” that will combine barcode renaming with additional skeletal data functionality (ASU).

## **Share Opportunities to Enhance Training Efforts**

### **Symbiota**

ASU held internal technical workgroup meetings to discuss how to develop “Symbiota Docs” as a completely revised and updated multi-language hub for documentation of the Symbiota biodiversity data management software. They also organized several technical training meetings on portal use.

### **Transcription**

F began enhancing existing documentation for crowd-sourcing transcription in preparation for participation in the Spring WeDigBio event, public events, and programming. They also began developing onboarding materials for students, staff, interns, participants associated with the project.

### **Georeferencing**

WIS researched webinars and training material for a shared resource page on georeferencing. They conversed with CINC to discuss successes with their georeferencing efforts and student training.



## **Share Collaborations with other TCNs, Institutions, and/or Organizations**

The GLOBAL Project Manager (TENN) reached out to several other TCN's (TPT, DigIn, CAP, MAM, MiCC) for example tracking and reporting documents and general advice from their TCN experiences.

F collaborated with Professor Emeritus LarsSoderstrom of the Norwegian University of Technology and Science, Trondheim on authoritative taxonomy files for liverworts and hornworts.

## **Share Opportunities and Strategies for Sustainability**

### **Portal Management**

ASU began setting up servers for portal hosting.

### **Taxonomy**

Initial meetings of the GLOBAL Taxonomy and Nomenclature working group were held to discuss taxonomy updating routines. ILL & ILLS presented early efforts for taxonomy update routines to identify directions for further development. MO continued to develop accepted names data for the bryophyte portal and java-based skeletal data entry application.

## **Share Education, Outreach, Diversity, & Inclusion (EODI) Activities**

F began coordination for a special WeDigBio event scheduled for the spring of 2021 and initial planning of education and outreach initiatives.

ASU began discussions about developing new "Symbiota Docs" as part of outreach to the community.

## **Share Information About Your Website and/or Portal Usage**

Development of the GLOBAL project website is projected for 2021-Q1 with the assistance of staff at TENN.



## Share Other Activities and/or Progress

### Imaging Tagging

ASU worked on setting up controlled vocabularies for an image tagging library and continued image analysis (online character matrix of identification keys currently being revised).