



TCN Quarterly Progress Report

TCN Name

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

Person Completing the Report

Miranda Zwingelberg (GLOBAL Project Manager)

Share Progress in Digitization Efforts

This report covers progress completed during the period of April 1 – June 30, 2021.

Digitization progress at all GLOBAL institutions continued to be limited by COVID-19 constraints during much of 2021-Q2. However, restrictions began to ease in many areas during this period and some collaborators saw an increase in access, allowing more collections to begin some digitization activities. Four institutions are still waiting to start GLOBAL work until conditions are more favorable in fall 2021.

Imaging Equipment

Additional progress was reported in purchasing and setting up imaging equipment during 2021-Q2. BRY established its new lichen imaging station and CINC continued to improve its new bryophyte imaging station using already existing materials. COLO purchased some basic equipment (color square nano, blackout paper etc.) while using an existing lightbox, but will be replacing the camera and lens later in the GLOBAL project. With campus opening back up they

¹ 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



are planning to purchase the computer and camera for the project in July. TENN finished purchasing the equipment for a second imaging station.

Workflow Development

Many institutions continued to spend time in 2021-Q2 drafting, updating, and refining their imaging workflows (CINC & MU, DUKE, MO, MSC, NY, TENN, WIS, YU). MO began barcoding and MSC was able to start imaging bryophyte specimens. CINC's imaging specialist is working on detailed imaging and image post-processing workflows. WIS continued to refine digitization protocol and review post-processing tasks. MSC prepared lichen specimens for digitization and went through an accession of lichens that have been sitting for several years, creating a spreadsheet that was used to print labels onto packets.

The GLOBAL Portal Manager (ASU), Georeferencing Manager (WIS), and Project Manager (TENN) met with additional collaborators to discuss centralized georeferencing and the flow of coordinate data between the portals and internal databases (ALA, ASU, BRY, CINC & MU, FLAS, MO, MSC, OSC, PH, UC, YU). WIS began creating data sets (by country) in the Collaborative Georeferencing interface (CoGe). This allows collection records to be directly downloaded from the Bryophyte and Lichen Portals for users to begin georeferencing. We are only able to use those records that are already transcribed with locality information so are limited by the slower than expected progress due to COVID-19 restrictions that institutions are under.

Personnel

FLAS lost the four student employees on this project to graduation in May. They advertised positions and hired two new students. One is cataloging remotely and one is carding specimens. Many respondents to the ad are interested in starting in August. ILLS hired a research assistant who imaged bryophyte specimens. MO began the process of hiring full-time a digitization technician. PH hired a full-time undergraduate co-op to begin imaging our bryophyte packets. TENN hired two undergraduate techs to work almost full-time on the project over the summer. YU hired a part-time undergraduate student worker to begin imaging bryophyte specimens.

Digitization

Fifteen institutions (BRY, CINC & MU, COLO, DUKE, F, FLAS, ILL & ILLS, LSU, MICH, MSC, NY, PH, TENN, WIS, and YU) reported progress on digitization deliverables, with a total of 42,637 specimens barcoded (20,223 bryophytes and 22,414 lichens), 25,613 labels imaged (18,100 bryophytes and 7,513 lichens), 29,716 specimens imaged (20,964 bryophytes and 8,752



lichens), 47,200 specimen records uploaded to the portal (16,054 bryophytes and 31,146 lichens), 31,735 skeletal records created (9,781 bryophytes and 21,954 lichens), 8,614 labels fully transcribed (7,269 bryophytes and 1,345 lichens), and 31,268 specimens georeferenced (24,521 bryophytes and 6,747 lichens).

Table 1: Digitization progress by GLOBAL collaborators in 2021-Q2, separated by Bryophyte (B) and Lichen (L) specimens.

	# Barcodes Added		# Labels Imaged		# Specimens Imaged		# Uploaded to Portal		# Skeletal Records Created		# Fully Transcribed		# Georeferenced	
	B	L	B	L	B	L	B	L	B	L	B	L	B	L
ALA														
ASU														
BRY										300				
CINC & MU	49		40		40		9				2,844		11,330	3,359
COLO		1,595		1,595				1,595		1,595		722		
DUKE	1,019		1,341		879	3,829	2,212		1,066		21		1	837
F	7,500	1,032	2,838	1,032	9,737		9,737	915	5,116					
FLAS	2,180		414	197							57	387		
ILL & ILLS			1,627		1,627									
LSU	437	9	443	33			437	9	437	9	1	63		
MICH	1,883		2,789		73		367		652		1,231		42	
MIN														
MO														
MSC	891		891		891									
NY	63	19,728	365	4,465	365	4,465		28,305	63	19,728	699	22	441	30
OSC														
PH	3,535		3,535		3,535		298		298					
TENN	1,951		3,102		3,102		2,994		2,149		2,416	151	320	106
UC														
WIS		50		191		458		322		322			12,387	2,415
YU	715		715		715									
Totals	20,223	22,414	18,100	7,513	20,964	8,752	16,054	31,146	9,781	21,954	7,269	1,345	24,521	6,747
B+L Totals	42,637		25,613		29,716		47,200		31,735		8,614		31,268	

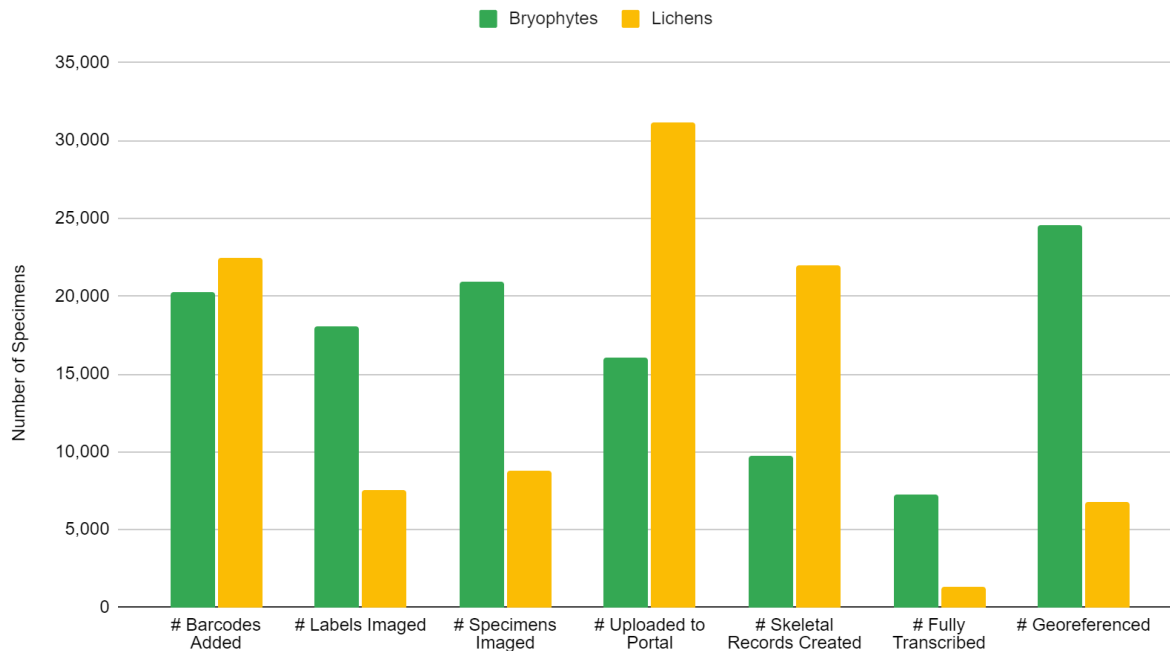


Figure 1: Digitization progress for the GLOBAL collaboration in 2021-Q2, separated by Bryophyte and Lichen specimens.

Share Best Practices, Standards, and Lessons Learned

Flexible Workflows

The GLOBAL teams continued to make use of flexible digitization workflows in 2021-Q1, including the use of remote imaging stations, virtual transcription work, and prioritizing label imaging. COVID-19 restrictions began to ease near the end of 2021-Q1 for some participants, allowing several collaborators to begin digitization activities and others to look forward to more standard workflows. As of mid-June several restrictions on access to the collection were relaxed at COLO. They expect to be able to get the project back on track and be able to have more students working in the collection at the same time. F began transitioning from remote imaging back to working on-site at the museum.



Collaboration

Team members continued to make use of Basecamp, Zoom, and email to communicate and collaborate during 2021-Q2. A Management Committee Meeting was held in May open to all GLOBAL team members to review quarterly and cumulative grant progress. The GLOBAL Project Manager (TENN) completed check-in meetings with most collaborators in April (ASU, CINC & MU, COLO, DUKE, F, ILL/ILLS, LSU, MICH, MO, PH, UC, WIS, NY) to discuss progress, concerns, and plans for the summer. She also met weekly with the Portal Manager (ASU) to coordinate project activities and needs. The GLOBAL IT Team convened in May to update progress and priorities. The GLOBAL Executive Committee met in June to discuss plans for the External Advisory Committee.

Duplicate Matching

The Portal Manager (ASU) and Georeferencing Manager (WIS) were able to clean duplicate georeferenced records and present files to the collection managers to review. These records were, or will be, uploaded to the portal and linked as duplicates. This was an effective way to reduce the workload for georeferencing the same locality multiple times. It was also a great chance to meet each of the managers and listen to their management styles and plans for the project.

Four additional international collections data were uploaded to the Bryophyte and Lichen Portals during 2021-Q2, including the Herbarium of the Muséum national d'Histoire Naturelle (Lichens), Ibaraki Nature Museum, Saitama Museum of Natural History, and National Museum of Nature and Science, Japan. This makes a total of 21 international collections, providing over 900,000 bryophyte and 900,000 lichen specimens as possible duplicates. These collections will not be permanently maintained in the portals, but will be available for all collections during the grant period.

Following the exsiccate list updates in the Bryophyte and Lichen Portals in 2021-Q1, additional progress was made to clean up records to add and correct exsiccate fields in individual collections (DUKE, TENN). DUKE Senior Personnel Aguero also cleaned about one fifth of the bryophyte exsiccatae library on the portal. ASU began establishing protocols for snapshot collections to upload their offline records using a unique exsiccatae identifier (ometid) as part of their data upload/update routine to the portals.



Data Usage Policies

Data usage policies were updated on both the Bryophyte and Lichen Portals, including a Spanish language translation. A disclaimer regarding sensitive and offensive language on labels was drafted and included with the usage policies.

Share Identified Gaps in Digitization Areas and Technology

Imaging Uploading

Image uploading to the portals was a major gap at the start of the GLOBAL project. The interim image uploading workflow made available to the GLOBAL team in 2021-Q1 transitioned to an official workflow in 2021-Q2. All collaborators now have access to this option for uploading images to the Bryophyte and Lichen Portals.

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. ASU continued working on a prototype version of “PhotoWatcher” that is currently being tested at TENN, COLO, F, and OSC. They worked on bug fixes and plan to share the official version with the entire community. They have also been fixing various bugs with “BarcodeRenamer.” The program now also reads barcodes from files with *.jpeg extension instead of just from *.jpg.

Taxonomic Filters

Specimen data outside of the Bryophyte and Lichen Portals offers the opportunity for additional information as well as possible duplicates to update incomplete records on existing specimens. One challenge is separating the particular records of interest from a larger collection of data. The GLOBAL Portal Manager and ASU team worked in 2021-Q1 to develop taxonomic filters to isolate bryophyte records from plant data and separate lichenized, lichenicolous and allied fungi from occurrence records of non-lichenized fungi. In 2021-Q2, ASU successfully applied the new lichen filter to the OSC collection, which now live-manages their data in CNALH, and the filter is in use for many imported collections.



Share Opportunities to Enhance Training Efforts

Digitization

DUKE held a Zoom training session organized with their undergraduate work study student to train him about what a specimen is, and what a protologue is, and what he should be photographing with regards to lichen type specimens.

FLAS started revamping the original bryophyte and lichen PEN website (<https://www.floridamuseum.ufl.edu/mossesinfla/>) to include new procedures, standards and help files for this TCN.

A dedicated “Student Group” was created on Basecamp in April 2021, to allow opportunities for communication, co-learning, and networking.

The GLOBAL TCN website (<https://globaltcn.utk.edu>) went live in 2021-Q2, which includes links to developed protocols and workflows.

Transcription

The GLOBAL Project Manager continued compiling transcription resources during 2021-Q2 to share on Basecamp and all resources were posted to the project website.

Georeferencing

WIS and ASU met with collaborators to plan centralized georeferencing workflow and data management. WIS also began reviewing georeferencing training materials for students that will be hired in the fall.

Symbiota

ASU created a YouTube video archive to store videos of informal workshops and meetings (example: OSC training on how to switch from managing data as a snapshot to now managing data live within the portal).

As part of our outreach to lichenologists from Latin America, ASU PI Bungartz organized a Symbiota workshop (in Spanish) for the Consorcio de Herbarios de Líquenes en América Latina during the 9th Symposium of the International Association for Lichenology, in Brazil August 1-6; the two day workshop is being planned as post-congress event:
<https://doity.com.br/ial9/blog/workshops>.

Portal manager Katie Pearson is receiving training from developer Ed Gilbert on Symbiota development, particularly using GitHub to track new developments.



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

ASU PI Bungartz held Zoom meetings with Ecuadorian collaborators from the Instituto Nacional de Biodiversidad (INABIO) to set up a strategy on how to share data sets between the Ecuadorian National Biodiversity Data Portal and the Bryophyte and Lichen Portals.

The TCN's External Advisory Committee (EAC) was contacted to coordinate an initial meeting with the GLOBAL Executive Committee (F, NY, TENN, UC). EAC members include: Deborah Paul (University of Illinois Urbana-Champaign; TDWG), Joe Miller (GBIF), Rosa Scherson (University of Chile), Shelley James (Western Australian Herbarium; Australasian Herbarium Collections; SPNHC; TDWG), Shuo Shi (Hebei Normal University), and Terry Hedderson (University of Cape Town). The first meeting is scheduled for July.

The GLOBAL Lead PI and Project Manager (TENN) participated in the May iDigBio Quarterly IAC meeting to connect with other active TCN's.

Share Opportunities and Strategies for Sustainability

Portal Management

ASU portal management staff continued to facilitate the uploading of images into both portals, creation of new collections, and cleaning of datasets (including fixes to the import filter for lichen collections).

F coordinated an IPT update of both the lichen and bryophyte collections at the Field Museum so all the specimens we currently have in our internal database are reflected on the portals.

NY continued work to identify issues with their IPT to fully loan specimens and images to portals.

Back Ups

Raw images and JPGs at COLO are being uploaded to the University of Colorado Research Computing. These images are in addition to the local copies housed in the CU Herbarium. The hope is that these images will never need to be accessed, but to serve as a catastrophic backup if we have a computer or hard drive failure. Monthly backups of the COLO database in the Bryophyte and Lichen Portals are made on the first working day of the month. These files are



housed locally and will be archived on Research Computing in case we ever need a point in time backup of our data.

Taxonomy

ASU continued data maintenance of taxonomic thesaurus in the lichen consortium as part of regular database maintenance and updating routine.

MO PI Brinda conferred with Ed Gilbert (ASU) regarding issues with importing new Bryophyte nomenclatural thesaurus.

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

F and TENN successfully submitted an abstract (on behalf of all TCN participants and institutions) to the online conference: Bryophytes, lichens, and northern ecosystems in a changing world (BL2021; July 6-9, 2021). F PI Matt von Konrat presented the project to conference attendees from the four major bryological, lichenological and botanical societies: the International Association of Bryologists (IAB), the American Bryological and Lichenological Society (ABLS), the Canadian Botanical Association (CBA-ABC) and the Société québécoise de bryologie (SQB).

The GLOBAL TCN website (<https://globaltcn.utk.edu>) went live in April 2021, and includes links to developed protocols and workflows. Social media accounts belonging to collaborators began using #globalTCN as a way to share progress with the community.

ASU continued organizing a Symbiota workshop (in Spanish) for the Consorcio de Herbarios de Líquenes en América Latina during the 9th Symposium of the International Association for Lichenology, in Brazil August 1-6; the two day workshop is being planned as post-congress event: <https://doity.com.br/ial9/blog/workshops>.

Senior Personnel Aguero (DUKE) led a herbarium tour and biodiversity informatics presentation to PI Shaw's Plant Diversity class in Spring 2021.

DUKE Senior Personnel participated in a "LGBTQ leaders in STEM" panel discussion as part of June Pride Month talking about work on lichens.



FLAS started revamping the original LBCC PEN website

(<https://www.floridamuseum.ufl.edu/mossesinflas/>) to include new procedures, standards and help files for the GLOBAL TCN.

LSU's GLOBAL results were exhibited in the biology building in a display case located in front of the herbarium which will be highly trafficked when students return in fall 2021. This display is targeted at visiting students and staff, and the public.

NY outreach products on the virtual herbarium website The Hand Lens

(<http://sweetgum.nybg.org/science/the-hand-lens/>) are in progress.

PH led herbarium tours for young museum campers at PH on June 30, 2021 introduced many of them to bryophytes and lichens for the first time and showed them the digitization process.

Share Information About Your Website and/or Portal Usage

The GLOBAL project website, <https://globaltcn.utk.edu>, was launched publicly in April 2021.

Google Analytics was set up on the site on April 29, 2021. 100 users accessed the project site during that short initial period (see Figure 2).



Google Analytics Audience Overview

Continent ▾

Region ▾

Channel ▾

Device ▾

Apr 29, 2021 - Jun 30, 2021 ▾

Your audience at a glance

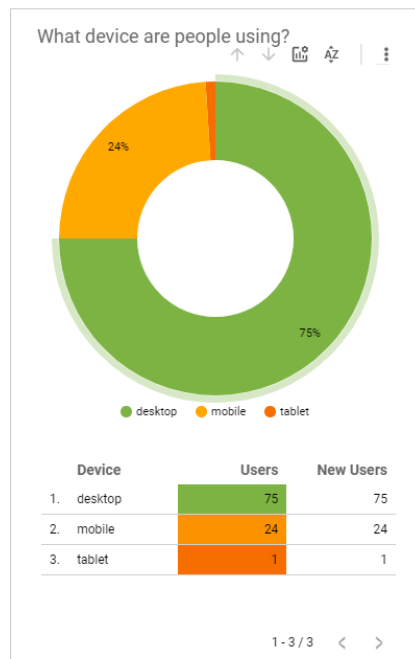
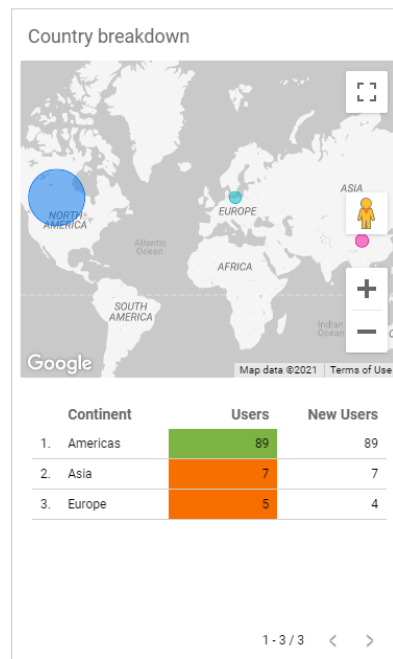
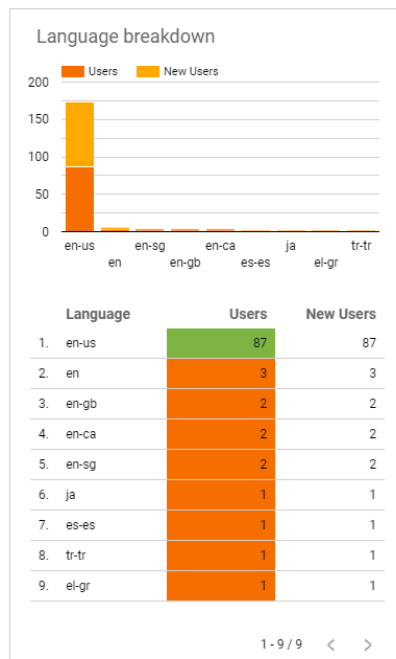
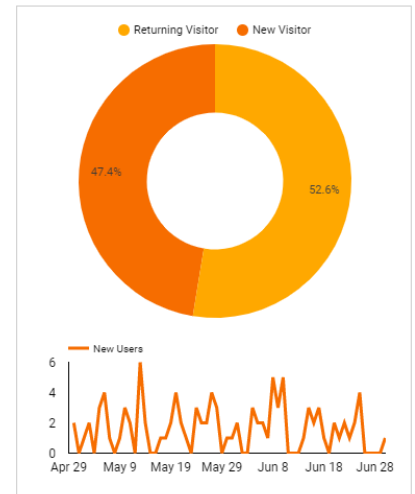
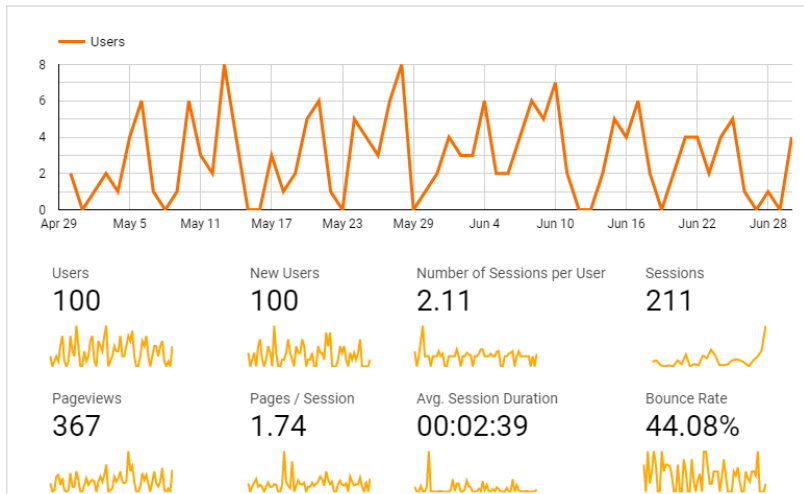


Figure 2: Use metrics for the GLOBAL project website (<https://globaltcn.utk.edu>) from April 29 – June 30, 2021.



The Bryophyte and Lichen Portals, created as part of the original LBCC grant, host new images and data produced by the GLOBAL collaborators. Over 2,400 users visited the Bryophyte Portal and over 13,800 users visited the Lichen Portal during 2021-Q2 (see Figures 3 & 4).

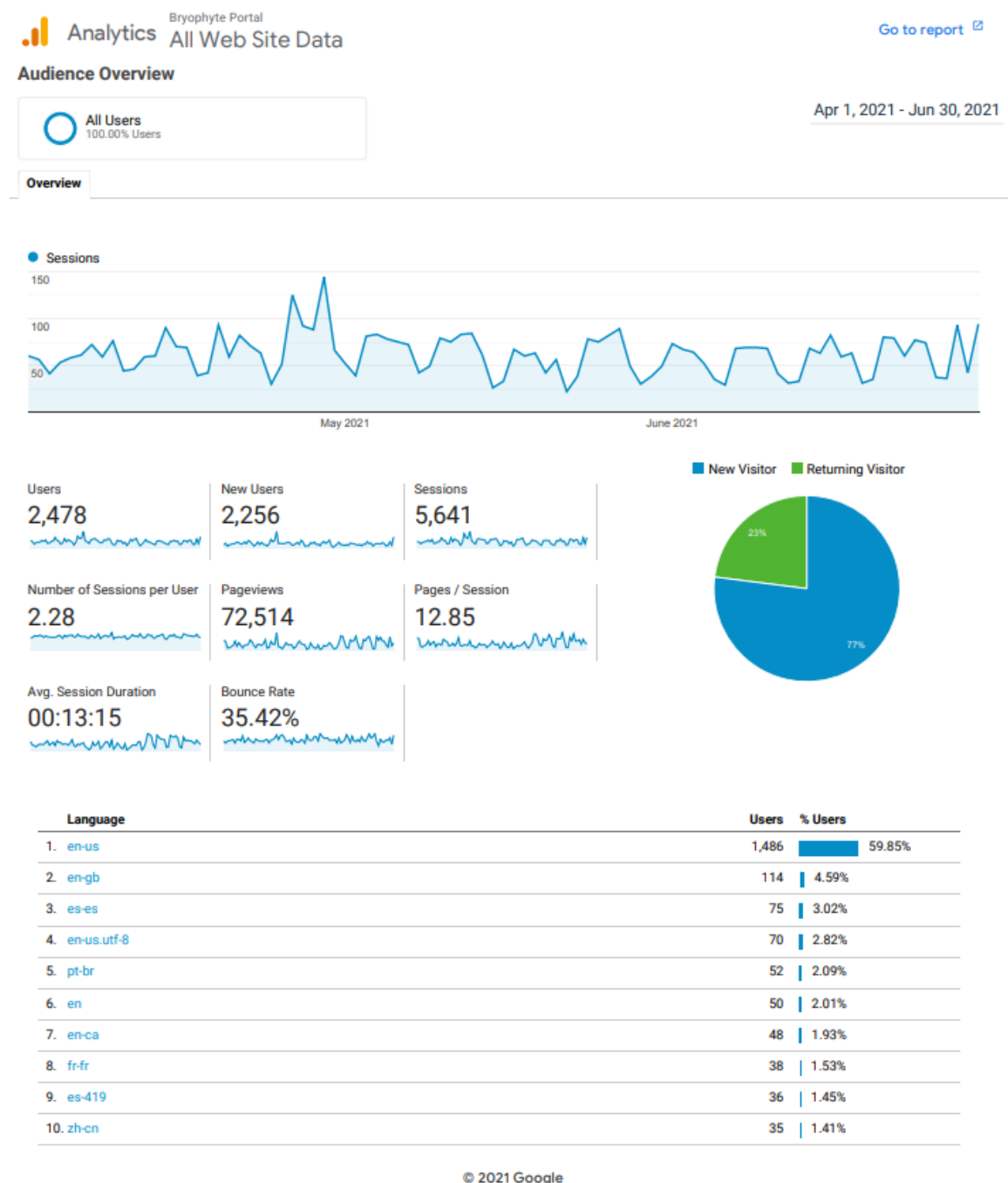


Figure 3: Use metrics for the Bryophyte Portal (<https://bryophyteportal.org/portal/>) from April 1 – June 30, 2021.



Analytics Lichen Portal
All Web Site Data

[Go to report](#)

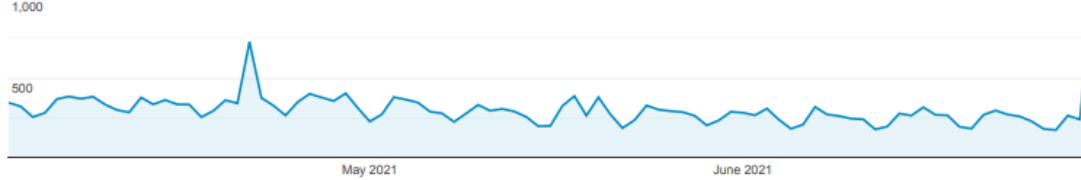
Audience Overview

All Users
100.00% Users

Apr 1, 2021 - Jun 30, 2021

Overview

Sessions
1,000



Users

13,847

New Users

12,647

Sessions

27,338

Number of Sessions per User

1.97

Pageviews

131,337

Pages / Session

4.80

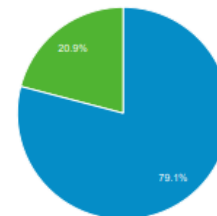
Avg. Session Duration

00:06:21

Bounce Rate

53.05%

New Visitor Returning Visitor



Language	Users	% Users
1. en-us	6,197	44.68%
2. zh-cn	1,025	7.39%
3. en-gb	917	6.61%
4. es-es	631	4.55%
5. en-ca	359	2.59%
6. en-us.utf-8	313	2.26%
7. fr-fr	243	1.75%
8. pt-br	235	1.69%
9. ru-ru	226	1.63%
10. de	202	1.46%

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Figure 4: Use metrics for the Lichen Portal (<https://lichenportal.org/cnalh/>) from April 1 – June 30, 2021.



Share Other Activities and/or Progress

Imaging Tagging

ASU has now added a completely revised character set of secondary metabolites, integrated with a new program called Mytabolites, to the CNALH glossary. Revision of morpho-anatomical character matrix continues.

Bryophyte Packet Labels

ASU now has a beta version of lichen and bryophyte label format currently being tested. They are fixing several bugs mainly to make sure that packet folding marks are consistently printed at the same position.

NSF Annual Reporting

The Project Manager (TENN) created reporting templates for all GLOBAL institutions to facilitate Year 1 NSF Annual Reporting, which is scheduled for completion in 2021-Q3.