Quarterly Progress Reports To iDigBio Submitted By Active Thematic Collections Networks (TCNs)

November 2022

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- ~~Google Analytics across ADBC~~
- Reports from the following **active** TCNs:

☐ All Asia	☐ GLOBAL	☐ PILSBRY
☒ BigBee	☐ LepNet & SCAN	☒ SoRo
☒ CAP	☐ oVert	☒ TORCH
☒ DigIn	☐ PCC	☒ TPT
☒ ESB		

- Reports from the following **retired** TCNs are no longer included:

~~Cretaceous World~~	~~InvertEBase~~	~~NEVP~~
~~EPICC~~	~~LBCC~~	~~Paleoniches~~
~~Endless Forms~~	~~MaCC~~	~~SERNEC~~
~~FIC~~	~~MiCC~~	~~TTD~~
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TCN Quarterly Progress Report

Prior to each Internal Advisory Committee (IAC) meeting, TCNs are asked to complete a quarterly progress report in the areas outlined below. The TCN Lead PI or Project Manager collects information from all collaborators and compiles them into one overall progress report for the TCN. The TCN Lead PI or Project Manager then submits the quarterly reports via an email to Cat Chapman. An archive of previously submitted reports is available on the Internal Advisory Committee wiki page.

Naming convention for files: YYYY-Q1-BigBee-TCN-CODEN

Individual PI reports due: *last Wednesday in Jan, Apr, Jul, and Oct*

October 26, 2022

TCN Name

Collaborative Research: Digitization TCN: Extending Anthophila research through image and trait digitization (Big-Bee)

Person Completing the Report

Crystal Maier, Pam Horsley & Katja C. Seltmann. This is the cumulative report for the Big Bee project. Individual institution reports can be found at: https://drive.google.com/drive/folders/1Cg26_JtZHyCxzez_gSg3yEi61p4zvWnq?usp=sharing

Share Progress in Digitization Efforts

UCSB

- Captured 457 multi-focal stacked exemplar images and 1038 dorsal with label images during this period. Images are from specimens in the UCSB and LACM collections.
- The UCSB bee collection on the Bee Library now contains 8,671 specimen records, 8,413 (97%) georeferenced, 2,507 (29%) with images (6,315 total images), with 4,905 (57%) identified to species

MCZC

- Captured photo-stacked image suites for 265 species of Andrenidae, Colletidae, Megachilidae, and Mellitidae, constituting 1,135 images of dorsal, lateral, and frontal views.
- Photographed the labels/low-resolution dorsal habitus images for 17,195 specimens of bees in the families Andrenidae, Colletidae, Megachilidae, and Mellitidae. Started transcription of labels and upload of transcribed data into MCZbase. We developed and are now testing the workflow. We have transcribed and uploaded label data from 1,697 specimens to MCZbase.

- Workflows and scripts for renaming images, data quality control, and migration of taxon data into MCZbase are progressing smoothly, with no major issues.
- We have tested the 3-D imaging capabilities of the Macropod system and are currently learning how the system works.

ASUHIC

- Our digitization of specimen records made the goal of over 10,000 records. The total of 13,010 specimen records of 7 families of Anthophila have been digitized with 100% georeferenced on the Bee Library portal (https://library.big-bee.net/portal/index.php).
- Produced 2D images of label-specimen or specimen: a total of 2,882 images representing 1,428 specimens that have been imported/uploaded on the Bee Library portal

FSCA

- FSCA has steadily progressed in our digitization efforts. Approximately 3,494 specimens have been photographed in dorsal view and the data associated with these specimens recorded and parsed into DarwinCore format. We also produced 70 focus-stacked exemplar images and procured some equipment needed for 3D imaging.

LACM

- Photographed specimen labels with dorsal views for 4,824 specimens in the families Andrenidae and Bombidae

UMMZI

- Label and dorsal habitus images for 7,275 specimens for 202 species across four families (Andrenidae, Apidae, Colletidae, Megachilade). Andraenidae and Apidae have been completed.
- A databasing workflow and protocol was developed for subsequent label data capture post label imaging. Protocol discussions are ongoing with IT to streamline upload processes for bulk uploads through Specify Workbench. A search is currently underway to supplement IT support for UMMZ.
- Macropod systems have been set up and protocol and operations have been developed. 2D focus stacked images are being generated, currently for *Andrena*. 428 head, lateral and dorsal images for 49 species have been captured.
- Currently working towards developing an Expedition in NfN to capture intertegular measurements.
- Currently in the process of developing local IPT protocols to publish data beginning in 2023.

CAS

- Since last quarterly report 6,875 specimens with labels were photographed for transcription and measurement (10,208 running total)
- A second imaging station was set up for new entomology volunteers who have been recruited to help with the effort.
- 2,363 reconciled transcriptions were returned from Notes from Nature. Records are being cleaned up before being uploaded to the CAS portal “Monarch” (Symbiota based portal for import into BeeLibrary and iDigBio)
- 607 new focus-stacked high resolution images were taken (running total 881 images).
- Two new zip files of bees were sent to NfN for transcription and measurement, but not yet posted (1,771 images).

EMEC

- Four new digitization assistants to replace four that graduated.
- Labels for 12611 specimens photographed (22,417 running total)

- Trained three new photography (focus-stacking) assistants for hi-res imaging to replace graduating students.
- 2D focus-stacked images completed 461 (1381 running total)

SDMC

- 693 dorsal label images taken and are being uploaded to SCAN/BeeLibrary (2399 of 10958 running total)
- Worked with a museum volunteer to produce 183 focus-stacked images of mainly Bombus sp.
- Completed 126 focus-stacked images of Xylocopa sp.(35), Osmia sp., and Megachile sp. (342 of 797 running total)
- Successfully completed a 3D model of a specimen using 85 stacked images of 36 images each, totaling 3,060 images
- Deer currently working towards producing more 3D models and becoming familiar with necessary software to complete this

SEMC

- We have generated 1572 focus-staked exemplar images for 293 species (524 specimens) of the bee genera *Alocandrena*, *Ancylandrena*, and *Andrena*.

UCMC

- To date we have captured 21,917 images of 9,956 individual specimens for ITD measurements and/or dorsal label imaging
- We purchased and set up an additional Samsung Galaxy Tab S7 for dorsal label imaging
- With 3 tablet imaging stations, we have captured 16,400 images dorsal label and lateral images of 8,200 individual specimens of 60 different species of *Bombus*
- Using our older Passport II imaging station, we have also completed dorsal label and lateral images of 1,756 individuals of 53 species within 7 genera of Megachilidae: *Ashmeadiella, Atoposmia*, *Chelostoma*, *Heriades*, *Hoplitis*, *Noteriades*, and *Osmia*
- We received and installed a new stage, flashes, diffuser, and replacement lens on our new Macropod Pro 3D imaging station and have been continuing to learn and test the 3D capabilities of the system
- We have captured 2D focused stacked image suites of exemplar specimens, from 311 specimens of 49 species within 7 genera of Megachilidae: *Ashmeadiella*, *Atoposmia*, *Chelostoma*, *Heriades*, *Hoplitis*, *Noteriades*, and *Osmia*
- A. Carper (PI) and G. Jolma (graduate student) have written new protocols for the new system, adapted from previous imaging efforts for CU and from collaborators
- Carper (PI) and Scott (co-PI) continue to identify digitization priorities, including target species and individual exemplar specimens
- We have now hired and trained 14 undergraduate hourly assistants for dorsal specimen and label imaging and have trained three in 2D focus-stacked imaging
- Our imaging stations have also been used by other researchers within the museum, in other departments, and from around the world
- We trained two museum graduate assistants in 2D and 3D imaging as part of their research and for an *Emerging Museum Technologies* course
- We also trained a PhD student in the Dept of Ecology and Evolutionary Biology in 2D imaging, as part of her descriptions of two gynandromorphic bee specimens previously undocumented
- A collaborating Museum and Field Studies MS student has CT scanned the gynandromorphs and is testing incorporation of 3D photo suites from our imaging station

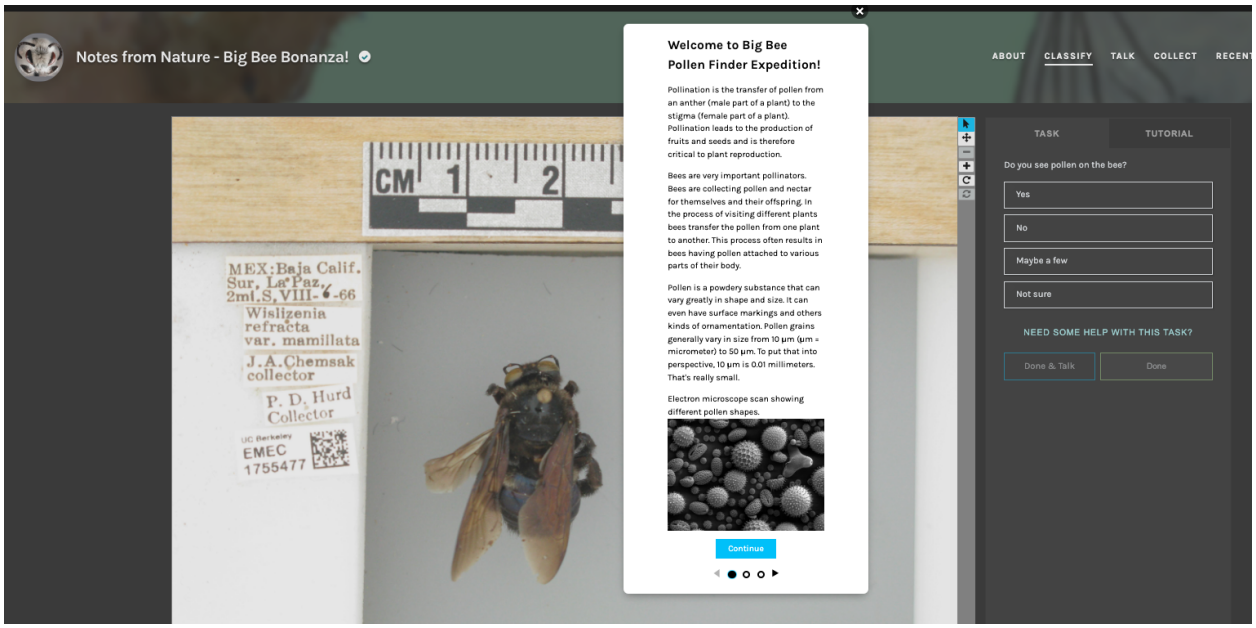
into higher resolution 3D renderings. These models will be compared to the photogrammetric models using AgiSoft 3D.
- Another PhD student in the Dept of Ecology and Evolutionary Biology, used our new tablet imaging station to calculate butterfly wing morphometrics and explore how secondary metabolite sequestration and temperature impacts wing morphology and flight performance
- We continue to occasionally host a visiting faculty from the Instituto Multidisciplinario de Biología Vegetal (CONICET-UNC, Argentina) who has been 2D imaging *Solanum* spp. seeds for comparative paleontological studies
- We continue to include lateral views along with dorsal view for label imaging as some characters can be important in this view (e.g. malar space in *Bombus*) and it has added only ~30 seconds to each specimen handling time
- We have resized ~3,500 *Bombus* dorsal label images to upload for a *Notes from Nature* expedition for ITD measurements
- A. Carper (PI) updated protocols for renaming images with tags using R coding and Windows command prompt.
- We successfully uploaded and launched our first *Notes from Nature* transcription expedition for 1,442 Megachilids, *CU Museum Osminii I*, and have been overseeing comments and suggestions on the forum

Share Best Practices, Standards, and Lessons Learned

- All participants communicate via BigBee Slack channel
- Big Bee continues to have weekly Zoom meetings with PIs, ASU support HUB members, collection managers and digitization specialists working on the project.
- NSF annual report compiled across all particpating institutions. By setting baseline metrics for each institution at project start and completing quarterly iDigBio reports, compiling the annual report was relatively simple and efficient.
- Bergersen refined the CAS style imaging setup which includes a small copy stand, DSLR, and a $9 selfie light ring for optimal imaging.

Notes from Nature
- UNR and UCSB evaluated the Notes from Nature measurement instructions and results. The evaluation led to improved instructions on how to take a measurement as well as new analytics for evaluating resulting measurements. This result will likely improve Notes from Nature measurement projects in the future.
- Our Notes from Nature project, Big Bee Bonanza (https://www.zooniverse.org/projects/md68135/notes-from-nature-big-bee-bonanza) has 800 volunteers and completed 14,839 subjects.

- We have included a new expedition for finding pollen on bees called Pollen Finder



Share Identified Gaps in Digitization Areas and Technology

- CAS discovered need for a 3rd fully operational dorsal-label image station was realized to increase output, working towards allocating equipment to dedicate to this station.
- SEMC are in the process of linking all generated images to specimen records in our database so that we can deliver them to the data aggregators. We are currently using Specify 6, which does not handle more than one image per specimen record. Thus, we are planning on using Specify 7. We expect to have everything ready in the next couple of weeks.

Share Opportunities to Enhance Training Efforts

- Big Bee continues to have weekly meetings of PIs, ASU support HUB members, collection managers, and digitization specialists working on the project. This quarter the meeting focus has shifted to photogrammetry training and best practices. Each participating collection works on learning photogrammetry methods using the Macropod Imaging system based on videos created by Mark Smith for Big-Bee (https://macroscopicsolutions.com/video-tutorial-big-bee-tcn). We discuss models and processes during the weekly meetings.
- Class co-taught with Susan Mazer at UCSB
- UMMZI developed a protocol for digitizing label data in Specify. Developed a protocol for capturing quality 2D focus stacked images. Students were trained in Specify uploads, label data transcription, and hi-res image capture and handling.

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

- UCSB borrowing specimens from the American Museum of Natural History for imaging
- UCSB collaborating with Susan Mazer (UCSB-CAP TCN) to teach a Big-Bee/CAP year long course in 2022-23 as part of the Ecology, Evolution and Marine Biology curriculum. 12 students are participating in Course 1 in the series.

Leveraging Biological Collections to Understand the Impacts of Climate Change on the Life Cycles of Plants and Pollinators is a three-quarter series providing hands-on learning and accessible research opportunities in the fields of Ecology and Global Change Biology through publicly available data.

Course 1 (Fall 2022)—Applications of biological collections to global change research
Students will cover selected papers that introduce the basics of plant and pollinator developmental biology under climate change, the nature, breadth, and limitations of biological collection data, and how they are applied in global change research today.
Course 2 (Winter 2022)—Data management and analysis in R
Students will develop technical skills in data management and basic statistics necessary for conducting
collection-based research. This work will be conducted in the statistical computing language R. Previous programming and statistical training is not required for participating in this course.
Course 3 (Spring 2023)—independent research projects
Students will design and conduct a collection-based research project, crafting hypotheses, choosing appropriate study systems, assessing the fit between research questions and data, and conducting and interpreting their own statistical analyses.

- Digitization cross-training with students involved with LepNet TCN at UC Berkeley
- At UMMZI two concurrent TCN grants allow for the opportunity for cross-communication and interactions among student research assistants across the two projects.
- MCZ new hire on the Big Bee Project, Zoe Flores, will concurrently work in a position with the NSF funded "LightningBug" project, which aims to develop an imaging system which captures images of specimens and their labels in 3-D, in order to reconstruct the labels in a flat, computer-readable form. We hope that the close interaction of the two projects will provide new ways of capturing bee data.

Share Opportunities and Strategies for Sustainability

n/a.

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

- October 13th Grinter and Bergersen (CAS) participated in another NightLife after-hours event for the public with the theme of “Makes Sense”, which focused on how animals

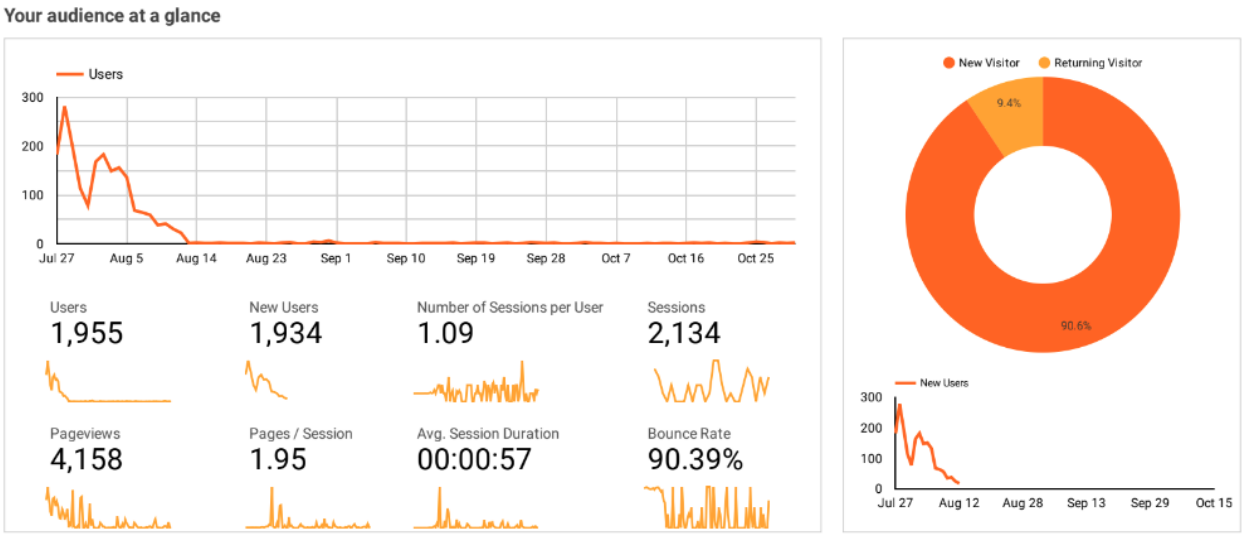
sense and explore the world. We tabled bee specimens and discussed the BigBee grant, as well as general biology to 1,060 people.

- Two social media posts sharing Big-Bee photos and project information to SDMC accounts
- Virtual social hour for Big Bee technicians from all institutions
- EMEC Peter Oboyski was a lead organizer and/or presenter in the following outreach and education activities:
    - Ongoing Pollinator Garden project as part of a Xerces Society “Bee Campus”. Students plant and manage native California plants in a demonstration garden designed to promote pollinators in cooperation with UC Berkeley campus landscapers.
    - Museum tours for UC Berkeley classes “Natural History Museums & Biodiversity Science” (x40 students); “Biogeography” (x30 students); and “Natural History of Insects” (x80 students).
    - Lecture and museum tour for UC Berkeley “Save the Bees” (x18) student-led class.
    - Museum tour for local conservation group “Friends of the Albany Hill” (x20) who are creating a mural of local native plants and their associated insects.
    - UC Berkeley Homecoming Weekend Museum Open House for students, alumni, and their families (x450 visitors).
- UCMC A. Carper (PI) has included the project in 6 invited talks/outreach events to foster interest in our future *Notes from Nature* expeditions:
    - CU Boulder Mountain Research Station 100th Anniversary Seminar Series (6/21/2022): *Colorado's Wild Bees Expanding the Conservation Impacts of Pollinator Research*
    - CU Conference on World Affairs Panel (4/8/2022): *Silent Farm: Saving our Birds, Bees, Frogs, and Ourselves*
    - People & Pollinators Action Network Webinar (4/7/2022): C*hallenges in Conserving Colorado's Native Bees*
    - CU Boulder Department of Ecology and Evolutionary Biology Colloquium (9/9/2022): *Insect Ecology in the Anthropocene: from Parasitoids to Pollinators*
    - Northern Colorado Beekeepers Association (9/15/2022): *Our Vulnerable Bees: Managing Honey Bees While Conserving Our Native Pollinators*
    - Boulder County Beekeepers Association (10/5/2022): *Our Vulnerable Bees: Managing Honey Bees While Conserving Our Native Pollinators*
- UCMC A. Carper has also included slides of the project in two guest lectures:
    - MUSM 6110: Advanced Seminar: *Emerging Technologies in Museum Studies*. University of Colorado-Boulder
    - GEOG 5500: *Beeography*, Geography and Environmental Sciences, University of Colorado-Denver.
- UMMZI Trained two undergraduate Assistants in Research, Ione Calvin and Faith Zimmerman, in Specify Workbench uploads, label data transcription in Specify, proper specimen handling when staging specimens for macrophotography, macrophotography and focus stacking; Developing a flexible teaching module for upper-level high school and lower-level undergraduate courses using biodiversity data repositories (iDigBio, GBIF). The module will be designed to explore effects of climate change in host and species range size using available longitudinal museum data. A beta version is being shared for feedback.

- MCZ trained 7 undergraduate student interns and one high school student on digitization and entomology collections procedures.
- SEMC will present the Big-Bee initiative in both English and Spanish at the Annual Meeting of the Entomological Society of America (Nov 14-17, 2022); SEMC trained three female undergraduate students from biology, art, and pre-health majors in properly handling specimens and using the photographic system. One of them is a non-traditional student, as well as a first-generation college student.

Share Information About Your Website and/or Portal Usage

- In this reporting period, the Bee Library Symbiota portal had 1,955 users. The majority of these users were new.



Share Other Activities and/or Progress

Publications

- Salim JA, Seltmann KC, Poelen JH, Saraiva AM (2022) Indexing Biotic Interactions in GBIF data. Biodiversity Information Science and Standards 6: e93565. https://doi.org/10.3897/biss.6.93565
- Publications of Big Bee Images: Big Bee Community, Poelen, Jorrit H., & Seltmann, Katja. (2022). Xylocopa sonorina - UCSB-IZC00012194 - Bee Library - 73e389aa-5886-4c48-8778-ba8932d1bd7e hash://sha256/96bfde1efa599e0e8e61de18b14d61dd308737f684950e4079c04e9bc0f33958 hash://md5/4940f68c84cffa4412f7ffb98bb255bd (0.0.3) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7114665 on 26 Sept 2022

- Global Bee Interaction dataset including interactions from literature, observations and collection records. Katja C. Seltmann. (2022). Global Bee Interaction Data (v1.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6564718. October, 2022

Presentations

- Seltmann, KC. (2022) Entomological Collections Management Workshop. Big Bee and Terrestrial Parasite Tracker. Retrieved from https://www.idigbio.org/wiki/index.php/BioDigiCon_2022 on 22 June 2022
- Seltmann, KC. (2022) Extending Anthophila research through image and trait digitization: Big-Bee. Biodiversity Digitization Conference (BioDigiCon) Virtual presentation. Retrieved from https://www.idigbio.org/wiki/index.php/BioDigiCon_2022 on 27 Sept 2022
- Seltmann, KC. (2022) Extended Thoughts about the Extended Specimen. Biodiversity Digitization Conference (BioDigiCon) Virtual presentation. Retrieved from https://escholarship.org/uc/item/0g99h7kf. mp4 on 28 Sept 2022
- Ostwald MM, Seltmann KC, Allen J, Brown BV, Carper A, Eldredge T, Engel MS, Franz N, Gilbert E, Grinter C, Gonzalez VH, Horsley P, Kung GA, Lee S, Maier C, Miko I, Morris P, Oboyski P, Pierce NE, Poelen J, Scott VL, Smith C, Smith M, Talamas EJ, Tsutsui ND, Tucker E (2022) Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization. BeeCon, York University, Toronto, CAN. Hybrid conference.

Posters

- Ostwald MM, Seltmann KC, Allen J, Brown BV, Carper A, Eldredge T, Engel MS, Franz N, Gilbert E, Grinter C, Gonzalez VH, Horsley P, Kung GA, Lee S, Maier C, Miko I, Morris P, Oboyski P, Pierce NE, Poelen J, Scott VL, Smith C, Smith M, Talamas EJ, Tsutsui ND, Tucker E. Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization. (2022). International Union for the Study of Social Insects (IUSSI), San Diego, CA.

ASUHIC

- Attended virtually the Biodiversity Digitization Conference 2022 – iDigBio on September 27-29, 2022.
- Assisting in a research project investigating how bee body size varies intraspecifically with climate change by providing images of the ASUHIC bee specimens that are targeted for the project.
- Documented how Big-Bee adds images to the Bee Library and presented this information alongside other Symbiota workflows at the Biodiversity Digitization Conference: https://symbiota.org/digitization-workflows/
- Performed periodic code updates of the Big-Bee GitHub code repository (https://github.com/Big-Bee-Network/Symbiota-light) by pulling developments from the BioKIC/Symbiota project. These updates include addition of new features, bug fix, and security patches. Code updates to the production data portal code are coordinated with the GitHub updates. SSH IT administrator Greg Post has been added as an admin to the GitHub project to assist with these tasks.
- Provided TCN PI Katja Seltmann access to the backend database via PhpMyAdmin web application

- Made improvements to the image tagging scripts. Scripts are now run each night as a Cron Job to ensure all new images are tagged within 24 hours of being loaded
- Batch added ~30,000 newly digitized specimen records and ~10,000 images to the portal for other institutions on this TCN.
- EMEC museum staff (not funded by TCN) completed updating species names and higher taxonomy for *Andrena* (Andrenidae) ahead of digitization efforts; Museum staff (not funded by TCN) sorted and integrated into the museum collection several hundred specimens from UC Berkeley research projects not associated with the BigBee TCN; Oboyski oral presentation at iDigBio annual conference - DigiCon 2022, “A workflow for cleaning Notes from Nature data transcriptions”
- CAS Museum staff (not funded by TCN) sorted and integrated into the museum collection several hundred identified specimens from Sam Dorege and the USGS bee lab & recruited 3 new volunteers who will begin working on BigBee in November, 2022.
- LACM started Macropod imaging and are working on; 11 August, PI Katja Seltmann and 4 students from UC Santa Barbara visited the LACM collection to discuss our progress on Big-Bee and to borrow specimens for their Big-Bee work; Giar-Ann Kung attended Biodiversity Digitization Conference, 27-29 Sep 2022
- MCZ hired and trained three additional undergraduate student technicians. Re-filled position vacated by Hannah Kernen, continuing collaboration with Hannah Kernan and the Purdue Entomological Research Collection. Zoe Flores will be in the position half time for one calendar year; Shared photos generated by the project in social media posts on the Harvard Museum of Comparative Zoology social media accounts.
- SDMC shared project progress with Science Communications personnel at SDNHM for social media posts; Created .psd scale overlays for the 100m lens; Continually documenting issues and solutions to imaging with macropod system; volunteers helping to integrate donated specimens of project focal taxa into collections for imaging

CALIFORNIA PHENOLOGY TCN – QUARTERLY REPORT – NOVEMBER 2022

Assembled by Katie Pearson on October 28,2022

PROGRESS IN DIGITIZATION EFFORTS

The CAP TCN has surpassed our imaging goal by 5% (over 950,000 specimens imaged), our transcription goal by 6% (over 320,000 specimens transcribed), and we have completed 92% of our georeferencing goal (over 277,000 specimens georeferenced; Figure 1).

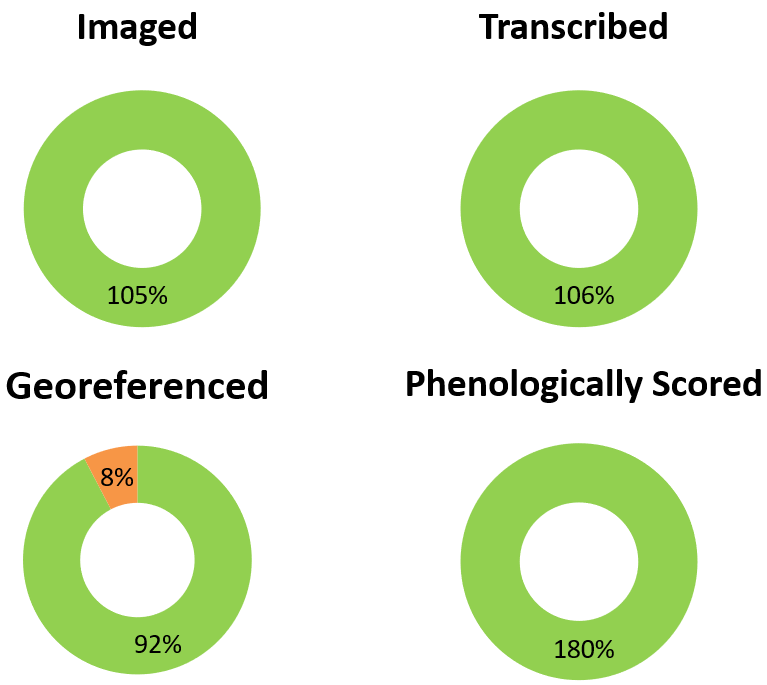


Figure 1. Progress in each of our four major digitization goals. Totals represent the original goals of the CAP grant: 902,400 specimens imaged and phenologically scored, and 300,000 transcribed and georeferenced. Additional specimens to be digitized by the PEN grant are tabulated in the PEN section below. This progress reflects completely new digitization activities to the CCH community, rather than total data liberated by the grant. **In the latter terms, we have far exceeded our goals in all four areas listed here.**

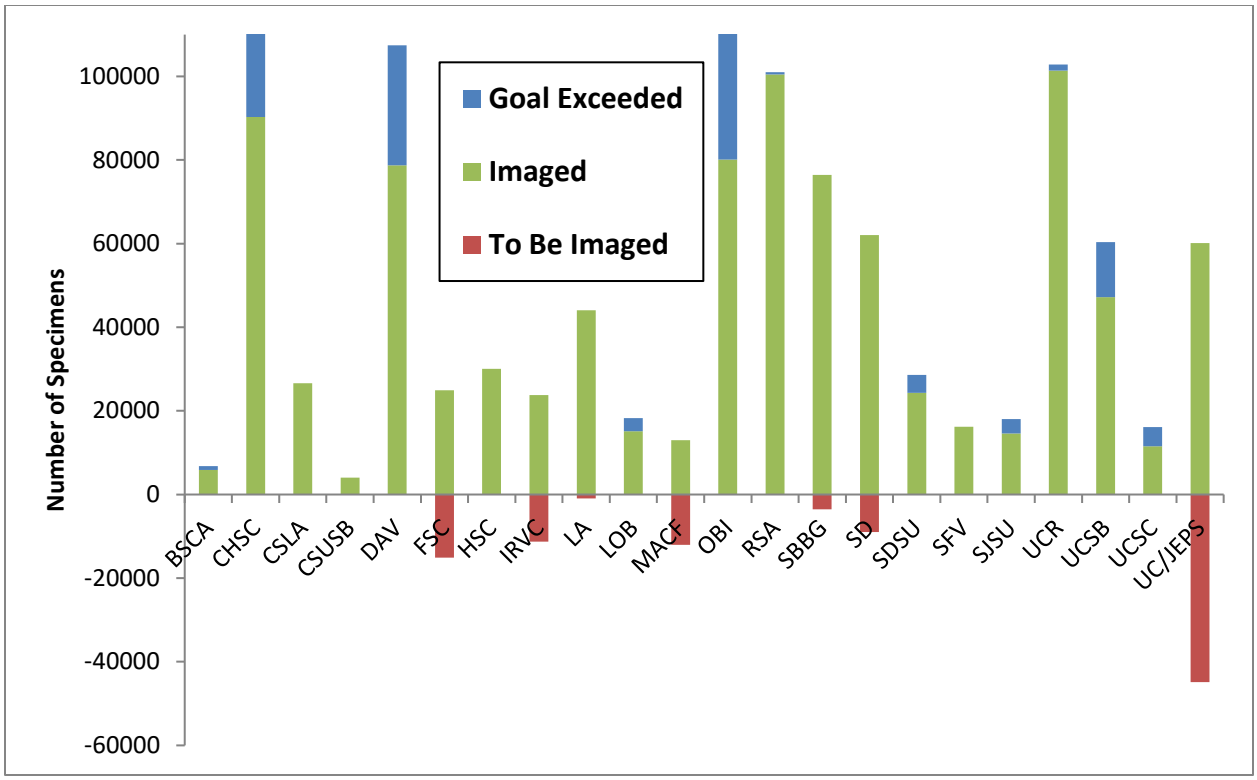


Figure 2. Herbarium specimen imaging progress. Blue portions represent the number of specimens that have been imaged, while green portions represent the number of specimens that have been imaged beyond the expected target specimens. Red bars below the zero line indicate the number of target specimens that have not yet been imaged. Note that SD's total includes the 15,000 additional Baja California specimens added as part of the PEN.

PEN PROGRESS

Imaging is ongoing at OSC, PUA, SFSU, and SD. UNLV and SHTC have completed their imaging goals, and CDA has continued to experience delays in procuring their equipment. Figure 3 shows the current imaging progress at PEN institutions. CDA has, instead, focused on georeferencing and has georeferenced 29,919 of their own specimens and 6,600 of other collections' specimens, exceeding their goal by 300%.

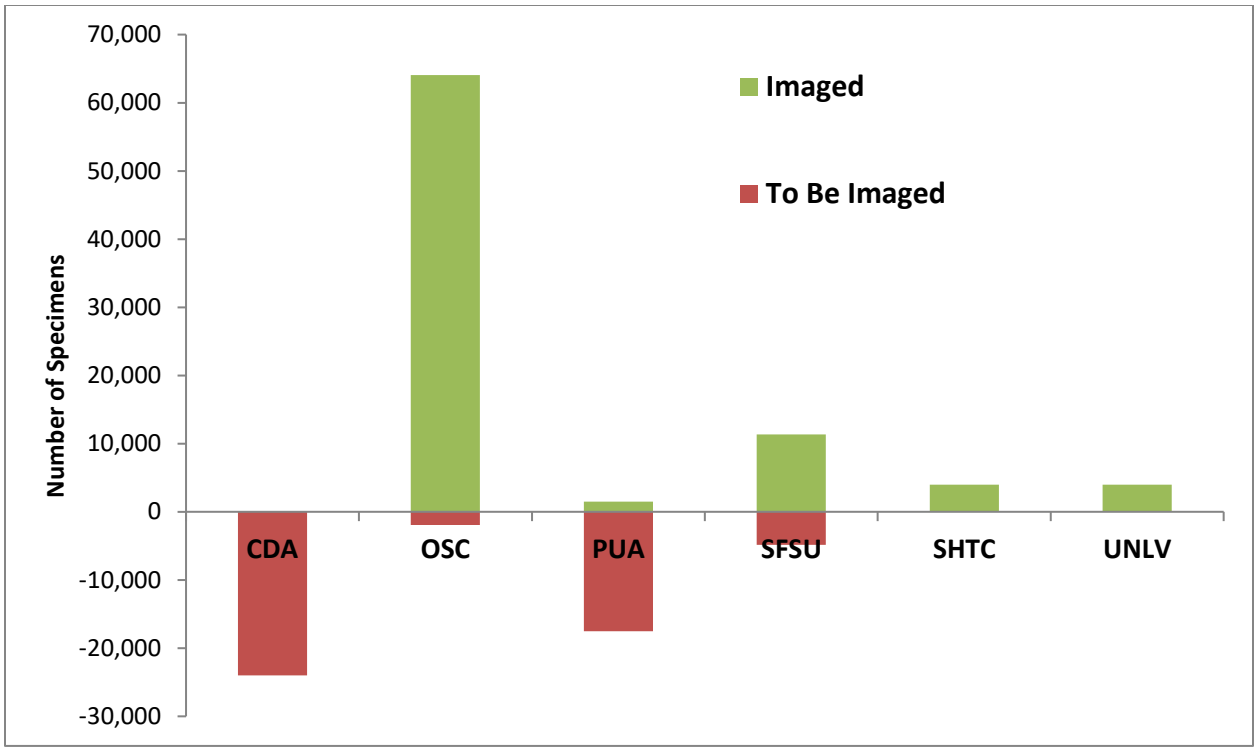


Figure 3. Herbarium specimen imaging progress for the seven PEN institutions. Green portions represent the number of specimens that have been imaged, while red bars below the zero line indicate the number of target specimens that have not yet been imaged. For SD, the total number of specimens to be imaged, including those added as part of the PEN grant, is indicated in Figure 2; therefore, SD is not included in this figure.

SHARE AND IDENTIFY BEST PRACTICES AND STANDARDS (INCLUDING LESSONS LEARNED)

After more consideration and research, we decided not to develop a new Darwin Core extension with which to share the plant phenological data we derived from herbarium specimens. Rather, we will map Plant Phenology Ontology terms to the existing Extended Measurement or Fact (eMoF) Darwin Core Extension. The framework for sharing eMoF extensions already exists, and the conceptual framework of the eMoF matches with the phenological traits (i.e., measurements) we have derived. Our preliminary mapping is currently being reviewed by our Plant Phenology Task Group and will be discussed at the upcoming working meetings in November.

IDENTIFY GAPS IN DIGITIZATION AREAS AND TECHNOLOGY

Nothing to report

SHARE AND IDENTIFY OPPORTUNITIES TO ENHANCE TRAINING EFFORTS

We continue to support the work of our “100 Club” of naturalist georeferencers. We hold Zoom co-working sessions on the first Tuesday of every month in which we socialize, answer questions, and georeference together.

We conducted one “Data Portal Lunch Break” webinar this quarter due to travel engagements. The recording of this webinar can be found here: https://www.capturingcaliforniasflowers.org/symbiota.html and on our YouTube channel.

We have transitioned to quarterly Consortium of California Herbaria meetings in which we discuss issues of concern to the California herbarium community, including potential funding and sustainability needs, portal improvements, and curation challenges.

SHARE AND IDENTIFY COLLABORATIONS WITH OTHER TCNS, INSTITUTIONS, AND ORGANIZATIONS

In mid-September, the PM transferred the Cal Poly SLO imaging equipment and provided training for three botanists and three AmeriCorps interns at the Klamath National Forest (KNF) Yreka herbarium. Over the next few days, they imaged the entire 4,093-specimen herbarium. With their new knowledge and equipment, the botanists and interns traveled to the KNF Scott-Salmon District herbarium, KNF Happy Camp/Oak Knoll herbarium, and Siskiyou County Dept. of Agriculture herbarium and imaged all of their 1,348, 1,350, and 873 herbarium specimens, respectively. They also lent the equipment to the Shasta-Trinity National Forest herbarium, where STNF botanists and volunteers imaged their collection. All the images from this flurry of activity are now being processed and will soon be uploaded into CCH2, where they will be ready for transcription by volunteers and technicians. These small collections are critical targets for digitization because they represent unique collections with few, if any duplicates, in botanically rich areas, and they are all in moderate to high danger of being destroyed by wildfire. The imaging equipment is now at the Whiskeytown National Recreation Area, where a botanists and volunteers will image their collection. We are very excited to add these six new collections to CCH2 imminently.

We have consulted with several other California institutions about digitizing their collections and getting their data in CCH2, including the Green Diamond Resource Company, Morro Bay Natural History Museum, Granite Mountains Desert Research Center (specimen imaging), Mesa College, and Los Angeles County Arboretum & Botanic Garden Herbarium. The CAP TCN has provided enormous momentum and resource potential for the digitization of these small but critical collections.

We continue to work with the Symbiota Support Hub to mobilize other collections belonging to California herbaria, such as collections of algae, fungi, and bryophytes. These collections are being added to the Macroalgae portal, MyCoPortal, and Bryophyte Portal, respectively. The San Diego State University is engaging their campus’s vertebrate collections to get them mobilized and in the Consortium of Small Vertebrate Collections portal.

SHARE AND IDENTIFY OPPORTUNITIES AND STRATEGIES FOR SUSTAINABILITY:

CAP PIs continue to provide leadership for the Consortium of California Herbaria, including planning an in-person meeting at the California Native Plant Society Conference in late October. CCH meetings have involved several discussions about sustainability and how we can continue to fund the herbaria of the

state. Several statewide funding initiatives have passed recently that may provide opportunities to keep CAP's momentum going. We also continue to disseminate information about the CCH2 data portal, such as at the symposium led by 2 CAP PIs (see next section).

SHARE AND IDENTIFY EDUCATION AND OUTREACH (E&O) ACTIVITIES:

We have two Notes from Nature expeditions currently ongoing, consisting of 1,500 specimens from CSU Fresno and 2,733 specimens from Oregon State University. Students from CSU Long Beach, CSU Fresno, and Oregon State University participated in WeDigBio in mid-October, during which time we saw a noted peak in transcriptions (Figure 4).

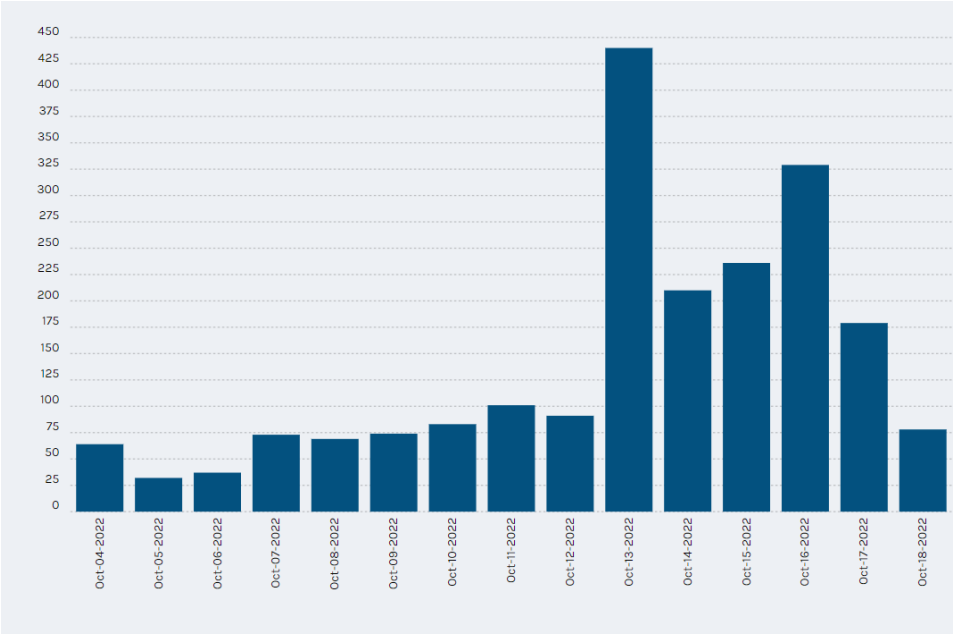


Figure 4. Peak in transcription activity during WeDigBio 2022, October 13-17.

Lead PI Yost (Cal Poly, SLO) and PI Colwell (UC Davis) organized a 2-part symposium at the California Native Plant Society Conference on October 20 and 21 titled "Innovation in California Herbaria and Specimen Records Use." In this symposium, 5 CAP PIs, 1 postdoc, 1 graduate student, 1 undergraduate, and 1 collaborator with the Inyo National Forest presented talks about digitization, education, and research projects using herbarium specimens, the CCH2 data portal, and/or the specimen data produced by CAP.

In August 2022, the PM submitted a manuscript about the uses of herbaria in grasslands research to the California Native Grasslands Association's journal, *Grasslands.*

WEBSITE AND PORTAL USAGE

Our project website (capturingcaliforniasflowers.org) has received 1,783 visits (a 15% decrease from last quarter) and 2,385 pageviews (a 12% decrease from last quarter) from August 1, 2022 to October 27,

2022. The data portal (cch2.org) has supported 20,159 sessions (a 33% decrease from last quarter), 169,371 pageviews (36% decrease from last quarter), and 11,638 users (32% decrease from last quarter) over the same time period.

TCN Quarterly Progress Report

Prior to each IAC meeting, TCNs are asked to complete a quarterly progress report in the areas outlined below. The TCN Lead PI or Project Manager collects information from all collaborators and compiles them into one overall progress report for the TCN. The TCN Lead PI or Project Manager then submits the quarterly reports via an email to Cat Chapman. An archive of previously submitted reports is available on the Internal Advisory Committee wiki page.

Digitization TCN: Collaborative Research: Documenting Marine Biodiversity through Digitization of Invertebrate Collections (DigIn)

Person Completing the Report: Regina Wetzer (Lead PI)

Progress in Digitization Efforts

ALMNH: Kevin Kocot: This summer I led three significant field expeditions. During each, we directly entered data into a preformatted spreadsheet that will be easily converted into an Arctos bulkloader. Specimens were imaged live in the field and these data are precurated to be uploaded to Arctos as well.

AMNH: E. Rodriguez: To date, we have added 21,187 records, updated with images, locality information or card catalog records including some that were already in the database but incomplete. A total of 18,770 card catalog records have been attached to our database catalog records. A total of 3,823 images of specimens and/or labels have been taken and attached to catalog records. 20,312 database records are associated with a locality record and of these 8,836 have an initial set of geographical coordinates. We replaced our second digitizer (resigned last January), and we have been able to hire a third digitizer. We are up to 37% of our goal digitalizing goals and 57% of our imaging goals.

AUMNH: Nusrat Noor: An additional 1,099 specimens were cataloged and uploaded to iDigBio.

BPBM: Holly Bolick: This quarter our digitizing focused on data cleanup as well as installing specimens collected during more recent expeditions (2000-present) including specimens from the Census of Marine Life Expedition (2006) that are identified down to species and pre-cataloged, but were never installed into the database due to time and other constraints. We had to track down metadata for this cruise online because unfortunately the information was not transferred over at the time the specimens were delivered to the museum. We are still working to obtain additional metadata from other DigIn members that participated in this expedition. This quarter, we added 338 new specimen records; we updated and cleaned an additional 2,806 specimen records; we mobilized 50 more specimen images that are linked to catalog number and ready for upload. We acquired 20 new specimen images. Our specimen image total (mobilized and new images) is now 3,379.

CAS: Christina Piotrowski: A total of 5,456 specimen records were fully digitized this quarter, with the exception of georeferencing, which will later be performed offsite for CAS records. CAS DigIn Digitization Technician Hanna Baek is rapidly hand entering data records directly from specimen jars into preformatted spreadsheets which, added to the efforts of a weekly volunteer and other staff, resulted in 4,483 records captured. Volunteers entered another 973 records from scans of jar labels for a total of 5,456 records entered. All records were cleaned, edited, and uploaded directly to our Specify database (5,456 total) and will be

available via GBIF and iDigBio portals, after records lacking full coordinate data have been georeferenced.
CAS volunteers scanned 1,671 specimen labels to later be hand-transcribed. Staff continued with QA/QC/reformatting transcribed Notes from Nature-Invertebrate Time Machine Project data to prepare it for ingestion, cleaning an equivalent of 1,000 records (an estimated metric since data is cleaned by field rather than by specimen record). We are now using Open Refine for most of the QA/QC of these records, however certain fields still require staff research and manual cleanup.
Approximately 2,688 specimen jars were pre-curated this quarter by volunteers. Another volunteer is pre-curating our photographic slides this quarter by assessing and physically numbering them. We've drafted a workflow for scanning and attaching these images to specimen records where applicable. Upon examination we have determined that many CASIZ slides do not directly pertain to specimen lots, at least not identifiably. We will parse these images ahead of scanning photo slides, retaining uncataloged slides for taxonomic and historical reference.

FWRI: Paul Larson: 1,155 new records have been digitized this quarter.

HBOM: M. Dennis Hanisak: Previously we have focused on the remediation and renovation of the HBOM collection space and trained HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project. This quarter we focused on organizing our HBOM invertebrate samples and developing the appropriate workflow. In the last week of the quarter, we began barcoding samples, our first step in our digitization efforts. 386 lots were barcoded. We will continue to barcode all invertebrates and we are set to begin photography.

MCZ: Adam Baldinger: This quarter, 183 uncataloged lots equaling about 318 specimens (mostly echinoderms) were databased from spreadsheet data and specimens in hand. As of 24 October 2022, 11,951 records in MCZbase have been cleaned/vetted for accuracy. Of these, 11,779 records contain vetted/verified georeferences.

NCSM-NMI: Megan McCuller: During Q4, we have digitized 210 new collection objects and taken 1,562 images of internal jar labels. Most of the digitization efforts have focused on QA/QC and image processing.

NHMLA: Dean Pentcheff: Digitizing is proceeding at full scale. We currently manage 20 work-study part-time students and 3 NHM Guest Relations staff (working part-time for digitizing). Our new staff (Caroline Haymaker, NHMLA Associate Collections Manager, and Victoria Westover (Digitization Specialist, hired on DigIn funds) are strongly dedicated to managing the digitization training and daily work of the large dedicated staff.

RSMAS: Maria Criales: We continue entering collection records. In total this quarter we digitalized 4,533 records, capturing a total of 23,799/55,000 from catalogued cards and books. We completed entering data for: Porifera, Cnidaria, Polychaeta, Brachiopoda, Echinodermata and Cephalopoda. These data have been uploaded into InvertEbase Symbiota portal, making a total of 9,385 lots almost ready to be uploaded to iDigBio. A significant amount of time has been spent cleaning taxonomic and geographic names using the Symbiota cleaning tool linked to Worms.

SBMNH: Daniel Geiger: Entered more lots.

SIO-BIC: Charlotte Seid: Digitized 2,304 lots this quarter, largely backlogged processing by the collection manager of transcription from an extensive and fairly uniform set of specimens (City of San Diego benthic invertebrate monitoring program). Our DigIn student employees were on hiatus this quarter due to other commitments, so no DigIn funds were expended in Q4.

SIO-PIC: Linsey Sala: Our team has captured data from 4,501 specimen vial, slide, and jar labels, and pre-curated another 3,300 lots.

UCM: Kelly Martin: A total of 967 specimen lots have been imaged by student workers. Our undergraduate worker Kayla Vasarhelyi has helped us tremendously in our imaging push this year. A graduate student volunteer, Cameron Pittman, has also been responsible for imaging. Kelly Martin has started work and is becoming familiarized with the grant. We expect to finish our imaging in the next few years (we are just shy of our imaging goal) and will turn our efforts toward georeferencing.

UF: John Slapcinsky: This quarter we entered 2,161 new specimen records including georeferencing and uploaded 322 images an additional 20,000 images are prepared for upload.

VIMS: Jennifer Dreyer: 696 new records have been entered into Excel this quarter. I am still working on incorporating the taxonomic nomenclature changes that Nicolas processed with the WoRMS taxa matching tool. I have been doing this in batches, before I upload records into Specify. No additional records have been uploaded into Specify this quarter due to some unexpected issues with my Specify database. For some unknown reason my taxon tree was missing some groups of taxa (all Amphipoda, for example) and the tree needed to be rebuilt. While this was being rebuilt it was discovered that other functions were not working properly and had to be addressed. It took a few months to get it all sorted out. That was finally completed just this week so I hope to make more progress moving forward. 335 historic/old specimen labels were photographed for an archive to attach to specimen records in Specify. Some of the labels are tearing or the ink is smearing so it has been very valuable to capture these images before any label data is lost.

NOTE: that a selection of quantitative progress measures has also been reported above:

Institution	Grant proposal commitments		Commitments completed		Records ready to upload	Georeferencing			Curation	Specimen photography		Label or catalog data capture				Direct capture from specimens			Capture seconds-per-specimen		Transcription seconds-per-specimen		Processing seconds-per-specimen		Logs captured	Comments
	Digiin lots to digitize for upload	Digiin images to create or mobilize for upload	Specimen records uploaded to iDigBio	Images uploaded to iDigBio	Specimen records fully prepared for upload to iDigBio	Records prepared for georeferencing	Records uploaded to CoGeo	Records QCed and reprioritized after georeferencing	Specimens precurated for digitization	Specimen images taken	Specimen images QCed and databased	Records imaged from ledgers, cards, or labels	Records OCRed or transcribed	Records QCed	Records databased	Records directly captured from specimen labels	Specimen records QCed and databased	(Add columns if there's something else to report)	Seconds	Phrase describing capture	Seconds	Phrase describing transcription	Seconds	Phrase describing processing	Field Notes and Station Files digitized	Qualifications or explications. Or just say, "Hi!".
ALMNH	5,250	0	0	-	0	0	0	0	2,000	6,000	0	0	0	0	122	0	0	0	0		0		0		0	I have on the order of 5,000 specimens collected and imaged during the course of three field expeditions over the last 6 months in the queue to be bulkloaded and to have their images uploaded to Arctos but I haven't found the time to QC the data and do it yet. I am on sabbatical now so that will happen soon :)
AMNH	56,708	7,000	0	0	0	~5000	3,660	902	0	4,065	4,035	21181*	19,068	18,447	21181*	20	20	0	860	imaging spmns/labe	237	transcribing spmn la	0		0	*Reflects new & modified. Note transcription sec-per-spmn is for paid interns. However, volunteer effort is also about 252 secs per specimen/specimen record
ANSP	22,060	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	
AUMNH	10,000	5,000	4,361	0	0	0	0	0	0	0	0	0	0	0	0	702	0	0	0		0		0		0	
BPBM	6,238	3,900	0	0	2,590	0	0	0	0	139	3,240	0	0	0	0	0	0	0	0		0		0		0	
CAS	59,616	3,500	0	0	0	0	0	0	7,297	1,471	0	39,813	32,805	14,589	4,302	13,103	13,103	0	257	scanning labels	282/279	direct label capture	0		128	
FMNH	1,140	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	
FWRI	33,582	150	153,280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	
HBOM	10,000	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	Hello
MCZ	31,564	4,631	11,358	43	593	11,778	0	0	0	10	0	0	0	0	11,950	0	0	0	420	Entry of new data re	0		0		0	Hello
NCSM-NMI	31,283	675	0	0	0	0	0	0	0	0	0	8,581	0	0	0	6,714	0	0	400	imaging labels	0		0		0	Around 5600 databased records were via bulk upload of spreadsheet data
NHMLA	320,000	2,572	0	0	0	0	0	0	0	1,000	0	0	36,324	0	0	0	82,593	0	0	84	label photos and dir	0		0		0	
RSMAS	55,000	0	0	9,385	0	0	0	0	0	0	0	0	0	0	23,799	0	0	0	0		0		0		0	
SBMNH	100,000	4,500	35,158	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0		0		0	
SIO-BIC	29,300	30,000	0	0	8,294	0	0	0	0	789	11	0	0	0	0	8,294	8,294	0	181	data entry from labe	0	NA	16	QA/QC, running scr	0	Time estimates are a vast underestimate because they represent work only on a repetitive and uniform set of specimens, used as a test case and low-hanging fruit.
SIO-PIC	34,371	0	0	-	0	0	0	0	3,300	0	0	0	0	0	0	4,501	0	0	0		0		0		0	
UCM	3,285	1,000	0	0	0	53	0	0	0	967	0	3,554	0	0	0	0	0	0	0		0		0		0	hi
UF	20,000	400,000	10,075	26,104	0	10,638	0	0	22,219	400,000	18,982	0	0	0	0	0	0	0	0		0		0		0	
VIMS	6,000	125	0	0	0	0	0	0	50	0	0	335	0	0	0	696	0	0	180	imaging labels	120	direct label capture	0		0	No additional records were uploaded into Specify this quarter due to some unexpected issues with my Specify database. For some unknown reason my taxon tree was missing some groups of taxa (all Amphipoda, for example) and the tree needed to be rebuilt. While this was being rebuilt it was discovered that other functions were not working properly and had to be addressed. It took a few months to get it all sorted out. That was finally completed at the beginning of October so I hope to make more progress moving forward.

Access the quantitative table here.

Best Practices, Standards, and Lessons Learned

ALMNH: Kevin Kocot: Having a custom Excel spreadsheet that we can enter data into during field sampling simplifies and error checks the data from look-up tables (e.g., to make sure someone didn't spell their own name wrong) has made the final QC of field data for bulkloading much easier and faster.

BPBM: Holly Bolick: A valuable lesson I have learned the hard way (more than once): Always collect metadata for incoming specimens at the time (or preferrably before) the specimens are transferred to your institution. It's easy to convince yourself you will remember to get this

information later, but in practice, it doesn't always happen. Also collect any permits used to collect the specimens from the field, as well as any limits to their storage and curation once installed. This will save time and prevent headaches in the future.

CAS: Christina Piotrowski: Academy staff continue to participate in the DigIn Working Group and Steering Committee. Three of our staff (Piotrowski, Loacker, and Baek) will participate in our project retreat held in Southern California at the beginning of next quarter. We initiated a new Slack channel to share best practice and standards in specimen photography, as at least two of our institutions plan to ramp up efforts over the next two years.

This quarter Piotrowski and Libby Elwood planned and recruited a session moderator (Alana Rivera from MCZ) for a closed conference symposium to present the work from our TCN and ESB at the Society for the Preservation of Natural History Collections meeting next summer, to be hosted by CAS. Our proposal has recently been accepted by the conference organizers and we will plan and discuss DigIn institutional contributions at the upcoming retreat.

MCZ: Adam Baldinger: MCZ staff continue to be involved in the Steering Committee and in the Expedition, Nomenclature and Georeferencing Working Group discussions. Information obtained is then shared with curatorial staff in other MCZ departments, including those working on other TCN's (e.g., ESB). Various staff members working on the project participated (via Zoom) in monthly DigIn meetings.

NHMLA: Dean Pentcheff: Time invested in training and training documentation pays off in higher quality data and smoother management. Who'd ever have guessed?

RSMAS: Maria Criales: The Symbiota cleaning tool linked to Worms works well. Katie Pearson continues being a great help.

SBMNH: Daniel Geiger: Entering data fully (incl. georef) is most efficient in the long run.

SIO-BIC: Charlotte Seid: Conducted a FileMaker Pro training/collaboration session (30 min) with SIO-PIC.

SIO-PIC: Linsey Sala: We assigned physical locations to each of our specimen records (e.g. carriage no., bay no., shelf/drawer no., box no. (for small vials, jars, slides) to ensure we could relocate digitized material easily for use. Then our team could conduct practice trials to see how quickly we could relocate our specimen lots. This has provided us the ability to find where total number of lots/box or drawer/shelf may have mismatches or lots were accidentally assigned physical locations incorrectly during rapid digitization effort periods. In reviewing our digitized data to date during these trials, this has also provided us the opportunity to begin to QC data and continue to refine our data capture processes.

UCM: Kelly Martin: Former student volunteers created standard operating procedures (SOPs) for continued use in the Invertebrate Zoology section for georeferencing, wet/dry specimen and ledger imaging which will enormously speed up training of future museum staff and assistants. These protocols were used to train the new collections manager as well as new undergraduate students working on the grant. These particularly came in handy during Q4 for our troubleshooting. As our students encounter and SOLVE various camera and software issues, we write these into the protocol to avoid these errors in the future. We have learned that documentation of our workflows and troubleshooting is extremely important and timesaving.

VIMS: Jennifer Dreyer: I continue to attend All Hands meetings and participate in the consolidated monthly meetings for any agendized topics and office hours for unagendized topics as often as I can. I continue to actively participate with the general group via Slack to provide content and feedback on publicity content.

Identified Gaps in Digitization Areas and Technology

AMNH: E. Rodriguez: We need an outlined georeferencing process.

BPBM: Holly Bolick: We do not currently have an imaging setup for medium to large specimens but if we did, the amount of specimen images we could acquire as we digitize would greatly increase. Our acquisition of our microscope camera setup has dramatically increased our number of new specimen images. However, I still do not have the capability to view my specimen images easily and there is no easy way to share the images with the community.

CAS: Christina Piotrowski: We are still working with CAS IT/Bioinformatics to set up a new institutional specimen portal alongside a system for attaching media to Specify records, which will also permit sharing to GBIF, iDigBio, and InvertEBase. We now have a system in place to standardize ITPC metadata, Creative Commons licensing, and credit/attribution in image metadata and Specify field structure so that these records will be ready for online sharing once they can be associated with records. We still have work to do before all Creative Commons images are ready for sharing but we are working towards readying a subset.

We have successfully set up a microscope imaging station, but continue to experience technical issues with the stacking apparatus in our type specimen imaging station related to camera tethering. We will likely need to make some unexpected repairs or purchases for our macrophotography station to function reliably. We remain concerned about having sufficient time to complete this deliverable alongside our primary focus of specimen record data entry, which remains our highest priority.

MCZ: Adam Baldinger: Images of ophiuroid types are beginning to be generated and uploaded to MCZbase.

NCSM-NMI: Megan McCuller: We are still facing difficulties with getting our data published online and are doing everything possible to alleviate this issue.

RSMAS: Maria Criales: The Symbiota cleaning tool linked to Worms works well. Katie Pearson continues being a great help. We are ready to start Georeferencing but we will need advice on it.

SIO-BIC: Charlotte Seid: Participated in the DigIn Technical Training and appreciated the resources, exercises, and discussions.

SIO-PIC: Linsey Sala: Looking forward to in person workshop next month where we can begin to discuss DwC mapping and iDigBio/GBIF importing processes.

UCM: Kelly Martin: During Q4, the collection continues to experience employee turnover. We have a new student who has been devoting their time to helping us reach our imaging goal. However, we have also had our undergraduate worker transition into focusing on their schoolwork as the semester starts. She was an incredible asset during the summer, and her hours have been reduced to accommodate her schedule. We have been adjusting to the new semester schedule and been working hard to use the limited time we have with our student employees efficiently. We also had quite a few issues this quarter with the camera and software (all resolved) that slowed us down. Ultimately, these issues were fixed and the solutions were added to our SOPs.

VIMS: Jennifer Dreyer: Our collection was not connected to iDigBio or InvertEBase, but I worked with Cat Chapman (iDigBio) and Katie Pearson (Symbiota) to get it added to both portals. Specify created an RSS feed that was given to both groups. I have not made any further progress on georeferencing and intend to tackle that after more records have been uploaded into Specify.

Opportunities to Enhance Training Efforts

AUMNH: Nusrat Noor: Participated in the DigIn technical data workshop.

CAS: Christina Piotrowski: This quarter several CAS staff members participated in the DigIn Technical data workshop designed to enhance our data carpentry skills in Excel, Google Sheets, and Open Refine.
Several CAS staff participated in BioDigiCon 2022 to familiarize ourselves with what others in the community are doing and to benefit from shared ideas and content.
DigIn's proposal for a closed DigIn/ESB symposium at SPNHC 2023 was accepted. We look forward to sharing project workflows and experiences, and to better familiarize the museum professional community with both of our TCN projects.

RSMAS: Maria Criales: Hoping to learn GEO-Locate (COGE) experiences from advance teams to start Georeferencing our data.

UCM: Kelly Martin: In previous quarters, student workers have used our generated SOPs to train new employees or staff on the grant imaging. This quarter, we experienced many issues with working the cameras and software programs. None of these we had previous experience. These issues significantly slowed our progress, especially because our students have busy schedules and we need to make efficient use of their time. Despite these setbacks, we have used these opportunities to improve our SOPs. We have added a troubleshooting section that will help prevent/resolve these problems in the future. The students worked together to solve the problems and update the SOPs as needed.

VIMS: Jennifer Dreyer: My summer volunteer went back to college but she recruited another student to take over where she left off. I am working with and training that new volunteer. She is working up to 6 hrs/wk imaging specimen labels with our document camera and then transferring specimens into new vials, if needed. Many of the old vials have plastic caps that are prone to leaking or cracks. We are targeting the most critical specimens. On August 1st, I attended the Symbiota Support Group where the taxonomic thesaurus and how it can be edited was discussed. We followed up this discussion with an InvertEBase taxonomic thesaurus editing training session set up via the DigIn Nomenclature Working Group on August 31st. We learned how to edit the thesaurus but it was noted that any edits should exclusively be done by taxonomic experts. I attended the Biodiversity Digitization Conference (BioDigiCon) on September 27-29. The conference was focused on data generation and mobilization with special emphasis workforce enhancement.

Collaborations with other TCNs, Institutions, and/or Organizations

CAS: Christina Piotrowski: Piotrowski serves on the Cordell Bank NMS Advisory Council and regularly interfaces with our NMS colleagues from this sanctuary and the neighboring Gulf of the Farallones NMS regarding museum activities, educational, and biodiversity topics which our museum collections and data may help to inform. CAS regularly collaborates with our regulatory partners for donations and services such as NOAA/NMFS, USFW, CDFW, the Nature Conservancy, and the EPA. This quarter we received a large donation of identified benthic invertebrates collected by the EPA from a multi-year dredge disposal survey. Piotrowski continues to serve on the SDNHM Advisory Committee as their digitization team works to digitize data from their (mostly Mollusca) collections and plans for the potential transfer of out of scope materials to other institutions including CAS. We continue to collaborate with the ESB TCN and will include this team in our closed SPNHC2023 symposium.

MCZ: Adam Baldinger: Information continues to be shared among permanent MCZ curatorial staff working on other TCN's (e.g., ESB) and on an NSF-CSBR cryogenic collections grant.
NCSM-NMI: Megan McCuller: We participated in the DigIn + ESB Technical Training Workshop that ended in August.
SIO-BIC: Charlotte Seid: Participated in a meeting of the San Diego Natural History Museum Marine Invertebrate Advisory Committee to discuss digitization opportunities and best practices (Oct 4, virtual). Building upon the NSF-funded "Workshop to Discuss the Value and Scope of an Antarctic Biorepository" (Feb Q2), contributed to an Opinion piece for PNAS ("The time is right for an Antarctic Biorepository Network") expressing the importance of accessioning and digitizing Antarctic biological specimens including marine invertebrates relevant to DigIn, and participated in a follow-up discussion (Oct 24, virtual) to plan development of a proposal for the Biorepository Network.

Opportunities and Strategies for Sustainability

CAS: Christina Piotrowski: We are discussing ways to ensure that non-mollusk shell collections added to the CAS Research Collection are able to be digitized ahead of incorporating them into the collections. This will be a financial hardship unless we can secure funding by donors, which we plan to request, but these resources do not typically exist (for example from the EPA for the above donation). We are exploring a means to secure resources internally for this work.
NHMLA: Dean Pentcheff: We have planned the first in-person retreat for the DigIn group, 1–3 November 2022.
SBMNH: Daniel Geiger: Giving old glassware to artists and art supply non-profit.
VIMS: Jennifer Dreyer: We continue to archive historic/old specimen labels that will be attached to specimen records in Specify.

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

ALMNH: Kevin Kocot: I taught an intensive biodiveristy and taxonomy course at Friday Harbor Laboratories this summer that emphasized, among other things, the importance of natural history collections and data quality and management (https://fhl.uw.edu/courses/course-descriptions/course/integrative-biodiversity-and-taxonomy-of-invertebrates/). I am designing an exhibit for the Alabama Museum of Natural history that I expect to be completed by the end of the semester and to be installed in the next year. I have been active in outreach through events on the UA campus and through in person and virtual visits to students.
AMNH: E. Rodriguez: We have two new volunteers and we continue to contribute with posts and other outreach material to the DIgIn social media account
AUMNH: Nusrat Noor: We created social media posts for the DigIn account. We also have had multiple tours and tabling events as well as organized a bioblitz this quarter and have reached over 800 people
BPBM: Holly Bolick: This quarter we submitted two social media posts to the publicity coordinator and one was posted in September. In November, the Invertebrate Zoology Department will be doing museum outreach programming for our in-house Taxonomy Exhibit and we are going to do a few DigIn promotions at our events (will add to next quarter's report).
CAS: Christina Piotrowski: CAS staff participated in Nightlife outreach events showcasing the Academy’s IZ collections geared towards an audience of young adults. Piotrowski presented

a short presentation highlighting ways the Academy has been working to 'decolonize' our coral reef invertebrate collections by repatriating holotype specimens and by making data and research products accessible to in-country partners.
This quarter CAS staff provided 19 collection tours to 223 individuals, including elementary, high school, graduate and undergraduate university students. Piotrowski also engaged with a group of Bayview Institute teachers working in underrepresented communities on the use of natural history collections and proposed ideas for engaging their students with museum biodiversity data.

FWRI: Paul Larson: Corinne has been producing outreach material for DigIn.

MCZ: Adam Baldinger: Nothing to report specifically for E&O, but in terms of publicity, the MCZ submitted fun fact content on squat lobsters and Scientist of the Week (Alana Rivera).

NCSM-NMI: Megan McCuller: In September, the NCSM-NMI unit participated in our Museum's BugFest, one of oure biggest events each year.

RSMAS: Maria Criales: We continue developing an educational MPS track program around the collection, which in the future should generate great learning outcomes.

SBMNH: Daniel Geiger: Tour for local college. Returning volunteer entering data.

SIO-BIC: Charlotte Seid: Conducted 9 E&O presentations (8.5 hrs) for 41 visitors (elementary school through adult learners), highlighting invertebrate biology and the value of digitized museum collections.

SIO-PIC: Linsey Sala: SIO-PIC continues to provide in person and virtual tours of our collections, and submit social media content as requested by our publicity team.

UCM: Kelly Martin: We are in the process of creating a shared repository for outreach activities and instructions within UCM. We have education and outreach events scheduled in November through our Museum to host school groups and educate/led activities on invertebrates.

VIMS: Jennifer Dreyer: I have done 5 tours of our Invertebrate Collection to the general public and reached over 490 people. My largest outreach event was hosted at our Eastern Shore Lab where the main seawater lab was open to the public with exhibits, live specimens, collection specimens, crafts for the kids and hands on touch tanks. This outreach event was open to the public and had the highest number of visitors since MLD began with over 400 people. The setup from Saturday was then used to educate over 100 more local elementary school students during field trips the following week. Visitors of all ages could learn about the broad range of research being conducted at VIMS ESL, look at live specimens under the microscope, get up close and personal with critters from the touch tank, see preserved specimens from the VIMS Invertebrate Collection, talk with scientists, and get creative with kid crafts. It was a big success and many of the visitors look forward to this annual event each year. I was asked to provide taxonomic identifications for organisms through 9 public requests to our institute, as well as to VIMS researchers. I contribute to the Instagram social media posts based on the publicity assignment and repost them on my personal Instagram to increase distribution.

Information About Your Website and/or Portal Usage

NHMLA: Victoria Westover: DigIn has published 120 Instagram posts, 40 Instagram stories, and 25 Twitter posts.
Our 120 Instagram posts include 25 Invertebrates of the Week, 27 Scientist Spotlights, 22 Friday Fun Facts, 45 General Content posts, and one Instagram Reel, a short-form vertical video about the digitization workflow at NHMLA.

The general content on our Instagram page includes two introductions to DigIn, seven posts that relate to trending hashtags in the scientific community, 15 posts about invertebrate specimens, nine posts about specimen collection, specimen observation, or outreach events, two posts about relevant international holidays, two project updates, and eight other posts, highlighting various topics including a relevant scientific study and the donation of invertebrates to local teaching institutions.
The 40 Instagram stories include one introduction to the project, 27 invertebrates that link to resources on InvertEBase, three inside looks of collection spaces, five stories about relevant international holidays, and four stories on outreach events (an NHMLA donor event, the DigIn Teacher Workshop 2022, the Friday Harbor Laboratories Biodiversity and Integrative Taxonomy of Invertebrates course, and VIM's Marine Life Day 2022).
Our 25 Twitter posts consist of two introductions to the project, four posts about relevant international holidays, three posts on trending hashtags in the scientific community, six posts about specimen collection, specimen observation, or outreach events, four posts about invertebrates, two inside looks of collection spaces, one project update, and three other posts about the E/V Nautilus, the World List of Actiniaria, and the time it takes to properly identify a specimen.

Other Activities and/or Progress

AMNH: E. Rodriguez: New volunteers have unpacked the recently acquired fiddler crab collection and are preparing it for digitalization and imaging.

FWRI: Paul Larson: All FWRI invertebrate records have begun being served to iDigBio, including DigIn records digitized to date (153,280 records in total).

MCZ: Adam Baldinger: Jennifer Goldstein, curatorial assistant, resigned from the project (for personal reasons) as of September 29, 2022. A search for her replacement began in early September, and we anticipate that the new staff member will join the project very soon.

NCSM-NMI: Megan McCuller: Cross-referencing of historical ledger books with our Specify database has begun, which should eliminate some confusion regarding previous catalog numbers and the QA/QC process (4 books have 5 instances of the number series 1-2250, three of those series have a prefix - in Specify, the absence of a prefix does not mean it wasn't supposed to have one).

SIO-BIC: Charlotte Seid: Coordinated the transportation and acquisition of large research collections to be donated to SIO-BIC by eminent deep-sea researchers Lisa Levin (SIO) and Craig Smith (University of Hawaii) as they prepare for retirement. These scientifically valuable collections will require further work for physical curation and digitization.

VIMS: Jennifer Dreyer: A DigIn 2022 Retreat was planned for Oct 31 - Nov 3, and I will be attending. I organized my institutional travel and the logistics of the visit. I am greatly looking forward to meeting everyone in person and having this dedicated time to work through grant related questions and topics to move our digitization progress forward.

TCN Quarterly Progress Report

Prior to each IAC meeting, TCNs are asked to complete a quarterly progress report in the areas outlined below. The TCN Lead PI or Project Manager collects information from all collaborators and compiles them into one overall progress report for the TCN. The TCN Lead PI or Project Manager then submits the quarterly reports via an email to Cat Chapman. An archive of previously submitted reports is available on the Internal Advisory Committee wiki page.

TCN Name

Eastern Seaboard: Mobilizing millions of marine mollusks

Person Completing the Report

Rüdiger Bieler, FMNH, Lead PI

Share Progress in Digitization Efforts

Share information here. You can also embed graphics if desired.

FMNH ESB: Digitized 514 de novo lots including vitality status, representing 4,053 total specimens; updated 146 existing records with vitality status; 13,696 records were cleaned/enhanced/improved; georeferenced 19 de novo localities, 9 improved georeferenced records.
ANSP ESB: 802 lots totaling 3,716 specimens were newly catalogued and digitized during this period and 3,716 lots had their data upgraded.
BMSM ESB: BMSM continues to digitize new records, having cataloged 317 new ESB lots during the period, for a total of 2,299 specimens. In addition, BMSM cleaned and standardized ESB locality names (mostly in Florida) for 551 lots. BMSM generated 42 new composite images and georeferenced 216 localities encompassing 565 existing records (mostly from S and SW Florida), all including error radius.The total number of georeferenced ESB records so far is 20,627. Entire BMSM dataset consists of 133,470 records, of which 23,951 are from ESB, including a total of 150,432 ESB specimens.
CM ESB: 2,282 total ESB records data cleaned; 1,576 total ESB records georeferenced. In 3rd quarter 2022, 390 additional localities georeferenced representing 687 records of marine mollusks from the Eastern Seaboard.

DelMNS ESB: DelMNS is now working to establish a good photography workflow in advance of starting to focus on taking photographs of ESB species. Approximately 100 test photos have been taken. Work will start with pictures of *Neoterebra* for an undergraduate project on determining live/dead in the species.
FWRI ESB: 255 georeferences either done denovo or refined from previous coordinates, and 1,569 de novo digitized specimen records generated. Some done by Sean, the ESB-funded worker and some by Austin, FWRI staff.
HBOM ESB: Previously we have focused on the remediation and renovation of the HBOM collection space and trained HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project. This quarter we focused on organizing our HBOM invert samples and developing the appropriate workflow. We should begin digitizing mollusks in the next quarter.
HMNS ESB: Previous work has focused on our NorthWest Gulf of Mexico specimens but this quarter we began looking at all HMNS malacology holdings from the Gulf of Mexico and Eastern Seaboard of the United States. By diving deeper into our digital collection records we have identified potentially 28,000 catalog records and 440,000 specimens that may apply to this project. This amount may fluctuate a bit as freshwater and terrestrial specimens are removed from this group but this does indicate we will be potentially contributing an additional 10,000-12,000 records and potentially 100,000 specimens above our committed goal. Work has also been done on sorting the 28,000 specimens into more manageable groups in order to facilitate data cleaning of specimen collection localities. To date 180 catalog records have been checked and had their geographic collection locality updated to include water depth if that data is provided. Work has also begun on sorting the collection into subdivisions such as marine, freshwater, and terrestrial so that we can have a better estimate of overall holdings.
LACM ESB: Between July 1 and September 30, 2022, 890 lots were digitized, representing 7,120 specimens. A total of 2,395 lots have been digitized to date, which constitutes 36% of our total goal. Much of this work was completed by our ESB-funded assistant collections manager; the rest was done by the Malacology department's Collections Manager.
MCZ ESB: 345 lots/records were databased this quarter. To date, 18,330 records in our database were cleaned/vetted for accuracy, and of these, 18,752 with verified georeferences. 12,096 records are available on iDigBio.
NCSM ESB: Nothing to report
PRI ESB PEN: Between July 1 and September 30, 2022, we have digitized 786 lots totaling 24,709 specimens. Cumulatively, 2,546 lots (39% of goal) containing 55,733 specimens (35% of goal) have been digitized. 61 additional lots were added from the North Carolina locality georeferenced earlier in the grant. The remaining 725 lots are from 50 localities in Florida that were previously georeferenced outside of the grant. An additional 783 lots have been coded with live-dead status (2,539 lots in total have been coded so far). A new volunteer, Madeleine Wenger, began photographing specimens. In September, photographs were taken of 11 specimens (2% of goal) equaling 33 images (3% of goal). We have been working with Symbiota to develop a mapping for uploading our ESB records to their portal.

RSMAS ESB: During this quarter we digitized 1,484 lots. We have to-date digitized 18,010 lots. 397 cephalopod species were cleaned and uploaded to InvertEBase via Symbiota. A

significant amount of time has been spent cleaning taxonomic names using the Symbiota cleaning tool. One graduate student was hired and trained on digitization in September.
UF ESB: Newly digitized 537 lots containing 1,012 specimens that are available in our online Specify Portal and InvertEBase. Georeferenced and estimated error radii for 531 specimen lots.
UMMZ ESB: One undergraduate student was hired and trained on digitization in September. 86 lots representing 548 specimens have been newly digitized; 559 lots uploaded to InvertEBase portal; 86 images generated, and 10 lots georeferenced.
YPM ESB: Nothing to report.

Share Best Practices, Standards, and Lessons Learned

Share information here. You can also embed graphics if desired.

FMNH ESB: DigIn created a document called "Aggregator Connection Status" that provides an overview of all the current datasets available on each aggregator site (iDigBio, GBIF, OBIS, etc.) for each TCN member. ESB added all its participating institutions' URLs and dataset ids; this helped identify missing datasets for the various aggregators/portals. In the future, we hope to add datasets of mollusk collections from all over the community beyond the TCNs.
ANSP ESB: Nothing to report.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DelMNS ESB: Nothing to report.
FWRI ESB: Nothing to report.
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.
LACM ESB: Nothing to report.
MCZ ESB: Permanent staff involved in the project continue to participate in Outreach, Steering, Expedition, Nomenclature and Georeferencing committees/work groups. Information is then shared with others in MCZ's Malacology and Invertebrate Zoology departments, including those working on other TCNs (DigIn). Various staff members working on the project participate (via zoom) in ESB monthly ESB general meetings and monitor communications shared on various Slack channels. MCZ is now hosting museum wide, monthly imaging workshops to set museumwide standards for photography of specimens.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: The Symbiota cleaning tool linked to WoRMS works well; Katie Pearson continues to be a great help.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
YPM ESB: Nothing to report.

Share Identified Gaps in Digitization Areas and Technology

Share information here. You can also embed graphics if desired.

FMNH ESB: Nothing to report.
ANSP ESB: Nothing to report.
BMSM ESB: Nothing to report
CM ESB: Nothing to report.
DelMNS ESB: Nothing to report.
FWRI ESB: Nothing to report
HBOM ESB: Nothing to report.
HMNS ESB: The previous collections database did not include fields for GPS coordinates, water depth, and distance from shore. This important data was stored in the notes field of the collection record and in order to bring the data up to current standards all ESB and Gulf of Mexico records are having to be checked and fixed as necessary.
LACM ESB: Nothing to report.
MCZ ESB: Nothing to report.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: We are ready to start Georeferencing, but we will need advice on it.
UF ESB: Nothing to report.
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

Share Opportunities to Enhance Training Efforts

Share information here. You can also embed graphics if desired.

FMNH ESB: Our newly hired Collections Technician participated in iDigBio's Digitization Academy: Intro to Biodiversity Specimen Digitization Course, August 29-September 1, 2022.
ANSP ESB: Juwhan Jung, a co-op student and Computer Sciences major from Drexel University has joined the project and will bring his programming skills to updating the Malacolog database of Western Atlantic Marine mollusks.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DelMNS ESB: DelMNS is collaborating with an undergraduate student and faculty member at Widener University on a project about shell morphology and predation. We will start working on *Neoterebra dislocata.*
FWRI ESB: Nothing to report.
HBOM ESB: Nothing to report.
HMNS ESB: Our Inventory Manager has potentially recruited 3 volunteers, including an undergraduate student, to assist with ESB data cleaning. Once applications and vetting has been done they should be joining the project.

LACM ESB: Nothing to report.
MCZ ESB: Nothing to report.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Nothing to report
UF ESB**:** Two ESB students have expressed interest in independent research projects and are being trained in systematics research.
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

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

Share information here. You can also embed graphics if desired.

FMNH ESB: Continued coordination with DigIn and PILSBRy TCNs, as well as WoRMS/MolluscaBase. Added all ESB institutions data to the "Aggregator Connection Status" document created by DigIn; it helps determine which aggregators are missing current datasets.
ANSP ESB: Started work on taxon names in ANSP collection that are not present in MolluscaBase. Those that have been published will be uploaded to MolluscaBase.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DelMNS ESB: Continued collaboration with BCEENET (RCN-UBE) to understand the types of information that undergraduate faculty and students need to incorporate specimen data into their course-based undergraduate research experiences.
FWRI ESB: Nothing to report
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.
LACM ESB: Nothing to report.
MCZ ESB**:** Information is shared among permanent MCZ staff working on other TCNs: DigIn and PILSBRy, and an NSF CSBR cryogenic collections grant.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

Share Opportunities and Strategies for Sustainability

Share information here. You can also embed graphics if desired.

FMNH ESB: Nothing to report.
ANSP ESB: Nothing to report.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DelMNS ESB: We have explored several potential methods of storing large quantities of photographs, including our on-site shared server, a stand-alone server, and a subscription cloud-based server. We have determined that a combination of approaches is necessary. Long term archival storage of high resolution specimen images will be maintained on an onsite shared server. However, multiple views of shells in a lot will be stored at a cloud-based photo sharing websites such as photoBucket. This is a cost-effective way to share multiple images with multiple data portals while maintaining the integrity of the Museum's firewall..
FWRI ESB: Nothing to report.
HBOM ESB: Nothing new to report.
HMNS ESB: Nothing to report.
LACM ESB: Nothing to report.
MCZ ESB: Nothing to report.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS: We are continuing to develop an educational MPS track program around the collection, which in the future should generate great learning outcomes.
UF ESB: Nothing to report
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

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

Share information here. You can also embed graphics if desired.

FMNH ESB: Continued coordination of Mollusk of the Month (MotM) on Instagram, Twitter and Facebook. PI Bieler presented a TCN update at the BioDigiCon on September 27, 2022.
ANSP ESB: The PI has continued work with iNaturalist and is the primary person bringing older observations into the ESB iNaturalist portal by flagging their live/dead status. To date he has contributed more than 18,000 identifications to the ESB project.
BMSM ESB: PI Leal is responsible for the ESB Facebook page, having posted regularly via that social media outlet; PI is a member of the ESB TCN steering committee. On 11 August 2022, PI Leal co-presented with Lead PI Rüdiger Bieler, the talk "Mobilizing Millions of Mollusks of the Eastern Seaboard," as part of the Bailey-Matthews National Shell Museum "Online Lecture Series." PI Leal participated in a series of video shoots about mollusks and malacological collections for the series "Changing Seas," produced by WPBT2, South Florida

PBS station. Among other mollusk-related topics, the December 2022 episode will highlight the ESB project.
CM ESB: Nothing to report.
DelMNS ESB: Nothing to report.
FWRI ESB: Posted items to instagram as part of the outreach committee
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report
LACM ESB: Nothing to report.
MCZ ESB: The iNaturalist public portal keeps growing and now includes 60 members, 3,115 identifiers, 91,622 observations and 939 species.
https://www.inaturalist.org/projects/eastern-seaboard-mollusks
NCSM ESB: We continue to use Instagram, TikTok, Twitter, and Facebook to reach the public. We participated in Mollusk of the Month for July and August on the ESB Twitter, Instagram and Facebook accounts.
PRI ESB PEN: Nothing to report.
RSMAS ESB: We are continuing to develop an educational MPS track program around the collection, which in the future should generate great learning outcomes. Website is nearly complete and should be publicly ready by the end of the year.
UF ESB: Nothing to report.
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

Share Information About Your Website and/or Portal Usage

Share information here. You can also embed graphics if desired, such as from Google Analytics.

FMNH ESB: Nothing to report.
ANSP ESB: Nothing to report.
BMSM ESB: Dataset is live and updated at portal' portal is hosted by Specify Collections Consortium https://webportal.specifycloud.org/shellmuseum. Stats and portal usage data not available.
CM ESB: Our collections data upload to InvertEBase is on target for the next quarter. No access to collection data through our museum website.
DelMNS ESB**:** All Mollusk collection data are on InvertEBase. There is currently no access to our collection data from our website.
FWRI ESB: Portal is hosted by Specify Collections Consortium and traffic and searches cannot be tracked by FWRI staff.
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.
LACM ESB**:** Nothing to report.
MCZ ESB**:** "Named Group" page in our database allows for researchers and others to gather information about the grant, records/specimen lots associated with ESB, including searchable

links/breakdown of records by taxa, geography (ie. by ocean, country, islands), images, collectors/agents; includes links to iDigBio (ESB), MolluscaBase and iNaturalist pages. (https://mczbase.mcz.harvard.edu/grouping/showNamedCollection.cfm?underscore_collection_id=82

NCSM ESB**:** The entire Mollusk database, along with any images are updated on the NCSM Collections website every two months. (https://collections.naturalsciences.org/search/mollusk)
PRI ESB PEN: Nothing to report.
RSMAS ESB: We have established an account in the Symbiota portal and will continue to upload Mollusk data.
UF ESB**:** Collection database and images are live and updated at portal http://specifyportal.flmnh.ufl.edu/iz/. Light photogrammetry images are available at https://sketchfab.com/FloridaMuseum/collections/invertebrate-zoology-b8787873d5384855b4f340781d5e6006
UMMZ ESB**:** Nothing to report.
YPM ESB: Nothing to report.

Share Other Activities and/or Progress

Share information here for things that do not fit into the above categories. You can also embed graphics if desired.

FMNH ESB: John D'Angelo, Collections Technician, was hired at the end of this quarter to digitize our ESB material.
ANSP ESB: Nothing to report
BMSM ESB: Complete record set was last uploaded to iDigBio on 22 September 2022, to GBIF and OBIS on 30 August 2022, and to InvertEBase on 22 June 2022..
CM ESB: Nothing to report.
DelMNS ESB: Nothing to report.
FWRI ESB: Nothing to report.
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.
LACM ESB: Nothing to report.
MCZ ESB: Two LHT (less than halftime) employees were hired to work in the collection 7 hours a week each on projects pertaining to ESB. They are digitizing records, and updating shelf lists for the malacology fluid shelf list.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Nothing to report.
UF ESB: Nothing to report.
UMMZ ESB: Nothing to report.
YPM ESB: Nothing to report.

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 July 1 – September 30, 2022.

Workflows, Equipment, and Personnel

Most GLOBAL institutions continued steady GLOBAL progress during 2022-Q3.

At ASU, summer digitization progress was slow, but all images taken by the previous student worker have now been uploaded to the Lichen and Bryophyte Consortium. They recently hired a new undergraduate student worker in the fall who just started routine specimen imaging again, making good progress.

CINC & MU were down to one student worker over the summer, but added two new students to GLOBAL in early September. Students are trained on both imaging and label transcription,

[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

but typically feel more comfortable with imaging more quickly than they do with transcription, and this is reflected in their July–September numbers.

At COLO, the first, second, and fifth most productive imaging months occurred during this quarter with 2,693 more specimens imaged than our previous best quarter (138% of the previous best quarter). This was also their most productive transcription quarter with 373 more than the previous high (115% of the previous best quarter). Their hope is that this quarter represents an inflection point for a successful second half of the project. They will also train more students to contribute to transcription work to boost those numbers during the upcoming quarter.

DUKE's three work-study students began transcribing again in September after summer break and three new students were trained.

F barcoded over 3,000 lichen specimens as part of a public engagement activity over a weekend in July. They are currently in a slight transition period with staffing, retaining some summer interns that are continuing as fall/winter interns and two part time collections staff. They continued databasing and imaging, with a focus on imaging lichen specimens and databasing bryophytes.

FLAS added three new hires onto the project, and currently has five student employees barcoding, imaging, and transcribing.

ILL & ILLS continued digitizing bryophytes. Their Collections Manager has been working on databasing bryophytes and one undergraduate student has been working on repackaging bryophytes this quarter.

LSU continued to transcribe bryophyte and lichen records already in the portals. In-house georeferencing included completion of records based on labels containing lat/long data. A volunteer continued to image specimens. A technician/project manager was re-hired in September and is working to assist with imaging and help to clean the bryophyte records. Two undergrads hired over the summer continued to work into the fall semester.

MICH continued digitizing lichens and bryophytes. Two technicians and two undergraduate students have been working in the herbarium on digitizing lichens this quarter.

Progress at MIN was slower over the summer months with only four students working on the project. Two worked remotely on bryophyte transcription and two worked in-person on imaging lichen specimens.

NY hired two interns in this period and has been able to continue imaging their general lichen collection while beginning barcoding both hepatic and moss collections simultaneously.

At PH, the 6-month undergraduate hire (32.5 hrs/week) finished at the end of September, having completed imaging all of the lichen collection and imaging a good portion of the remaining bryophyte specimens. Specimen records were transcribed by staff and volunteers. Transcriptions and image links of type and special collection, housed in their institutional Symbiota, were transferred to the Lichen (3,000 records) and Bryophyte (1,400 records) Portals.

TENN students continued barcoding, imaging, and transcribing bryophyte specimens. They are getting very close to finishing the mosses! Two of their undergraduate curatorial techs graduated and moved on to new adventures at the beginning of August. They have two continuing undergraduate techs and one new intern. The GLOBAL Project Manager began the interview and hiring process to bring on four new undergraduate curatorial techs.

UC continued with a team of three work study students who are digitizing lichens and bryophytes. They hired a recent grad to assist with this process including pulling and filing specimens for digitizing. They finished with our lichen collections and have moved on to bryophytes! No digitalization was completed during the summer break.

WIS continued georeferencing, retaining two students who had graduated in spring. WIS collaborative georeferencing is focused on initial passes over countries well represented on the portals, especially Europe and Scandinavia.

Digitization

Seventeen institutions (ASU, CINC & MU, COLO, DUKE, F, FLAS, ILL & ILLS, LSU, MICH, MIN, MO, NY, PH, TENN, UC, WIS, and YU) reported progress on digitization deliverables, with a total of 71,036 specimens barcoded (32,435 bryophytes and 38,601 lichens), 44,207 labels imaged (22,945 bryophytes and 21,262 lichens), 32,342 specimens imaged (23,497 bryophytes and 8,845 lichens), 29,039 specimen records uploaded to the portal (13,870 bryophytes and 15,169 lichens), 44,982 skeletal records created (28,521 bryophytes and 16,461 lichens), 30,795 labels fully transcribed (20,460 bryophytes and 10,335 lichens), and 23,236 specimens georeferenced (13,287 bryophytes and 9,949 lichens) (See Table 1 & Figure 1). The quarterly total for barcoding was the highest yet. (See Figure 2).

Table 1: Digitization progress by GLOBAL collaborators in 2022-Q3, 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	385	16,319		148		119	344	407		407		407		407
BRY														
CINC & MU	1,680		2,268		2,268		2,268		1,680		1,319			
COLO	500	9,184	264	8,684			264	8,684	264	8,684		2,846		
DUKE	1,560		946		57		1,003		810		1,123		30	
F	3,000	4,800	182	3,176	182	3,176		3,176	4,934	123				
FLAS	3,250		2,840		2,840		2,840							
ILL & ILLS	430										7,630			
LSU					1,977						1,310	6,178	709	2,725
MICH	306	4,167	306	4,167	34	463			306	4,167	14		16	1
MIN		1,762		1,762		1,762			2,465		3,079			
MO	5,004		3,950		3,950				4,010		150		85	
MSC														
NY	5,685	2,179	408	2,424	408	2,424			5,685	2,179	1,487	102	1,249	60
OSC														
PH	4,573	136	4,573	136	4,573	136		136		136	284	802		5
TENN	3,204		4,223		4,223		4,393		3,596		4,064		4,387	
UC	100	54	227	765	227	765			227	765				
WIS								2,766					6,811	6,751
YU	2,758		2,758		2,758		2,758		4,544					
Totals	**32,435**	**38,601**	**22,945**	**21,262**	**23,497**	**8,845**	**13,870**	**15,169**	**28,521**	**16,461**	**20,460**	**10,335**	**13,287**	**9,949**
B+L Totals		**71,036**		**44,207**		**32,342**		**29,039**		**44,982**		**30,795**		**23,236**

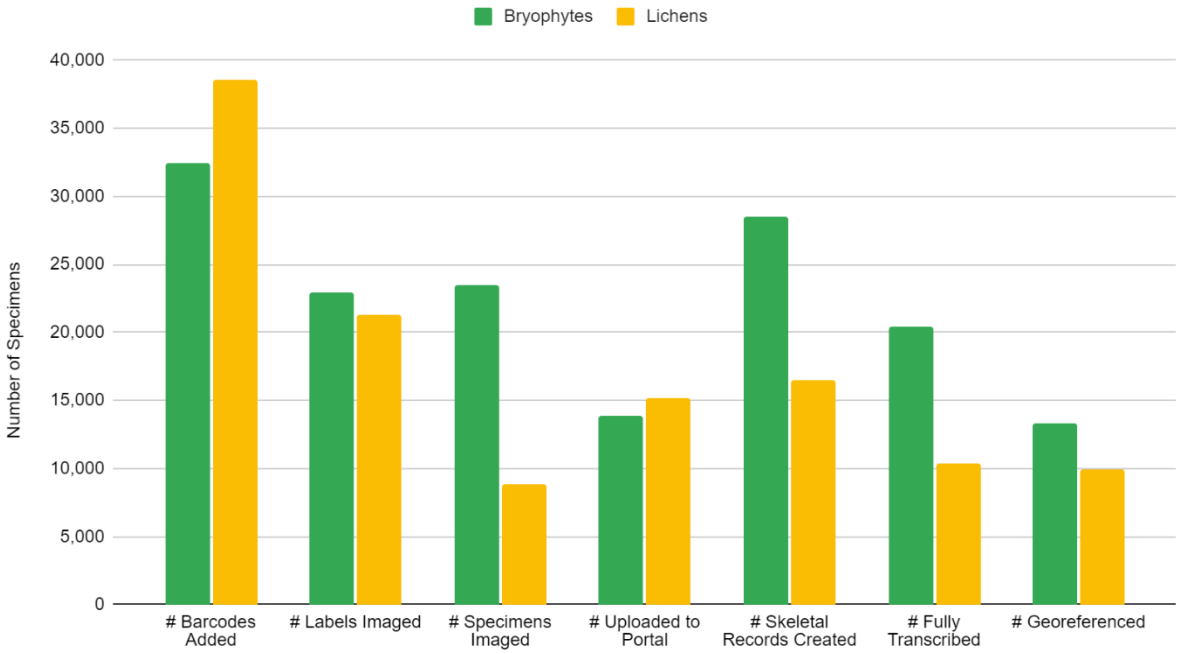


Figure 1: Digitization progress for the GLOBAL collaboration in 2022-Q3, separated by Bryophyte and Lichen specimens.

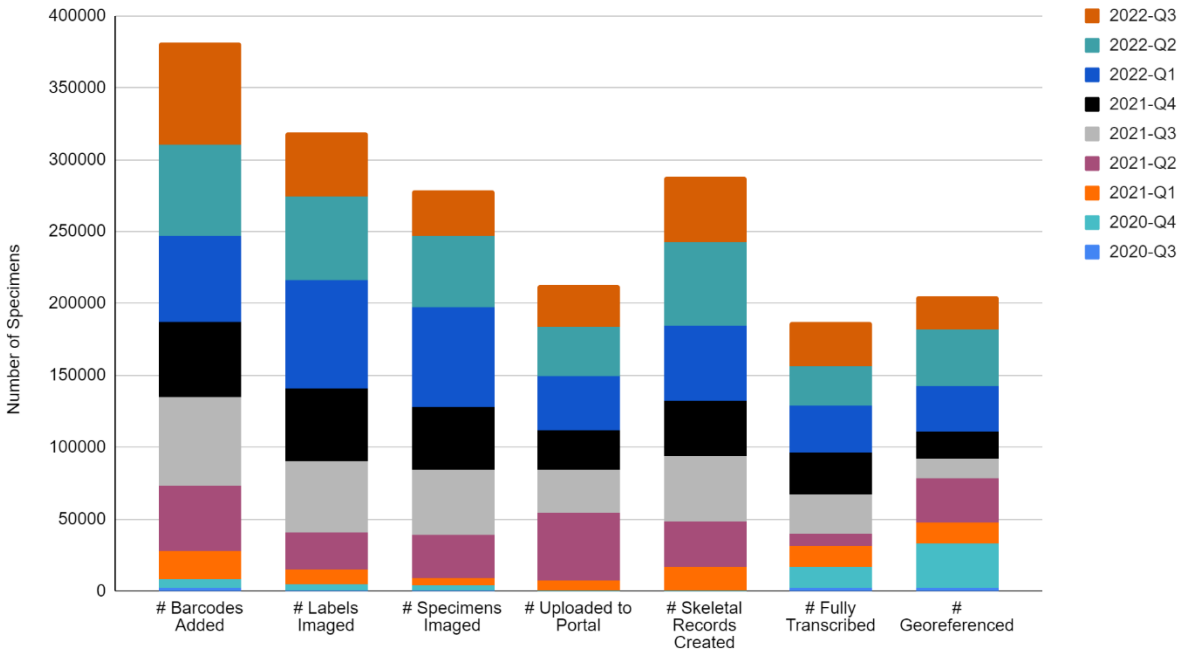


Figure 2: Cumulative digitization progress for the GLOBAL collaboration by quarter.

Share Best Practices, Standards, and Lessons Learned

Flexible Workflows

The GLOBAL teams continued to make use of flexible digitization workflows in 2022-Q3, including some use of virtual transcription work and prioritizing label imaging, while most collaborators were able to continue on-site work.

At COLO, based on preliminary work, the quality of specimen images is hampered by using a fixed imaging system to capture both packet/label data and specimens. They will most likely retake the specimen images later in the project when we have a system in place for capturing better specimen images. They are planning to capture both packets and specimens for the bryophyte collection in the same pass using two separate cameras and will circle back for lichen specimen images. Since no transcription work was completed on their non-North American specimens, they did not have records for the first wave of georeferencing work at WIS. They are prioritizing records from Australia, Finland, France and Sweden for transcription to build sets for georeferencing. They will be adding Chile, Japan and Norway to this priority list starting next quarter.

Duplicate Matching

The Portal Manager (ASU) added two additional publicly available international bryophyte collections for duplicate matching, which included over 49,000 bryophyte specimens with coordinates from the Komi Scientific Centre, Russian Academy of Sciences (SYKO) and 21,000 bryophyte specimens from the Osaka Museum of Natural History (OSA).

Collaboration

Team members continued to make use of Basecamp, Zoom, and email to communicate and collaborate during 2022-Q3. New collaborators and students were given access to Basecamp group resources. The Outreach & Education Group met in September to discuss ongoing projects and in preparation for the October WeDigBio event. The Executive Committee also met in September and discussed plans for the GLOBAL interface, re-naming / rebranding the portals to be more inclusive of international collaborators / contributors, and how best to engage the Executive Advisory Committee.

A Management Committee Meeting was held in August open to all GLOBAL team members to review 2022-Q2 and Year 2 grant progress and provide an open forum to the GLOBAL team.

WIS continued its collaborative georeferencing, creating new communities in the CoGe interface and georeferencing as fully transcribed records become available. The GLOBAL Geoferencing Manager (WIS) and Portal Manager (ASU) continued to consult on georeferencing workflows, especially those involving GEOLocate CoGe.

Share Identified Gaps in Digitization Areas and Technology

Barcode Renaming

The next version of ASU's BCRWatcher (0.9.0.2.) was released at https://help.lichenportal.org/index.php/en/bcrwatcher/. This new version includes several significant improvements and bug fixes (better barcode recognition, additional metadata fields, etc. - for details see the instructions).

Taxonomy

At COLO, the taxonomic dropdown for the ImagingWorkflow application was missing many of the names we use in our collection. Last fall they worked with Portal Manager Katie Pearson to get an export of the lichen taxonomic thesaurus and Ryan Allen reformatted this list so it could be added to the application. It is difficult to quantify the impact since every imaging session is different, but most specimens do not require manual entry. COLO will be testing the new image upload process starting with their Bryophytes captured in September.

Database Compatibility

MICH's uploading to the project Symbiota portals has been suspended this quarter due to an impediment with their institutional IPT export from Specify. They're optimistic that this issue will be resolved soon.

Share Opportunities to Enhance Training Efforts

The GLOBAL Project Manager (TENN) and Georeferencing Manager (WIS) continued compiling transcription and georeferencing resources during 2022-Q3 to share on Basecamp and all resources were posted to the project website (https://globaltcn.utk.edu). Students continued contributing to a shared document of Transcription tips and tricks available to student digitizers across the collaboration.

ASU continued to provide regular user support through the Symbiota Support Hub. Monthly Monday meetings by the Support Group are open to all members of the Symbiota community and generally well attended. More tutorials have been added to the Symbiota Documentation by the Symbiota Support Hub at https://biokic.github.io/symbiota-docs/.

The LSU Collections Manager attended several Symbiota Help sessions for various TCNs. These are often recorded and available from their website, and are very helpful for sharing information about Symbiota and linking with GBIF.

NY presented a short talk at BioDigiCon 2022 on both their open copy stand for photographing packets mounted on sheets and also the photoshop tools they use to auto crop and add digital rulers.

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

As part of ASU's efforts reaching out to the Latin American community, Venezuelan lichenologist Jesús Hernández was hired as free-lancer (on non-Global funding) to do a user survey of the participants of the Consorcio de Herbarios de Líquenes en América Latina and to provide technical support to that community. Undergraduate student Erin Eggenberger is working on uploading Latin American Checklists data as part of her independent student research project.

Ongoing collaboration between GLOBAL teams and other TCN projects (including PCC, All-Asia, and SoRo) occurring concurrently at their sites continued at CINC & MU, COLO, MICH, NY, and WIS, where personnel, resources, and learnings were often shared between projects.

TENN Project Manager participated in the quarterly iDigBio Internal Advisory Committee Meeting in August with other TCN participants.

TENN PI and Project Manager, along with CINC's Eric Tepe and FLAS's Alan Franck, reviewed and gave feedback on a PEN proposal for the Bishop Museum herbarium (BISH) the University of Hawaii (HAW), and the National Tropical Botanical Garden (PTBG).

Rikke Naesborg, Tucker Lichenologist and Curator of the Lichenarium at the Santa Barbara Botanic Garden (SBBG) was given access to our Basecamp resources.

Share Opportunities and Strategies for Sustainability

Portal Management

ASU continued to host and maintain the Bryophyte and Lichen Portals, including nightly backups, regular software updates, adjustments to portal configurations and layout, etc. They have also continued to support image uploading, regularly update snapshot collections from international collections monthly, and troubleshoot any import issues that accompany this procedure.

As an associate of the IUCN Lichen Specialists Red-Listing group, the Global IUCN Red-Lists of Lichens continue to be regularly updated in the Consortium of Lichen Herbaria. The ASU Symbiota IT team recently added a new GBIF citation applet to both the Bryophyte and Lichen Consortium. The applet tracks specimen citations in scientific data sets that were supplied from the Consortium to GBIF, downloaded and analyzed by researchers in their scientific publications.

Taxonomy

ASU continued regular updates of the taxonomic thesaurus with support of Gary Perlmutter, Jason Hollinger, and Alan Fryday. The newest version #25 of Ted Esslinger's North American Lichen Checklist is now available from the North American Lichen Consortium. In coordination with the GLOBAL Managing Committee, a strategy was devised to better integrate and streamline existing portals. All current bryophyte portals will be integrated into one single Consortium of Bryophyte Herbaria; the different lichen sites will be merged into a single Consortium of Lichen Herbaria. Both sites will provide tools to query data across different Symbiota portals using the newly developed API. New endpoints have been added to the API with API documentation appropriately extended (https://lichenportal.org/cnalh/api/v2/documentation, https://bryophyteportal.org/portal/api/v2).

ILL & ILLS have developed a taxonomic report which displays a summary of unresolved taxa associations within Symbiota portal collections. This clear, and concise, report provides targeted data to facilitate portal taxonomy updates, from both internal and external resources. Taxa identified in the report can be updated using combinations of existing Symbiota taxonomy tools, and custom functions provided by this plugin. Documentation for installing the taxonomy

plugin, and supporting framework, is being finalized before releasing the code for use by other Symbiota portals.

Back Ups

COLO's raw images and JPGs continue to be 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 they have a computer or hard drive failure. Monthly backups of the COLO database in the Lichen and Bryophyte 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 they ever need a point in time backup of their data.

UC is moving their internal collections space platform to a new server.

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

The GLOBAL TCN website (https://globaltcn.utk.edu) was maintained and updated with additional links to developed protocols and workflows. Social media accounts belonging to collaborators continued using #GlobalTCN as a way to share progress with the community. The Instagram feed was restored on the website following some connection issues.

In July, ASU PI F. Bungartz taught a workshop about the Lichen Consortium (in Spanish) at an international meeting of the Grupo Latinoamericano de Liquenólogos (GLAL XV), virtually in Argentina.

DUKE led a lichen-collecting field trip for four amateur botanists (non-students) to the North Carolina mountains in August.

F has a number of volunteers doing pre-digitization curation activities preparing specimens for digitization for both lichens and bryophytes. They are also using public events to barcode bryophyte and lichen specimens, and participated in several public outreach programs.

Two LSU CURE Biology Class tours of the herbarium (24 students per class) were led by the Collections Manager. These classes are engaged in research-based work using herbarium specimens.

NY presented a short talk at BioDigiCon 2022 on both their open copy stand for photographing packets mounted on sheets and also the photoshop tools they use to auto crop and add digital rulers.

TENN Lead PI J. Budke presented a talk on the GLOBAL project at BioDigiCon in September.

TENN continued hosting the GLOBAL weekly transcription event on Fridays during 2022-Q3. Ten community science volunteers from three countries participated (US, Canada, India) and transcribed skeletal data for over 500 specimens. Volunteers were also able to see a number of "Specimen Spotlight" presentations on specimens and collectors compiled by the TENN GLOBAL Project Manager.

The GLOBAL Outreach & Education group met in August. F, the lead outreach institution, shared updates on programs and educational materials being created. The team discussed plans and next steps for ALA's educational videos and began WeDigBio planning. The GLOBAL collaboration was polled to choose topics for the educational videos.

WeDigBio

Six GLOBAL collaborators (DUKE, COLO, CINC & MU, F, FLAS, TENN) agreed to participate in the October 2022 WeDigBio. They held one WeDigBio Planning Meeting in September to discuss initial logistics. The dates and times were chosen and they began creating print, virtual, and social media advertising for the event.

Share Information About Your Website and/or Portal Usage

Google Analytics for the GLOBAL project website, https://globaltcn.utk.edu, had some connectivity issues, so usage data was not captured for 2022-Q3. The connection was reestablished and will be reported for most the following quarter in our next report.

The Bryophyte and Lichen Portals, created as part of the original LBCC grant, host new images and data produced by the GLOBAL collaborators. Over 15,000 users visited the Bryophyte Portal (more than double the 7,000 from the prior quarter) and over 23,000 users visited the Lichen Portal during 2022-Q3 (see Figures 3 & 4).

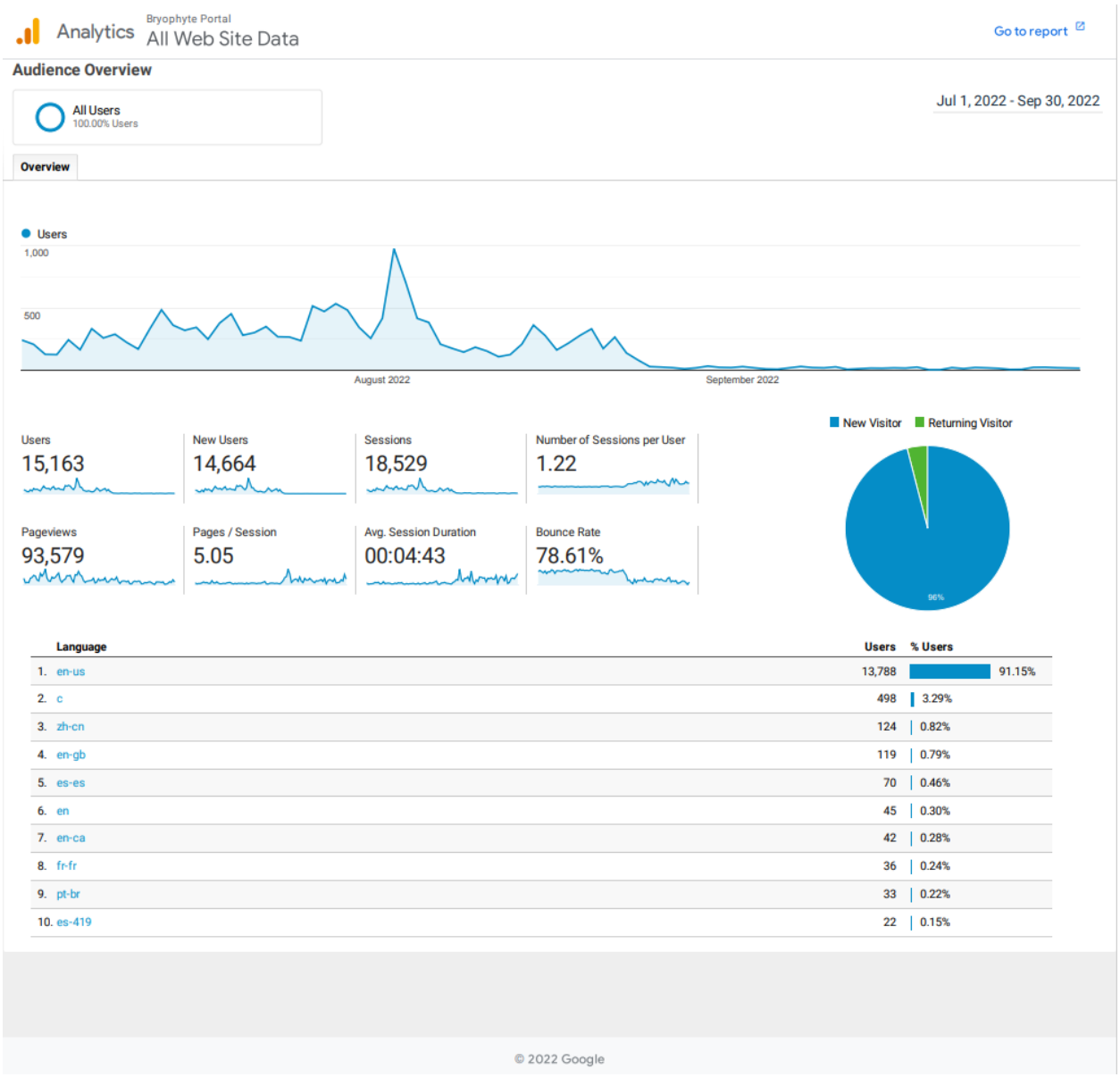


Figure 3: Use metrics for the Bryophyte Portal (https://bryophyteportal.org/portal/) from July 1- September 30, 2022.

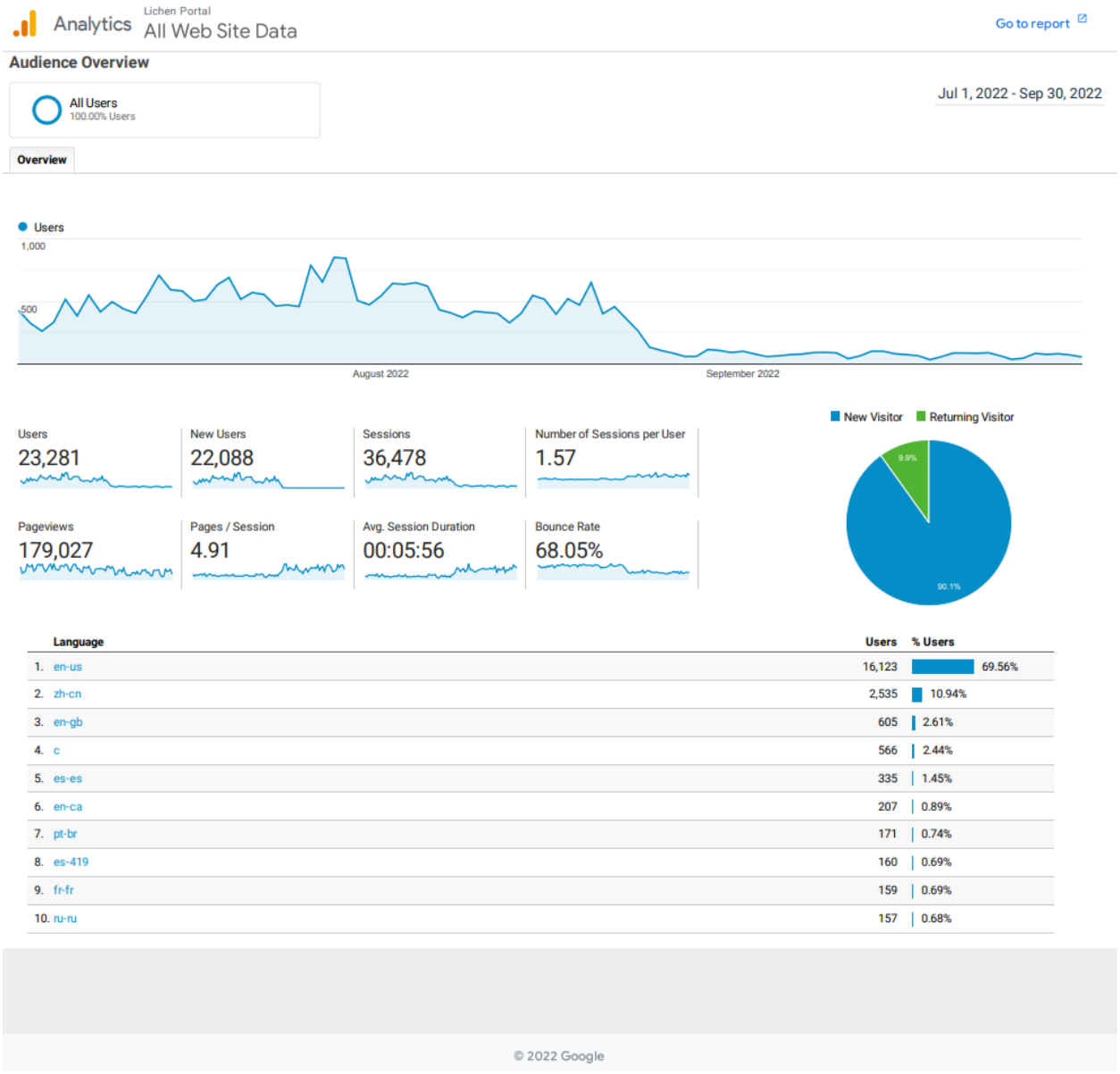


Figure 4: Use metrics for the Lichen Portal (https://lichenportal.org/cnalh/) from July 1-September 30, 2022.

Share Other Activities and/or Progress

Annual Reporting

GLOBAL Project Manager helped all teams with Annual NSF Reporting and completed the Integrated Annual Report for Year 2.

Image Tagging

As part of revising the lichen identification character matrix, a Glossary of lichen characteristics authored by F. Bungartz is now available from the Lichen Consortium. Currently this glossary provides text definitions only. Illustrations are currently being added (an example definition with illustrations can be found for the term lecanorine).

Lichen Images

ASU added 7,939 high resolution lichen macrophoto field images from renowned professional photographers Steven Sharmoff and Sylvia Duran Sharnoff (co-authors of Lichens of North America). These images represent 1429 species, largely from North America. All images are stored as a virtual specimen collection, named the "Sharnoff Image Collection (hb. Sharnoff-photos)"; all image records are linked to their voucher specimen records in UCR (in transfer to SBBG) and CANL.

TCN Quarterly Progress Report

Prior to each IAC meeting, TCNs are asked to complete a quarterly progress report in the areas outlined below. The TCN Lead PI or Project Manager collects information from all collaborators and compiles them into one overall progress report for the TCN. The TCN Lead PI or Project Manager then submits the quarterly reports via an email to Cat Chapman. An archive of previously submitted reports is available on the Internal Advisory Committee wiki page.

TCN Name

Using Herbarium Data to Document Plant Niches in the High Peaks and High Plains of the Southern Rockies - Past, Present, and Future (SoRo)

Person Completing the Report

J Ryan Allen Project Manager

Share Progress in Digitization Efforts

Collectively for the current quarter roughly August 2022-October 2022 we have entered 4,706 new records into databases, barcoded 4,080 new specimens, imaged 6,412 new specimens and georeferenced 13,628 new records.

Our overall project totals are: 486,197 new database records, 1,024,843 newly barcoded specimens, 1,056,282 new images and 508,683 new georeferences.
The project after ~62 months (out of 48) has completed.
Data Entry 88.1%
Barcodes 117.9%
Images 123.3%
Georeferencing 82.5%

The SoRo TCN requested a second no-cost extension to finish the project and the project has been extended to 8/2023. Most collections have finished digitizing or will finish during the next quarter. The focus of the second no cost extension will be website upgrades and consortium wide georeferencing.

Share Best Practices, Standards, and Lessons Learned

RSA: Families and genera with the highest representation of SoRo specimens in the RSA collection are targeted for the project. In our last report we indicated that we were barcoding and imaging Asteraceae and Cactaceae, which have very strong representation of SoRo targeted specimens. These efforts are still ongoing. We anticipate completing the imaging of

these two families by January 2023. Our strategy has been to assign staff to database a given family for one or two states in the SoRo project in order to make more records available for the georeferencing stage has worked very effectively in increasing our databasing and georeferencing efforts, and also gives the staff a sense of satisfaction when smaller chunks of data entry can be completed.

Share Identified Gaps in Digitization Areas and Technology

CSCN images captured before September 1st 2022 are now all uploaded to the Symbiota servers. We will continue to update as new images are transferred. Images are being transferred to COLO for compression prior to uploads. To date 43,915 specimen images have been uploaded. Ongoing work is needed to add accession numbers to images and link these images back to existing database entries.

GREE is working through the same process with image compression happening locally. 21,600 specimens have been now been linked to images as of 10/31/2022.

SJNM There are 9055 records in SEINET for which we do not have an associated catalog number. We will be looking into whether we missed imaging these or if these are duplicate records.

RSA: We have made significant progress in our barcoding and imaged; we have exceeded the former and are very close to approaching 100% on the latter. We are at 71% complete in our data entry efforts. Georeferencing is the one task that is lagging behind, with 45% of our records georeferenced, in large part because the georeferencing relies heavily on specimens first being transcribed. We could have benefited from the CCH2 portal (where we are live managed) being linked to the other Symbiota portals to easily port over georeferences from the SoRo portal. Other issues concern a significant turnover in staff in the herbarium. Within a 6 week timespan, 5 curatorial staff left, and each staff member participated in a significant way in digitizing the collections. We have just hired one intern for the project that will work specifically on data entry and georeferencing tasks.

Share Opportunities to Enhance Training Efforts

RSA: I have developed a series of “herbarium enrichments” for my staff to provide them with more context when working with the specimens. These are half hour to 45-minute presentations that cover such topics as history of plant classification, type specimens, and nomenclature.

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

COLO: is also on the GLOBAL TCN and All-Asia TCN, we have been sharing resources and tips from the SoRo TCN to help the project.
NYBG is the lead on the Endless Forms TCN and part of the All-Asia TCN
RSA: is also on the Endless Forms (NYBG as lead), CAP TCN and All-Asia TCN and an ICBR grant with BRIT (to curate, digitize, and create an extended specimen network for the Sherwin Carlquist collection) and the Africa TCN to digitize our Africa holdings, recently awarded in August/September of 2022. Lead PI and institution is Town Petersen, at KU.

HUH, NYBG, RSA, BRU and COLO are all members of the All-Asia TCN and we hope to apply lessons learned in this project to the new TCN.

Share Opportunities and Strategies for Sustainability

COLO: We are continuing to work with collections that do not have an institutional backup in place to store and archive a JPG version of the images captured under the project. Our goal was to get local backups in place at all institutions if possible. Where needed, these images will be stored on CU research computing along with the data generated at CU for this and other digitization projects.

RSA: All data (images, databased records, georeferenced coordinates) have been entered directly into RSA's institutional database. This has always been maintained with institutional support and does not rely on external funding. Our database is live managed in Symbiota (through the CCH2 portal. All data generated as part of this project will become part of California Botanic Garden's digital assets, and are managed in accordance with our digital asset management plan and will persist indefinitely.

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

COLO participated in WeDigBio in October of 2022. The focus was primarily specimens for our GLOBAL TCN
RSA: During this last quarter the RSA Herbarium has given nine tours to 94 participants. Of those tours, six were given to academic institutions in the Greater Los Angeles Metropolitan area. One institution, Mt San Antonio Community College, is a Hispanic Serving Institution (HSI; https://www.hacu.net/hacu/HSIs.asp). For some institutions that wish to waive their tour fee, we offer the option to "volunteer" half an hour of their time in exchange for a tour of the collections. Students from two classes at Mt San Antonio Community College barcoded ~1,200 specimens in the Annonaceae family as part of their volunteer time. Turning a passive tour into

an active one for the students, they learned about all of our digitization projects, including the SoRo project, the Annonaceae family, as well as learning about the RSA collection, best practices with specimen handling, and working in an herbarium. For all of the tours we emphasize the digitization projects we participate in, notably the SoRo project.

Share Information About Your Website and/or Portal Usage

Google Analytics
This Quarter (August 1st 2022-October 31st 2022) had 5,659 users over 6,036 sessions and 19,502 pageviews.

Last Quarter (May 1st 2022-July 31st 2022) had 19,199 users over 19,511 sessions and 32,935 pageviews.

Two Quarters back (February 1st-April 30th 2022) had 8,533 users over 9,151 sessions and 25,819 pageviews.

There was a significant jump in activity the quarter before this one and this quarter's usage appears to be a return closer to our previous baseline. New security measures to help prevent bot accounts and web injection via checklists seem to be working. Current use is probably more representative of actual site use now that the new security measures are in place. We suspect that most of the data use is still through the primary SEINet portal.

Share Other Activities and/or Progress

Most of the collections on the project have now exhausted funding. Three of the four collaborative awards (HUH, NY and RM) have finished digitization and have submitted their final report. Most of the remaining subawards have submit the last of their digitization updates or will do so next quarter. COLO, RSA and UNM have been awarded no-cost extensions. COLO is in the process of closing subawards and will evaluate residual funds. Remaining funds will mostly be dedicated to georeferencing and data entry, but COLO will also be working on upgrades to the soroherbaria web portal.

RSA: We put in for a no cost extension (NCE) to complete remaining work on the grant. This NCE will extend until January 31, 2023, at which time we will have exhausted all funds. We will continue beyond the life of the grant to meet the grant goals – our emphasis at this stage is to georeference target records. The intern that we have hired has experience with mapping, so we anticipate bringing our georeferencing totals closer to what we specified in the grant.

Analytics | SoRo SEINet
All Web Site Data

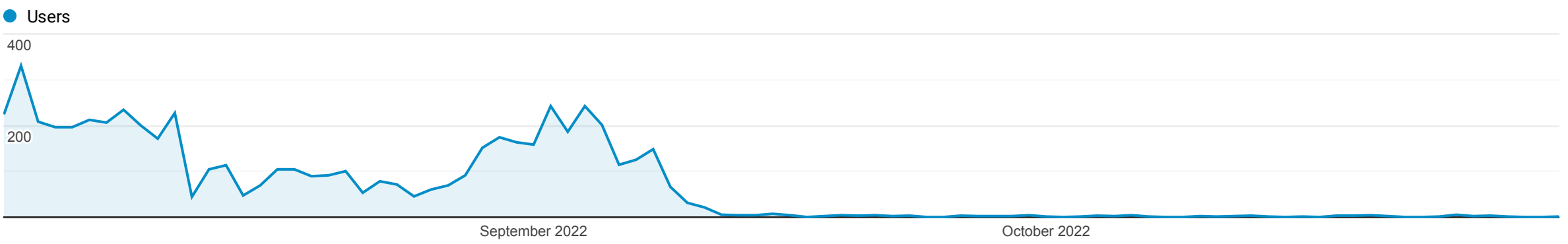
Go to report

Audience Overview

All Users
100.00% Users

Aug 1, 2022 - Oct 31, 2022

Overview



Users	New Users	Sessions	Number of Sessions per User
5,659	5,636	6,036	1.07

Pageviews	Pages / Session	Avg. Session Duration	Bounce Rate
19,502	3.23	00:02:17	92.28%

	Language	Users	% Users
1.	en	3,423	60.49%
2.	en-us	1,994	35.24%
3.	c	81	1.43%
4.	zh-cn	55	0.97%
5.	en-gb	13	0.23%
6.	es-es	13	0.23%
7.	nl-nl	12	0.21%
8.	id	4	0.07%
9.	es	3	0.05%
10.	es-us	3	0.05%

TCN Quarterly Progress Report

TORCH TCN — Quarterly Report

Reporting Period: August 1st, 2022 - October 31st, 2022
Assembled by BRIT on November 1st, 2022, for Nov. 2nd IAC meeting

TCN Name

American Crossroads: Digitizing the Vascular Flora of the South-Central United States
(Short Code: TORCH TCN)

Person Completing the Report

Diego Barroso, TORCH TCN Project Manager <dbarroso@brit.org>

Institutions reporting:

BAYLU – Baylor University
BRIT – Botanical Research Institute of Texas
HUH – Harvard University **(newly completed)**
KANU – University of Kansas **(completed in the past)**
MO – Missouri Botanical Garden
NOSU – Northeastern State University **(newly completed)**
NY – New York Botanical Garden **(completed in the past)**
OKL – University of Oklahoma, also including data for the University of Science and Arts of Oklahoma (**OCLA**).
OKLA – Oklahoma State University, also including data for University of Central Oklahoma **(CSU)**
SHST – Sam Houston State University
TAES – Texas A&M University-College Station
TAMUCC – Texas A&M University-Corpus Christi
TEX-LL – Plant Resources Center at University of Texas at Austin, and Data Providers
TTC – Texas Tech University **(newly completed)**
UTEP – University of Texas at El Paso **(completed in the past)**

Share Progress in Digitization Efforts

Progress in Digitization Efforts:

* Number Number of skeletal records created:

BAYLU = 0

BRIT = 0

HUH = 0 **(completed)**

KANU = 0 **(completed)**

MO = 0

NOSU = 0 **(completed)**

NY = 0 **(completed)**

OKL = 784

OKLA = 4,599 (19,684 total)

SHST = 13,500

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	0
Angelo State University (SAT)	0
Fort Worth Nature Center (FWNC)	0 **(completed)**
Howard Payne University (HPC)	0
Lady Bird Johnson Wildflower Center (JWC)	0 **(completed)**
Our Lady of the Lake University (LLC)	0
Saint Edward's University (SEU)	0 **(completed)**
Sul Ross State University (SRSC)	1,167
Texas Lutheran University (TLU)	0
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0

Sub-Total for TEX-LL & data providers: 1,167

TTC = 0 **(completed)**

UTEP = 0 **(completed)**

Total skeletal records created this quarter: 20,050

* Number of fully-transcribed records created:

BAYLU = 8,913

BRIT = 14,129 (10,129 staff and volunteer transcriptions + 4,000 community science Notes from Nature-generated transcriptions)

HUH = 1,307 **(completed)**

KANU = 0 **(completed**; total number of fully transcribed records from OK and TX = 27,566**)**

MO = 0

NOSU = 30 **(completed)**

NY = 0 **(completed**; total number of fully transcribed records from OK and TX = 84,500**)**

OKL = 784

OKLA = 3,400 (18,485 total)

SHST = 145 ? (24,145 total Staff and Volunteer transcriptions)

TAES = 100

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL) 1,583
Angelo State University (SAT) 0

Fort Worth Nature Center (FWNC)	0 **(completed)**
Howard Payne University (HPC)	0
Lady Bird Johnson Wildflower Center (JWC)	0 **(completed)**
Our Lady of the Lake University (LLC)	0
Saint Edward's University (SEU)	0 **(completed)**
Sul Ross State University (SRSC)	551
Texas Lutheran University (TLU)	425
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0

Sub-Total for TEX-LL & data providers: 2,559

TTC = 0 **(completed)**

UTEP = 0 **(completed**; total number of records from TX & OK = 27,573**)**

Total fully-transcribed records created this quarter: 31,367

* Number of specimens imaged:

BAYLU = 101

BRIT = 3,048

HUH = 1,307 **(completed)**

KANU = 0 **(completed**; total number of imaged specimens from OK and TX = 24,400**)**

MO = 0

NOSU = 0 **(completed)**

NY = 0 **(completed**; project total = 53,600**)**

OKL = 4,012 (OKL: 1,644 + OCLA: 2,368)

OKLA = 3,692 (OKLA: 261 (76,745 total) + CSU: 3,431 (10,093 total))

SHST = 13,500

TAES = 2,000

TAMUCC = 152

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	15,065	
Angelo State University (SAT)	0	
Fort Worth Nature Center (FWNC)	0	**(completed)**
Howard Payne University (HPC)	0	
Lady Bird Johnson Wildflower Center (JWC)	0	**(completed)**
Our Lady of the Lake University (LLC)	0	
Saint Edward's University (SEU)	0	**(completed)**
Sul Ross State University (SRSC)	1,167	
Texas Lutheran University (TLU)	4,031	
Texas State University (SWT)	0	
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	4,713	

Sub-total for TEX-LL & data providers: 24,976

TTC = 0 **(completed)**

UTEP = 0 **(completed)**

Total number of specimens imaged this quarter: 52,788

* Number of specimens georeferenced:

BAYLU = 1,907

BRIT = 106

HUH = 0 **(completed)**

KANU = 0 **(completed**; total number of georeferenced specimens from OK and TX = 27,351**)**

MO = 0

NOSU = 0 **(completed)**

NY = 0 **(completed**; total number of georeferenced specimens from OK and TX = 78,718**)**

OKL = 506

OKLA = 170 (11,599 total)

SHST = 200

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	311
Angelo State University (SAT)	0
Fort Worth Nature Center (FWNC)	0
Howard Payne University (HPC)	0
Lady Bird Johnson Wildflower Center (JWC)	0
Our Lady of the Lake University (LLC)	0
Saint Edward's University (SEU)	0
Sul Ross State University (SRSC)	0
Texas Lutheran University (TLU)	230
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0
Sub-Total for TEX-LL & data providers:	541

TTC = 0 **(completed)**

UTEP = 0 **(completed)**

Total number of specimens georeferenced this quarter: 3,430

* Other digitization or pre-digitization efforts:

For the whole TORCH TCN Project: In coordination with the Symbiota Support Hub, a Portal Advancement Campaign has been scheduled for the upcoming month of November and the first week in December.

BAYLU: Mounting of approximately 250 new specimens.

BRIT:

Data-cleaning of records generated from Notes from Nature.

We continue locating TORCH records for complete transcription through institutionally supported skeletal transcriptions of specimens from general imaging sessions through the crowd-sourcing module in Symbiota.

Completed transcription of all specimens loaned from the Balcones Canyonlands National Wildlife Refuge Herbarium (Herbarium Code BCNWR).

Launched two Notes from Nature expeditions concentrating on Texas specimens and completed one of these.

HUH: Nothing new to report. **(completed)**

KANU: None. **(completed)**

MO: Herbarium staff (on institutional funds) have been going through the collection to sort and flag the Texas and Oklahoma specimens in preparation for imaging.

NOSU: Nothing new to report. **(completed)**

NY: (completed)

OKL: Nothing new to report.

OKLA: Nothing new to report.

SHST: Nothing new to report.

TAES: Nothing new to report.

TAMUCC: Preparing new specimens to be digitized, by mounting and labeling.

TEX-LL: We have ceased separate tracking of our digitization efforts for UT Rio Grande Valley – Brownsville (RUNYON) for purposes of this grant because its merger into TEX is now complete. Its holdings are being incorporated into the TEX-LL workflow and reporting.

TTC: Nothing new to report. **(completed)**

UTEP: (completed)

* Comments about digitization progress:

HUH: We have **completed** digitization activities for the TORCH project. A total of 50,794 records have been mobilized with digital images and detailed records.

MO: The pre-imaging sorting has been progressing much more slowly than anticipated, and staffing shortages in the herbarium have significantly limited progress. However, we are actively recruiting another digitization technician, which will bring our imaging capacity to roughly 40,000 specimens per month. We hope to have the specimen sorting and technician recruitment finished by the end of the year, at which time we will commit to an intensive push on the TORCH specimens to finish the imaging quickly.

NOSU: We have **completed** digitization activities for the TORCH project.

SHST: Progressing very fast with barcoding and imaging of specimens.

TEX-LL:

We are still behind our schedule due to the earlier COVID shutdown, which was exacerbated by the slow recovery of in-person efforts and the occasional student worker who becomes infected and misses a week or more of work.

We are also continuing to experience slower than expected progress with a few of our data provider institutions (who are doing their own digitization), notably Howard Payne and Sul Ross.

We finished barcoding and imaging nearly all of the specimens from Texas Lutheran University (TLU) and UT Rio Grande Valley–Edinburg (PAUH), and are working on associating the images with their records in Symbiota. We are also starting to image specimens from Texas State University (SWT) and the University of Houston Coastal Center (UHCC).

We are discovering, based on our imaging efforts, that the number of specimens reported in the original proposal table for Texas Lutheran University (TLU) was an underestimate, and a significant number of sheets previously have not been transcribed into Symbiota. Thus, the task of completing records from this data provider institution will take longer than expected.

The fall semester began on August 22, with students slowly matriculating back into the city a week or so before then. During this time, our TORCH-dedicated student employees returned to begin work, and we hired additional new employees under the grant. This significantly increased our workflow progress in recent weeks as these new workers become fully trained.

TTC: We have **completed** digitization activities for the TORCH project.

All other institutions: Nothing new to report.

* Number of records available in iDigBio portal (cumulative):

BAYLU = 0

BRIT (Searched all collections on October 24th, 2022, with Kingdom = Plantae, and collected in Texas or Oklahoma):

BRIT-SMU-VDB-NLU:	179,482
TAC:	7,064
NTSC:	0
ACU:	0
HSU:	0
TCSW:	0
BCNWR:	0

Sub-total for BRIT Lead: 186,546

HUH = **(completed)** 50,794 TORCH-related specimens

MO (Searched October 31st, 2022, with Kingdom = Plantae):

30,439 TORCH-related specimens
(23,913 TX + 6,526 from OK)

NOSU = **(completed)** 0

OKL = 0

OKLA = 0

SHST = 0 (Searched on October 15th, 2022)

TAES = 0

TAMUCC = 0

TEX-LL and Data-Provider Institutions (searched Oct. 21st, 2022):

University of Texas at Austin (TEX-LL)	243,615
Angelo State University (SAT)	0
Fort Worth Nature Center (FWNC)	0
Howard Payne University (HPC)	22,909
Lady Bird Johnson Wildflower Center (JWC)	0
Our Lady of the Lake University (LLC)	0
Saint Edward's University (SEU)	0
Sul Ross State University (SRSC)	0
Texas Lutheran University (TLU)	7,578
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0

Sub-total for TEX-LL & data providers: 274,102

TTC = **(completed)** 23,605

Total number of records available in iDigBio portal (cumulative) from institutions that were active this Quarter:

565,486 from Texas and Oklahoma

* Number of records available in TORCH Symbiota portal (cumulative):

BAYLU = 50,663

BRIT: (Searched TORCH Portal for geographic distributions within each collection profile on October 24th, 2022, without taxonomic constraints & collected in TX or OK.)

BRIT-SMU-VDB-NLU:	211,758
TAC:	7,064
NTSC:	11,323
ACU:	3,747
HSU:	3,965
TCSW:	0

BCNWR: 94

Sub-total for BRIT Lead: 237,951

HUH = 50,794 **(completed)**

MO = 20,502 TORCH-related specimens (17,127 TX + 3,375 OK), searched October 31st, 2022. *NOTE: MO data on the TORCH Portal have not been updated since 2017-11-29.*

NOSU = 981 **(completed)**

OKL = 138,027

OKLA = 77,455 (74,995 Texas + 2,460 Oklahoma)

SHST = 0

TAES = 131,430 TORCH-related specimens (129,000 Texas + 2,430 Oklahoma; 236,005 vascular plant records in total)

TAMUCC = 0

TEX-LL and Data-Provider Institutions (searched October 21st, 2022):

University of Texas at Austin (TEX-LL)	243,036	
Angelo State University (SAT)	39,046	
Fort Worth Nature Center (FWNC)	1,918	**(completed)**
Howard Payne University (HPC)	22,908	
Lady Bird Johnson Wildflower Center (JWC)	3,283	**(completed)**
Our Lady of the Lake University (LLC)	0	
Saint Edward's University (SEU)	6,326	**(completed)**
Sul Ross State University (SRSC)	31,372	
Texas Lutheran University (TLU)	8,331	
Texas State University (SWT)	0	
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	6,574	

Sub-total for TEX-LL & data providers: 362,794

TTC = 23,605 **(completed)**

Total number of records available in TORCH Symbiota Portal from Texas and Oklahoma (cumulative) from institutions that were active this Quarter:

1,094,202

Share Best Practices, Standards, and Lessons Learned

TAMUCC:

* Following a protocol
* Having presets for saving images
* Maintaining order of specimens and proper handling

All other institutions: Nothing new to report.

Share Identified Gaps in Digitization Areas and Technology

OKLA:

Need segmentation/OCR of accession stamp to link existing database records to images as they are obtained—this may not be feasible and manual accession number entry may be needed. Work is in progress at BRIT to solve this.

Data manager position is vacant as of November 2021, following resignation of Clay Barrett. Replacement plans are in progress.

TAMUCC: Troubleshooting printer issues for labeling in pre-digitization efforts.

TEX-LL:

We are still trying to develop a workflow to allow uploading of records from some of our data provider herbaria into iDigBio. Hopefully, workflows will be developed to permit this to happen directly from SEINet, where the records currently reside.

At Angelo State University (SAT), the faculty curator retired in May 2022 and the staff collections manager left for a different job at around the same time. Thus, there has been no new activity at this data provider institution during the quarter. Apparently the start date of a new curator has been delayed by immigration issues of a foreign candidate, and the collections manager position will not be filled until the curator has started (hopefully in January 2023).

In-house progress at Howard Payne University (HPC) has been glacially slow because of a chronic lack of student help. Recently, TEX/LL borrowed ca. 2500 sheets to image at its facility in an effort to accelerate progress. Our colleagues at BRIT may help out with further off-site imaging in the future, time permitting.

All other institutions: Nothing new to report.

Share Opportunities to Enhance Training Efforts

The 2022 TORCH Summer Internship was successfully held at the five co-lead institutions on the TORCH TCN (BRIT, OKL, OKLA, TAES, and TEX-LL). The internship culminated with a poster session held during the XIII Annual TORCH Meeting on August 10th in Forth Worth, in which each TORCH intern presented a poster on their research project.

BRIT:

Hosted weekly zoom conversations with the Armchair Botanist program during August and September to engage Notes from Nature volunteers transcribing project specimens. Moved these sessions with slightly different formatting to once a month.

During the reporting period, nine 1-hour sessions were held, with 57 attendance events from 31 unique individuals. These sessions included a WeDigBio event.

BRIT TORCH Staff have participated in Symbiota Support Hub meetings.

Project staff attended or watched recordings of presentations delivered during iDigBio BioDigiCon (September 27th - 29th, 2022)

TORCH Project Manager Diego Barroso presented on behalf of the TORCH TCN Project during the 2022 BioDigiCon organized by iDigBio (September 27th), and attended and participated in presentations September 27th through the 29th. Barroso also served as a panelist on the "Reporting, Tracking, and Keeping People Engaged" discussion held on September 27th.

TORCH Project Manager Diego Barroso attended and participated in presentations during the TaxonWorks Conference held October 12th through the 14th.

TORCH Project Manager Diego Barroso has attended and participated in six Biotaphy sessions facilitated by the Soltis Lab (September 21st and 28th, and October 5th, 12th, 19th, and 26th).

OKLA:

Trained three new undergraduate assistants in transcribing.

Trained one new volunteer community member in transcribing.

Trained two new undergraduate assistants in imaging at University of Central Oklahoma.

SHST:

Learned about Fungi from David Lewis.

Offered additional weekly trainings on barcoding, imaging, and digitizing.

Organizing more volunteers.

All other institutions: Nothing new to report.

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

The 2022 TORCH Summer Internship was successfully held at the five co-lead institutions on the TORCH TCN (BRIT, OKL, OKLA, TAES, and TEX-LL). The internship culminated with a poster session held during the XIII Annual TORCH Meeting on August 10th in Forth Worth, in which each TORCH intern presented a poster on their research project.

The TORCH TCN held an Executive Committee meeting on October 28th, 2022.

BRIT: Collaborated with the TORCH Steering Committee and hosted the 2022 TORCH Annual Meeting on August 10th, 2022, held at the Botanical Research Institute of Texas. Approximately 70 guests representing 20 institutions from 3 states were in attendance. Thirty-six scientific presentations were submitted (13 oral, 23 poster) and there was a full day of engaging with other Natural History professionals, organismal biologists, naturalists, and students, including botanists, mycologists, data scientists, and community scientists. We heard extensively about how herbarium specimens and their digitized specimen data are being used in research in our two-state region.

TEX-LL: Image files for the TORCH project continue to be housed at the Texas Advanced Computing Center (TACC), which also is the source of a part-time data manager at TEX/LL.

All other institutions: Nothing new to report.

Share Opportunities and Strategies for Sustainability

The TORCH TCN continued work with Kuvio Creative, a software development group, on phase 2 of the TORCH Digitization Hub. The Hub streamlines and automates many of the standard image processing workflows. In phase 2, an enhanced web interface was added along with additional image quality control checks, login and permissions configuration, workflow configuration, and image transfer to file repositories (such as TACC). Beta testing for phase 2 is expected to finish in November. Project code and documentation is available at the link below:

https://github.com/TORCH-TCN/torch_hub

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

Methods of disseminating results to communities of interest (presentations, lectures, etc.):

For the whole project: Project Manager Diego Barroso presented on the "State of the TORCH TCN" and gave an introduction to the Symbiota Support Hub during the XIII Annual TORCH Meeting held in Fort Worth on August 10th. https://osf.io/kfjxs/

BRIT:

The Armchair Botany sessions held on October 13th, 2022, highlighted the Fall WeDigBio campaign, and BRIT staff and Texas Master Naturalist Volunteers teamed up to deliver the online presentation "Women Documenting the Floras of Texas & Oklahoma," followed by a transcription blitz in Notes from Nature. Event page, which will be updated with the session recording: https://fwbg.org/events/wedigbio-2022-women-tx-botany/. 26 attendees.

Three presentations were delivered at the annual meeting for the Texas Master Naturalists in Houston, Texas that communicated the existence and usage of the data generated from the TORCH grant for the purposes of prioritizing the collection of botanical specimens to "fill the gaps" in our knowledge of the Texas flora.

Provided an herbarium tour/discussion for the Association of Southern Region Extension Directors (ASRED) during their meetings in Fort Worth, on August 23rd, 2022, featuring "TORCHing" our collections to discuss the TORCH TCN. 25 attendees. Attendees included Extension Directors from 13 southern states and 2 territories, Puerto Rico and the Virgin Islands.

TAMUCC: Downloading digitized images from our collection and presenting to others to share about the digitization process and using it as a resource. Spreading the word about the herbarium and is duties to students with the hopes of getting them involved.

TEX-LL: On August 10th, our staff and four TORCH interns attended the XIII TORCH Annual Meeting at BRIT. See the list of posters below.

All other institutions: Nothing new to report.

Other Education and Outreach Activities:

BAYLU: BAYLU Symbiota database being used by Independent Studies undergraduate student at Baylor working on assessing grass specimens with frequent representation from 1860-present (Industrial Revolution) for use in a climate change study.

BRIT:
Bordelon, A. and T. Rehman. Armchair Botanist Program: Participate in Virtual Community Science. Workshop presented at Texas Master Naturalist Annual Meeting; October 20-23, 2022; Houston, Texas, USA.

Rehman, T. and B. Best. Plant Checklists: Finding and Filling Gaps in the Texas Flora. Workshop presented at Texas Master Naturalist Annual Meeting; October 20-23, 2022; Houston, Texas, USA.

Rehman, T. and A. Tiller. Collecting Scientific Botanical (Herbarium) Specimens. Workshop presented at Texas Master Naturalist Annual Meeting; October 20-23, 2022; Houston, Texas, USA.

OKL: Summer 2022 internship finished successfully at the 2022 TORCH Conference on August 10th in Fort Worth.

OKLA: Four interns, one undergraduate student, and one graduate student developed and conducted research projects using digital data generated by the project.

TAES: We completed an internship program this summer, which involved the training of four undergraduate students in imaging, transcription, data management, and data analyses.

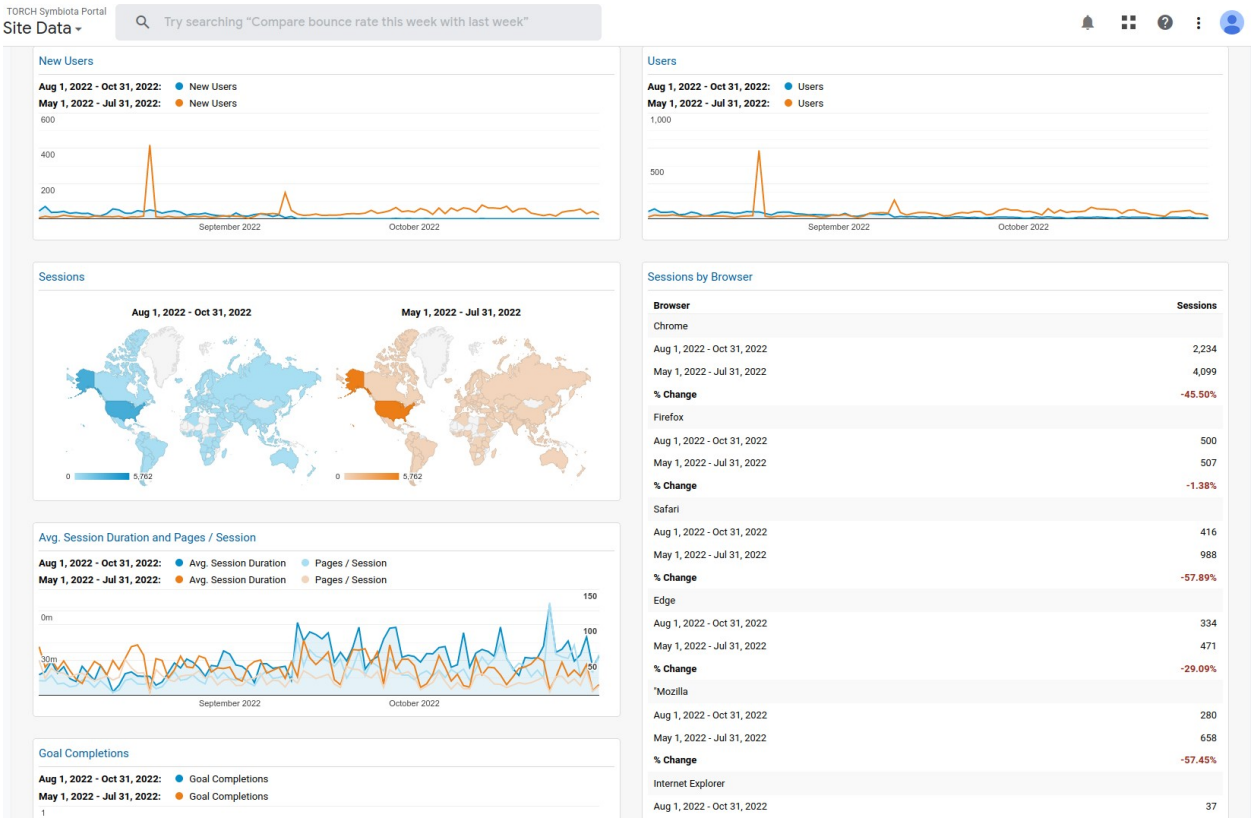
TAES was featured on television program aired on PBS.

TEX-LL: We gave three herbarium tours to classes from the UT Integrative Biology Department, one tour to a local undergraduate EEB Club, and one tour to a group of volunteers (mostly master naturalists) from one of our field stations. All of these contained information on the TORCH digitization activities. In-person tours continue to recover from disruptions caused during the pandemic. Some of the students from these tours expressed an interest in working at the Plant Resources Center.

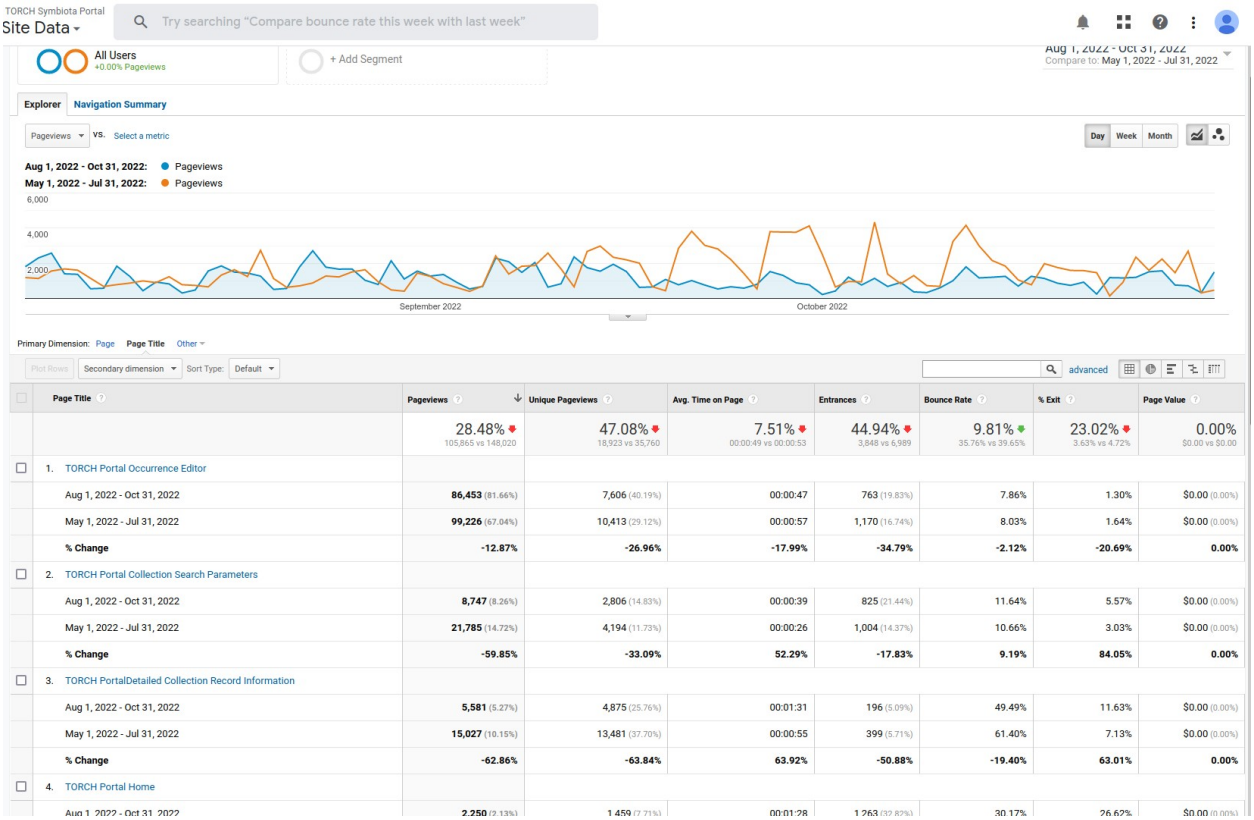
All other institutions: Nothing new to report.

Share Information About Your Website and/or Portal Usage

Dashboard, Aug. 1st, 2022 – Oct. 31st, 2022, compared to previous Quarter

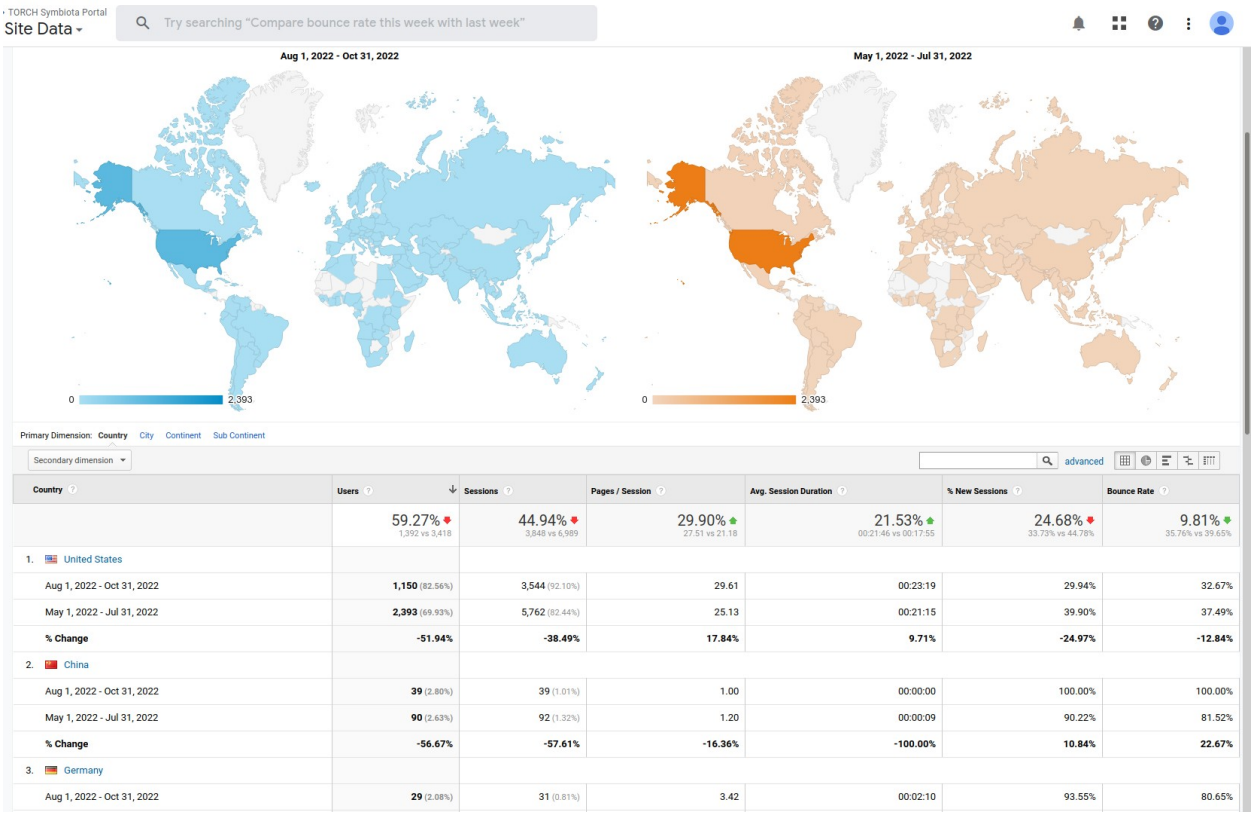


Pageviews, Aug. 1st, 2022 – Oct. 31st, 2022, compared to previous Quarter.



	Page Title	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
		28.48% ↓ 105,865 vs 148,020	47.08% ↓ 18,923 vs 35,760	7.51% ↓ 00:00:49 vs 00:00:53	44.94% ↓ 3,848 vs 6,989	9.81% ↓ 35.76% vs 39.65%	23.02% ↓ 3.63% vs 4.72%	0.00% $0.00 vs $0.00
☐	1. TORCH Portal Occurrence Editor							
	Aug 1, 2022 - Oct 31, 2022	**86,453** (81.66%)	7,606 (40.19%)	00:00:47	763 (19.83%)	7.86%	1.30%	$0.00 (0.00%)
	May 1, 2022 - Jul 31, 2022	**99,226** (67.04%)	10,413 (29.12%)	00:00:57	1,170 (16.74%)	8.03%	1.64%	$0.00 (0.00%)
	% Change	**-12.87%**	**-26.96%**	**-17.99%**	**-34.79%**	**-2.12%**	**-20.69%**	**0.00%**
☐	2. TORCH Portal Collection Search Parameters							
	Aug 1, 2022 - Oct 31, 2022	**8,747** (8.26%)	2,806 (14.83%)	00:00:39	825 (21.44%)	11.64%	5.57%	$0.00 (0.00%)
	May 1, 2022 - Jul 31, 2022	**21,785** (14.72%)	4,194 (11.73%)	00:00:26	1,004 (14.37%)	10.66%	3.03%	$0.00 (0.00%)
	% Change	**-59.85%**	**-33.09%**	**52.29%**	**-17.83%**	**9.19%**	**84.05%**	**0.00%**
☐	3. TORCH PortalDetailed Collection Record Information							
	Aug 1, 2022 - Oct 31, 2022	**5,581** (5.27%)	4,875 (25.76%)	00:01:31	196 (5.09%)	49.49%	11.63%	$0.00 (0.00%)
	May 1, 2022 - Jul 31, 2022	**15,027** (10.15%)	13,481 (37.70%)	00:00:55	399 (5.71%)	61.40%	7.13%	$0.00 (0.00%)
	% Change	**-62.86%**	**-63.84%**	**63.92%**	**-50.88%**	**-19.40%**	**63.01%**	**0.00%**
☐	4. TORCH Portal Home							
	Aug 1, 2022 - Oct 31, 2022	**2,250** (2.13%)	1,459 (7.71%)	00:01:28	1,263 (32.82%)	30.17%	26.62%	$0.00 (0.00%)

Users by Country, Aug. 1st, 2022 – Oct. 31st, 2022, vs. previous Quarter.

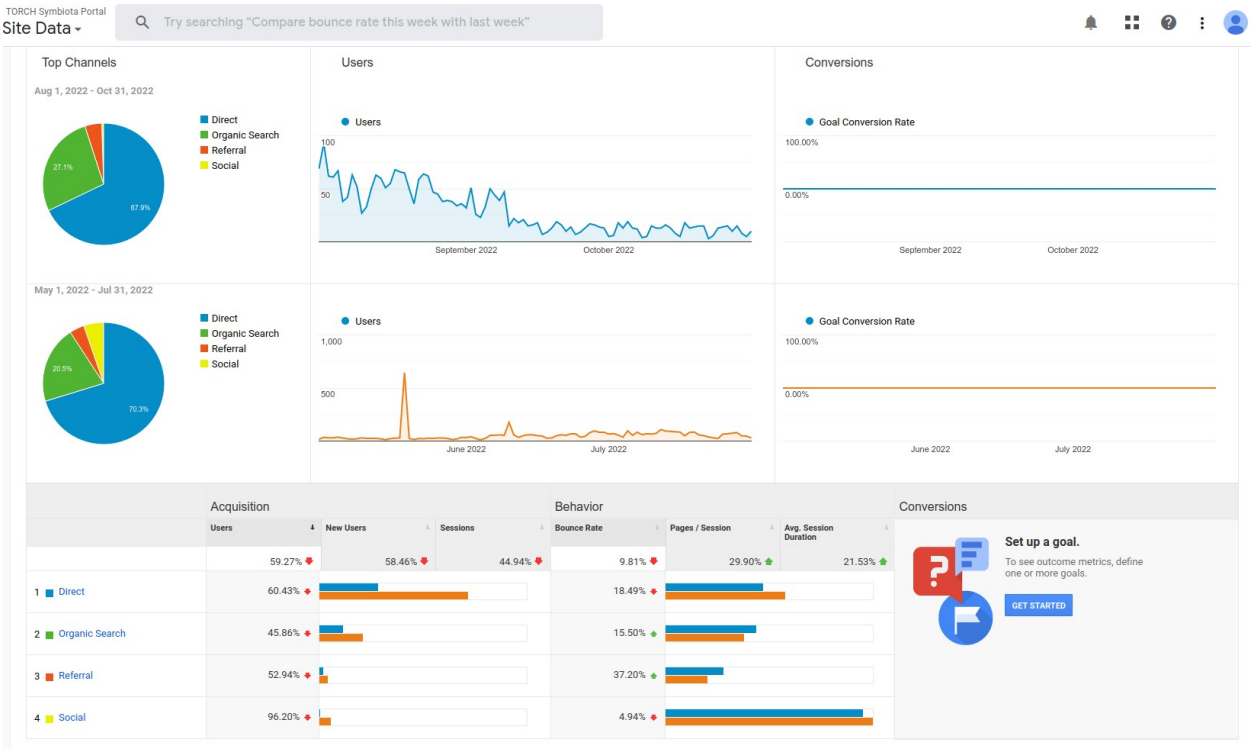


Primary Dimension: Country City Continent Sub Continent

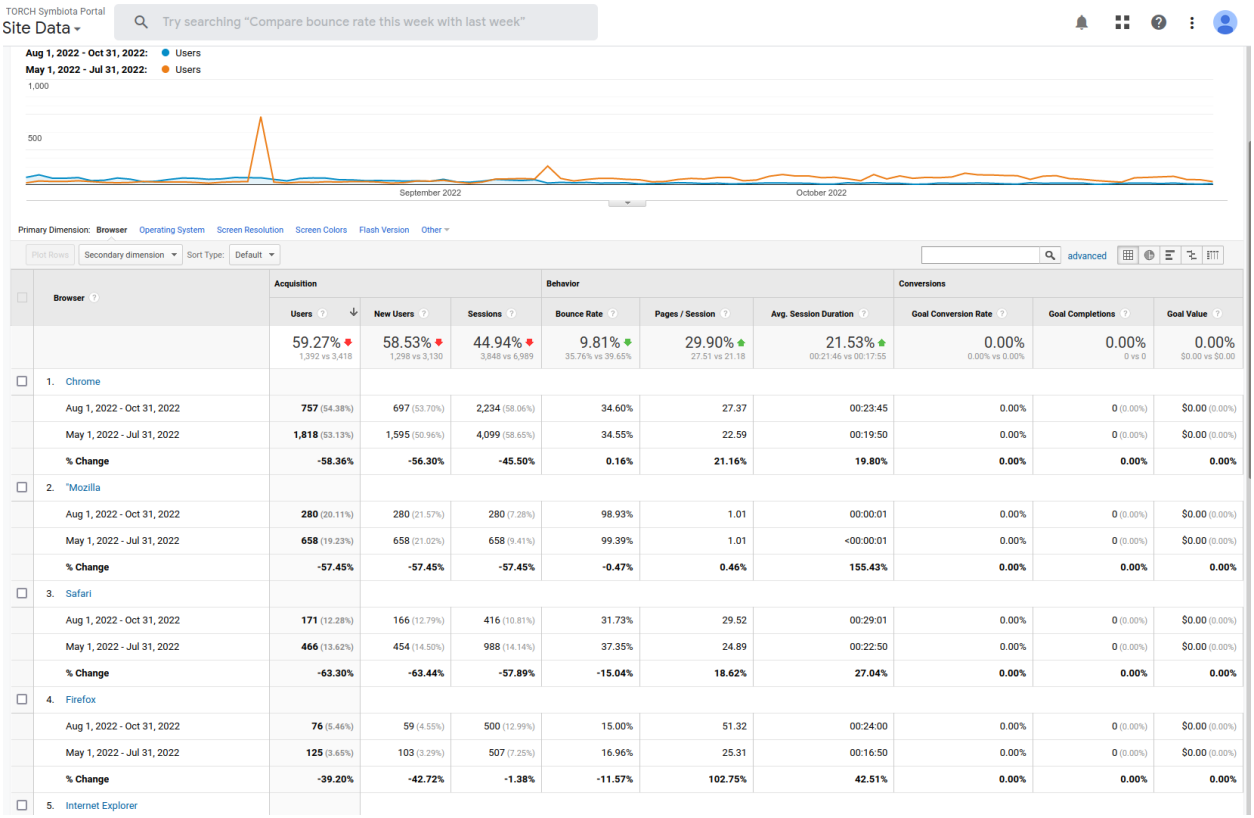
Secondary dimension | advanced

Country	Users	Sessions	Pages / Session	Avg. Session Duration	% New Sessions	Bounce Rate
	59.27% 1,392 vs 3,418	44.94% 3,848 vs 6,989	29.90% 27.51 vs 21.18	21.53% 00:21:46 vs 00:17:55	24.68% 33.73% vs 44.78%	9.81% 35.76% vs 39.65%
1. United States						
Aug 1, 2022 - Oct 31, 2022	**1,150** (82.56%)	3,544 (92.10%)	29.61	00:23:19	29.94%	32.67%
May 1, 2022 - Jul 31, 2022	**2,393** (69.93%)	5,762 (82.44%)	25.13	00:21:15	39.90%	37.49%
% Change	**-51.94%**	**-38.49%**	**17.84%**	**9.71%**	**-24.97%**	**-12.84%**
2. China						
Aug 1, 2022 - Oct 31, 2022	**39** (2.80%)	39 (1.01%)	1.00	00:00:00	100.00%	100.00%
May 1, 2022 - Jul 31, 2022	**90** (2.63%)	92 (1.32%)	1.20	00:00:09	90.22%	81.52%
% Change	**-56.67%**	**-57.61%**	**-16.36%**	**-100.00%**	**10.84%**	**22.67%**
3. Germany						
Aug 1, 2022 - Oct 31, 2022	**29** (2.08%)	31 (0.81%)	3.42	00:02:10	93.55%	80.65%

Channels, Aug. 1st, 2022 – Oct. 31st, 2022, vs. previous Quarter.



By browser used, Aug. 1st, 2022 – Oct. 31st, 2022, vs. previous Quarter.



TORCH Symbiota Portal
Site Data

Try searching "Compare bounce rate this week with last week"

Aug 1, 2022 - Oct 31, 2022: Users
May 1, 2022 - Jul 31, 2022: Users

1,000
500
September 2022
October 2022

Primary Dimension: Browser | Operating System | Screen Resolution | Screen Colors | Flash Version | Other

Plot Rows | Secondary dimension | Sort Type: Default | advanced

Browser	Acquisition			Behavior			Conversions		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
	59.27% ↓ 1,392 vs 3,418	58.53% ↓ 1,298 vs 3,130	44.94% ↓ 3,848 vs 6,989	9.81% ↓ 35.76% vs 39.65%	29.90% ↑ 27.51 vs 21.18	21.53% ↑ 00:21:46 vs 00:17:55	0.00% 0.00% vs 0.00%	0.00% 0 vs 0	0.00% $0.00 vs $0.00
1. Chrome									
Aug 1, 2022 - Oct 31, 2022	**757** (54.38%)	697 (53.70%)	2,234 (58.06%)	34.60%	27.37	00:23:45	0.00%	0 (0.00%)	$0.00 (0.00%)
May 1, 2022 - Jul 31, 2022	**1,818** (53.13%)	1,595 (50.96%)	4,099 (58.65%)	34.55%	22.59	00:19:50	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	**-58.36%**	**-56.30%**	**-45.50%**	**0.16%**	**21.16%**	**19.80%**	**0.00%**	**0.00%**	**0.00%**
2. "Mozilla									
Aug 1, 2022 - Oct 31, 2022	**280** (20.11%)	280 (21.57%)	280 (7.28%)	98.93%	1.01	00:00:01	0.00%	0 (0.00%)	$0.00 (0.00%)
May 1, 2022 - Jul 31, 2022	**658** (19.23%)	658 (21.02%)	658 (9.41%)	99.39%	1.01	<00:00:01	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	**-57.45%**	**-57.45%**	**-57.45%**	**-0.47%**	**0.46%**	**155.43%**	**0.00%**	**0.00%**	**0.00%**
3. Safari									
Aug 1, 2022 - Oct 31, 2022	**171** (12.28%)	166 (12.79%)	416 (10.81%)	31.73%	29.52	00:29:01	0.00%	0 (0.00%)	$0.00 (0.00%)
May 1, 2022 - Jul 31, 2022	**466** (13.62%)	454 (14.50%)	988 (14.14%)	37.35%	24.89	00:22:50	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	**-63.30%**	**-63.44%**	**-57.89%**	**-15.04%**	**18.62%**	**27.04%**	**0.00%**	**0.00%**	**0.00%**
4. Firefox									
Aug 1, 2022 - Oct 31, 2022	**76** (5.46%)	59 (4.55%)	500 (12.99%)	15.00%	51.32	00:24:00	0.00%	0 (0.00%)	$0.00 (0.00%)
May 1, 2022 - Jul 31, 2022	**125** (3.65%)	103 (3.29%)	507 (7.25%)	16.96%	25.31	00:16:50	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	**-39.20%**	**-42.72%**	**-1.38%**	**-11.57%**	**102.75%**	**42.51%**	**0.00%**	**0.00%**	**0.00%**
5. Internet Explorer									

Share Other Activities and/or Progress

Products generated (publications, conference presentations, technologies/techniques, websites, etc.):

Project Manager Barroso gave a presentation on the State of the TORCH TCN Project and an Introduction to the Symbiota Support Hub during the 2022 Annual TORCH Meeting held at BRIT in Fort Worth, TX <https://osf.io/kfjxs/>

Technological Innovator Jason Best gave a presentation on the TORCH Digitization Hub during the 2022 Annual TORCH Meeting held at BRIT in Fort Worth, TX <https://osf.io/pjyh6/>

Technological Innovator Jason Best presented a poster on the TORCH Light Box during the 2022 Annual TORCH Meeting held at BRIT in Fort Worth, TX <https://osf.io/gcu2f/>

BRIT:

Annual meeting posters and presentations uploaded by Presenters: https://osf.io/meetings/TORCH2022

OKL: Four interns presented posters at the TORCH XIII conference at BRIT in Fort Worth, Texas (August 10, 2022), with approximately 70 people in attendance:

M. Dugger, M. Szubryt, and A. Moore. Morphological variability of Monarda fistulosa in Oklahoma.

E. Korn, L. Monaghan, and A. Moore. Invasive aquatics and where to find them.

G. Payne, M. Szubryt, A. Moore, and J. Messick. Phenological classification scheme comparison for Cercis canadensis.

A. Thomas, T. Gillum, and A. Moore. Distribution of Oenothera species across Ecoregion 27.

OKLA:

Graduate Research Assistant Sierra Hubbard gave a research presentation based on TORCH data Botany 2022, Anchorage, Alaska.

Graduate Research Assistant Sierra Hubbard, Undergraduate interns Cameron Wood, Ana Risano, and Autumn Sutton, and Undergraduate researcher Sarah Short, gave research presentations based on TORCH data at the 2022 TORCH annual meeting in Fort Worth, Texas.

TEX-LL: At the XIII TORCH Annual Meeting at BRIT in Fort Worth on August 10th, 2022, our TORCH summer interns and staff presented the following posters:

Clark, E. J. 2022. Preliminary Survey: Drift Seeds of Mustang Island, Texas. https://osf.io/7ubvn/

Li, Adrienne. 2022. The Botanical Career of Dora Sylvester and Her Texas Collection: A Preliminary Analysis. https://osf.io/vkfjm/

Rodriguez-Vasquez, D., and Lydia G. Tressel. 2022. Mapping Analysis of Williamson County. https://osf.io/nb56y/

Semmling, B., S. Hunter, and L. Tressel. 2022. A Texas-sized Conundrum: A Morphometric Analysis of Lupinus subcarnosus Hook. and Lupinus texensis Hook. https://osf.io/sdwqm/

Young, B. 2022. The Biogeography of Ploidy & Reproductive Mode in the Xeric-Adapted Fern Myriopteris alabamensis (Buckley) Grusz & Windham. https://osf.io/j37qd/

All other institutions: Nothing new to report.

Participants (especially those who have newly joined the project):

BAYLU:

Joseph White
Robert Doyle
Albert Zertuche
Walter Holmes
Alejandro Ayala
Andy Conley
Sydney Ovaise
Faith Brewer

BRIT:

Ashley Bordelon, Digitization Coordinator; abordelon@brit.org
Diego Barroso, TORCH TCN Project Manager; dbarroso@brit.org
Tiana Rehman, Herbarium Director/Institutional Rep.; trehman@brit.org
Jason Best, Dir. Biodiv. Informatics/Technovator; jbest@brit.org
Peter Fritsch, VP of Research/PI; pfritsch@brit.org
Jessica Lane, BRIT Herbarium Assistant; jlane@brit.org
Natch Rodriguez, Digitization Technician; nrodriguez@brit.org
Kimberlie Sasan, Herbarium & Research Assistant; ksasan@brit.org

MO:

Colin Robinson (institutionally funded)
Victoria Patrick (institutionally funded)
Isaiah Oakes (institutionally funded)

NOSU:

Elizabeth Waring
Austyn Rice (Undergraduate student)
Benjamin Woolen (Undergraduate student)

OKL: Three of our four interns have continued georeferencing during Fall Semester.

OKLA: Three new undergraduate assistants (Wilson, Bardin, Wright) joined continuing assistants Rillo, Sutton, and Short in transcription and imaging activities.

SHST:

Shae Stafford (Paid Employee) Srs111@shsu.edu
Rosario Rocha (Paid Employee) Rxr117@shsu.edu
Luke Holmes (Paid Employee) Lah069@shsu.edu
Tomas Lewis (Paid Employee) Til003@shsu.edu
Landon McCoy (Paid Employee) Lam124@shsu.edu

TAES: Sarah du Plessis (digitization tech)

TAMUCC:

Anna Swanson
Paul Markley
Kamilla Anderson (new intern)

TEX-LL:

Two volunteers:
Suzanne Labry
Vicky Wold

Three returning part-time undergraduate student workers paid by the grant:
Stephanie Nuñez
Sofia Bautista
Brian Matibag

Five new part-time undergraduate student workers paid by the grant:
Alyssa Salazar
Annabelle Young
Elizabeth Reed
Sophia De Mendoza
Travis Langford

All other institutions: Nothing new to report.

Other progress not listed above (anything else to share):

For the whole project: The TORCH TCN NSF Annual Report was prepared and submitted by the NSF deadline (August 31st, 2022).

BRIT:

(Re-)Hired Digitization Technician Kelly Carroll, who is returning to the project in the same role, after devoting their time to completing their M.S. research and field work over the summer.

Digitization Coordinator Ashley Bordelon left the project to join BRIT as Herbarium Collections Manager.

(For the purposes of this report, BRIT modified its reporting period as follows: July 30th, 2022 to October 23rd, 2022, for digitization numbers; all other reporting information is for August 1st, 2022 to October 31st, 2022).

KANU: (completed) We don't have anything substantive to add to this report. We have added a few new records for specimens that we found hiding in the collection, resolved some georeferencing issues, and continue to add images to the records. We'll continue to do that. Perhaps for the next quarterly report we can look at the numbers again to see if there is anything significant worth adding.

MO: The Missouri Botanical Garden is in the middle of a large redesign project for its database, Tropicos, which will fundamentally change the way specimen data are handled. This has caused some temporary delays in image processing and databasing efforts, but the finished system is expected to improve speed and functionality considerably.

NOSU: I think on our end the grant has been closed out. I'll just go ahead and do this one to be safe. I know the students have been doing some work in the portal.

OKLA: Digitization continues at University of Central Oklahoma. Plans are in place for digitization at Cameron University and Northwestern Oklahoma State University.

All other institutions: Nothing new to report.

TCN Quarterly Progress Report

Prior to each IAC meeting, TCNs are asked to complete a quarterly progress report in the areas outlined below. The TCN Lead PI or Project Manager collects information from all collaborators and compiles them into one overall progress report for the TCN. The TCN Lead PI or Project Manager then submits the quarterly reports via an email to Cat Chapman. An archive of previously submitted reports is available on the Internal Advisory Committee wiki page.

TCN Name

Digitizing collections to trace parasite-host associations and predict the spread of vector-borne disease (TPT)

Person Completing the Report

Jennifer Zaspel (Lead PI), Erika Tucker (PM)

Share Progress in Digitization Efforts

This quarter (August through October 2022) begins our no-cost extension year, Year 4 of the TPT project. The last overarching annual report was submitted to NSF on July 05, 2022. We also filed a one-year no-cost extension request with NSF summer of 2022 due to pandemic related digitization impacts. Below is a summary of our digitization progress (cumulative). While we still have a significant amount of digitizing to complete, we are making great progress and expect all our collections to complete the project within the no-cost extension period.

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
ANS	11,806	359	12,368	1,226
BPBM	27,0975	4,928	19,103	10,247
BYU	14,689		14,689	
CAS	40,162	1,865	17,615	
CMNH	35,562	303	303	
CU	9,995			1,758
FMNH	10,774	2,138	75,986	141
HWML	45,640		23,230	
INHS	26,813	348	2,521	7,095

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
MPM	2,609		1,228	1,500
MSB	5,049	618	1,500	2,140
MSU	13,323	260	1,100	505
OSU	6,000		6,000	
PERC	10,082	10,082		
PSU	26,426	1,165	2,571	1,816
TAMU	67,445		6,773	13,595
UH	6,268	95	4,652	
UM	113,024	259	50,546	
UMSP	52,060		52,060	
UNH	10,500	2,125	10,500	1,763
UU	17,125		20,000	
UWSP	7,845		8,383	
WIRC	36,525	26,350	7,024	3,151
YPM	17,607	2,015	3,409	2,581
Totals	**620,703**	**81,053**	**345,561**	**46,018**
Total records	**1,093,335**			

Collections starred and highlighted in green have **completed or exceeded their digitization goals!

So far, TPT has completed 40 Notes from Nature expeditions and transcribed 169,816 slide images with the help of volunteers. We currently have two active expeditions, *Jumping into the Field Museum Flea Collection 7.0* and *Mite at the Museum 2.0*.

Share Best Practices, Standards, and Lessons Learned

Taxonomy. The TPT Taxonomy team continues to work on compiling and cleaning lists of names for the network. This project has prompted collaboration with GBIF and other stakeholders in the community to strive to find ways to share and maintain these resources for long-term use. You can now find the taxonomic resources and tools produced by TPT, as well as cleaned parasite and host taxonomy lists here: https://github.com/njdowdy/tpt-taxonomy/tree/main or via git on your local machine. Each taxonomic names list (i.e., higher-level taxon) has a different liaison for, 1) taxonomic information, and 2) the digital resource(s). You will find relevant contact

information for each resource as well as the overall project in the readme file. The readme file also gives some additional status information for each resource (e.g., whether synonyms were provided by the name providers). Taxonomic resources are also available with citable doi through Zenodo: https://doi.org/10.5281/zenodo.5562742.

Associations. Global Biotic Interactions team continues to working on incorporating the taxonomies created by TPT into GloBI and has created a way for data providers to check their taxon names against the TPT taxonomies via the GloBI TPT webpage (https://www.globalbioticinteractions.org/parasitetracker/). Individual data providers can also review their taxonomic names by clicking the heart logo next to their institution listing on the GloBI webpage.

The GloBI team continues to create new and exciting functions that further improve the functionality and usefulness of the website. Recently, TPT PM Tucker worked with GloBI to produce a help, or 'How-to' page (https://www.globalbioticinteractions.org/how-to), that consolidated pre-existing, but disparate GloBI instructional resources as well as added additional documentation for both new and existing methods that can be used for GloBI data.

Updates to the TPT full dataset are regularly published on Zenodo with all versions citable here: doi 10.5281/zenodo.3685364. TPT data publications are important because they track how the project data has changed over time and provide a permanent and citable record of the data we are creating. Creating data publications of TCN projects is a new concept and the TPT is leading the way in how to create citable datasets of natural history collection data. The GloBI and TPT Research Advisory Board is actively working to get more data providers involved in these data publications as authors so that everyone can get credit for their hard work. Everyone involved in the TPT project can be a coauthor of this data publication. Please contact Jorrit Poelen or Katja Seltmann if you would like to be included.

Reports. Nick Dowdy (MPM) wrote a script to help collections track their digitization progress and project transcription rates needed to meet goals. This "TPT progress reporting" script and instructions for use are available on GitHub (https://github.com/njdowdy/digitization_progress_reports). The idea is that this script can be easily modified as needed for any collection(s) and TCN projects in the future - not just for the TPT group. Progress graphs have been created for all collections in the TPT group and the graphs, as well as the script to create them, have been shared with each collection to help with planning out digitization strategies specific to each collection's specimens, resources, and team.

Jorrit Poelen and PI Seltmann created a script to extract association data from GloBI for any contributing collection and automatically create a report. The script is available on GitHub here: https://github.com/ParasiteTracker/tpt-reporting. Reports for all TPT collections are regularly generated and published on Zendo (see above).

Symbiota Portal. A dedicated TPT portal has been developed using Symbiota2 programming and is now launched (https://s2.parasitetracker.org/). Taxonomic backbones and record data are in the process of being imported and there are still improvements being made, but the portal has

some limited functionality already. This portal will provide a lot of very useful and interactive tools, such as mapping, checklists, and association overlays, to help better understand the parasite data this project has been digitizing.

Share Identified Gaps in Digitization Areas and Technology

TPT network members continue to progress towards completing their digitization goals. There still continues to be some periodic staffing issues, but this has generally improved at most institutions since pandemic related restrictions have lifted and collections have reached a new "normal" equilibrium state. Despite the pandemic, Yale and the Ohio State Arthropod Lab (OSU) have already completed their digitization goals for the project, the Harold W. Mantor Parasitological Laboratory at the University of Nebraska State Museum has well exceeded their digitization goals and is still digitizing, and a number of our collections still anticipate finishing by the end of the year as originally planned. The remaining collections have filed for a no-cost extension year with NSF, which should be sufficient to complete the project.

We have hit a slight delay in completing our Symbiota Portal and Fieldbook applications due to loss of some skilled technological expertise. PI Zaspel and PM Tucker are working with both application PIs to resolve these issues and explore potential alternative avenues to accomplish our goal. PM Tucker has also been coordinating efforts to hire a new engineer for the Symbiota Portal.

PI Zaspel and PM Tucker continue to reach out to all PIs and collaborators in the network keeping participants engaged and offering assistance whenever needed. In October, we held a group TPT Report Out Day to get everybody together (virtually) and share project updates.

Share Opportunities to Enhance Training Efforts

FMNH - Zoe and Colin led a "Parasite Palooza" in one of FMNH's free Museum days in October -- they invited Museum visitors to take a closer look at parasites, recruited volunteers to work on Notes from Nature projects, and NBC5 interviewed them!

TAMU - A few new student employees joined the TAMU Insect Collection team in August and have been busy with learning about data entry and specimen preparation. Technician Shelby Fisher completed her organization of dark data ectoparasite collections. All samples have been physically and electronically organized and now are available to be uploaded to the Texas A&M Insect Collection database. In total, there are now over 1250 specimen tubes of ectoparasites (lice, fleas, mites, ticks) ready for accession into the TAMUIC. Since nearly all of these samples have hosts in natural history collections, these parasite records were shared with the appropriate host collections (including Texas A&M, Louisiana State, Museum of Southwestern Biology, Texa Tech, Museum of Vertebrate Zoology, etc.) so that host databases could link to parasite vouchers. Jessica is in the process of sharing these data with GlOBI. Jessica is also

working on an updated host-parasite list for sucking lice (Anoplura) that can be shared with GlOBI and other interested parties when completed.

UMSP - Established the attachment path to the university server where the slide images are stored, so the images are now linked to the collection object table in the UMSP Specify database and all local users have universal access to that repository. UMSP is currently working with both Specify and Symbiota to establish the base URL to upload the Specify data to the UMSP portal on SCAN. This has worked in the past, and UMSP is optimistic that the connection will be re-established soon.

UWSP - Provided resources and training to another parasitologist interested in scanning and digitizing parasitology slides. Christopher Whipps from SUNY-ESF.

UM - Rachel Wadleigh finished her summer semester Graduate Student Curatorial Assistantship where she coordinated all student Research Assistants and helped develop digitization protocols. Wesley Lia (Research Assistant) moved on after the summer semester. Three additional Research Assistants were hired and are being trained: Andrew Benjamen (incoming masters student); Satara Fountain (incoming masters student); Tia Brown (2nd yr undergraduate student). Patrick Killian was promoted to help coordinate digitization efforts.

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

Databases & Repositories. TPT is continuing collaborations with Vectorbase, NMNH, and Walter Reed to aggregate occurrence and observation data, deliver association data to GloBI, and provide taxonomy resources to the arthropod collections community. Multiple members of the TPT group are also collaborating with and adding extensive expertise to BugFlow (https://entcollnet.github.io/BugFlow/) to help the greater global entomological and collections community with digitization efforts.

TPT is also working with the Denver Museum of Nature & Science (DMNS) and the Florida Museum of Natural History Herp Collection (FMNH) to help them connect their data to SCAN and GBIF. So far we have mobilized and made accessible >1,100 parasite records from the DMNS collection that were previously “dark data”. Mobilizing and connecting the FMNH Herp parasite data to the world is still in progress, but once done will not only result in thousands of new parasite records, but also add new names to our Ixodes taxon list and likely result in a related publication.

Other TCNs & Grants. TPT is collaborating with the newly funded **NSF TCN Big-Bee** digitization initiative and the **NSF TCN iDigBees** proposal currently pending by sharing workflows, digitization and project management insights, and technical expertise. In addition, members of TPT are lending expertise to the **USDA funded National Bee Monitoring RCN** and PM Tucker is helping organize a workshop on topics relating to bee monitoring data preservation and

management. This will not only help develop better monitoring protocols, but also better standardize data collection methods which will hopefully lead to pre-digitization efforts and smoother incorporation of new collection data into both internal and shared databases.

PI Zaspel & PM Tucker helped organize, plan, and implement this year's NSF funded **Entomological Collections Management Workshop**. Partially due to COVID concerns, but largely to make the course more accessible to a broader and more diverse student population, this year's course adopted a hybrid model. Student feedback for the hybrid model (and course in general) was positive. This workshop is the only one of its kind for the entomological community and is extremely important in training the next generation of entomological collections managers - many of whom will be implementing digitization protocols at their institutions. With TPT's assistance, this year's curriculum incorporated more modern collection management techniques with part of the course emphasizing digitization methods and existing workflow resources which will well equip new managers and curators to care for and improve their collections.

Other Institutions. PI Grinter (CAS) continues collaboration with Hassan Dawah of the National Museum of Wales and provides images of Culicidae for a publication Dawah is writing on the mosquitoes of Saudi Arabia for an upcoming publication in Zootaxa.

Share Opportunities and Strategies for Sustainability

Multiple TPT PIs are actively involved with and are collaborating on the BugFlow repository project. Workflows and tools developed by TPT have started to be added to the repository and continue to be added as each item is completed. Workflows and tools shared on this platform are available through the working side of GitHub (https://github.com/EntCollNet/BugFlow). In order to make the workflows more accessible to a broader audience, all workflows and information deposited on BugFlow are also available through a public facing webpage for those not comfortable using GitHub directly (https://entcollnet.github.io/BugFlow/). Many TPT providers are contributors of various modules, including slide imaging (both high and low resolution), papered specimen archival protocols, project management, curation, georeferencing, and data transcription.

The TPT group played an important role in the 2022 Entomological Collections Management Workshop. In addition to TPT members presenting at the workshop, and participating in the workshop, PI Zaspel (MPM) was instrumental in advising, planning, and organizing the new hybrid version of the workshop (part online/remote participation, part in person for those who can physically attend). This workshop is one of the most important collections training opportunities within the entomological community and offers an ideal venue for sharing digitization practices and resources developed by TPT, as well as many others, resulting in significantly higher chances of long-term sustainability.

TPT PM Tucker was an integral part planning out the iDigBees TCN proposal (currently in review) and if funded will continue to offer expertise and support to the new project. A key part in continued digitization efforts that improve upon existing infrastructure and methods while innovating new methods and technologies (instead of having to figure out the same things repeatedly) is having experienced TCN participants actively participating in newly fledged and submitted TCNs. It is important to foster this kind of cross-collection and inter-institutional communication and collaboration between more experienced TCN participants and newer ones to facilitate sustainability, productivity, and reduce stress for everyone involved.

The TPT group continues to work closely with GloBI creator Jorrit Poelen on improving the "how-to" page (https://www.globalbioticinteractions.org/how-to) on GloBI. GloBI is an amazing resource for the scientific community, but it can often be a bit challenging to navigate and find a particular resource needed. The 'How-to' page on GloBI consolidates pre-existing, but disparate GloBI instructional resources, as well as adds additional documentation for both new and existing methods that can be used for GloBI data. One of the new functions we developed and documented is a script that can query and download records for multiple taxa in a given list all at once. We believe usability of a given resource, such as GloBI, goes a long way in helping to sustain these types of resources in the long term.

Involvement with TPT helped PI Orlofske (UWSP) secure support for new collection infrastructure and a larger collection space that will allow students and staff to continue to be able to work within the museum space and provide room for future collection growth. Furthermore, involvement in the TPT grant helped justify financial support for three students who were already involved in the project to assist with the collection move. This assured the move could be accomplished in a timely manner and that specimens would be handled professionally.

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

Zoe Albion and Colin Bailey (**FMNH**) led a "Parasite Palooza" in one of FMNH's free Museum days in October -- they invited Museum visitors to take a closer look at parasites, recruited volunteers to work on Notes from Nature projects, and NBC5 interviewed them!

UNH continues to showcase the interactive educational exhibit about Bird Lice created by PI Miko (**UNH**). This exhibit allows users to learn about the bird parasites by matching a bird with the lice that use it as a host. This interactive exhibit uses CLSM based 3d images.

PIs Cameron and Gall (**YPM**) continue to conduct outreach activities in collaboration with the YPM EVOLUTIONS (Evoking Learning and Understanding through Investigations of the Natural Science) program. This is a free after school youth program for highschool students that helps

prepare students for college and careers in science through classes, museum jobs, research internships, and other events.

As part of Entomological Collections Management workshop and to facilitate the remote attendees at the workshop, multiple TPT participants contributed to the creation of a website with a reusable lesson plan and hands-on activity examining species interaction data and interpretations. The goal of the website activity is to help data providers better understand the data they may come across in their collections, what it means, and how it may be used by future researchers downstream. Website and reusable/modifiable lesson/interactive activity, the Interaction Data Interpretation Workshop, are available online here: www.globalbioticinteractions.org/ecm-workshop.

Share Information About Your Website and/or Portal Usage

To date, the TPT Notes from Nature project has completed **40 expeditions, 169,816 transcriptions** for 53,307 unique specimens, and provided learning experiences for **2,383 citizen Scientists** and **volunteers**. TPT Notes from Nature statistics: https://www.zooniverse.org/projects/md68135/notes-from-nature-terrestrial-parasite-tracker.

The latest GloBI report included all TPT collections and collaborators indexed as of October 13, 2022. The total number of interactions included in this reporting period is **794,320** records (500,000 interactions was the overall goal for TPT). The full TPT biotic interaction dataset published on Zendo has been **viewed 962 times** and been **downloaded 393 times:** https://zenodo.org/record/7194486#.Y1wVtezMKjQ.

Share Other Activities and/or Progress

The TPT group actively shares research and results at a variety of different venues. Below are some of the ways we have shared our knowledge over the last quarter.

Conferences, Presentations, & Symposia

- Representatives from all 24 TPT primary data providers, as well as representatives from GloBI, SCAN, and Notes from Nature, gave presentations and project updates at the TPT Report Out event. The event was held virtually and was hosted and sponsored by iDigBio: https://www.idigbio.org/content/terrestrial-parasite-tracker-tcn-report-out (10/2022).

- PI Jessica Light (TAMU) traveled to South Africa for the 4th International Congress on Parasites of Wildlife where she gave an oral presentation about the TPT digitization project. Her presentation included a discussion about the importance of digitization and making available parasite data, and GlOBI biotic interactions. Jessica also shared TPT resources such as workflows and other information available at github sites and via BugFlow.

(www.wfpnet.org/uncategorized/4th-international-congress-on-parasites-of-wildlife-icpow) (2022).

- Tucker, E.M., Zaspel, J. (2022) . Terrestrial Parasite Tracker (TPT) Beyond the TCN: Project Sustainability. BioDigiCon 2022.

Publications

- Poelen, Jorrit H., Seltmann, Katja C., Campbell, Mariel, Orlofske, Sarah A., Light, Jessica E., Tucker, Erika M., Demboski, John R, McElrath, Tommy, Grinter, Christopher C, Diaz-Bastin, Rachel, Bush, Sarah E, Delapena, Robin, Cook, Joseph, Gall, Lawrence F., Whiting, Michael F, Clark, Shawn M, Cameron, Stephen L, Replogle, Charla R, Rund, Samuel S.C., … Bailey, Colin. (2022). Terrestrial Parasite Tracker indexed biotic interactions and review summary (0.7) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7194486

- Dr. Nicolas J. Dowdy, Dr. Erika M. Tucker, Jorrit Poelen, Dr. Vijay Barve, Teresa Mayfield-Meyer, Kathryn Sullivan, & Dr. Jennifer M. Zaspel. (2022). njdowdy/tpt-taxonomy: TPT Taxonomic Resource v2.0.0 (v2.0.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7215550