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

August 2022

CONTENTS:

iDigBio is funded by a grant from the National Science Foundation's Advancing Digitization of Biodiversity Collections Program (Cooperative Agreement EF-1115210). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

TCN Quarterly Progress Report

TCN Name: Bringing Asia to digital life: mobilizing underrepresented Asian herbarium collections in the US to propel biodiversity discovery (All Asia)

Person Completing the Report: *Brad Ruhfel – PI (MICH)*

Reporting Period: April 1 through June 20th, 2022

Share Progress in Digitization Efforts

1) MICH + CHIC (Ruhfel)

Barcodes and imaging equipment have been purchased/ordered. Lighting units are on back order and expected to be in stock at the end of August. A project manager will be hired in lare August early September.

MICH
Specimens imaged: scheduled to begin in year 2 (15 Sept 2022).
Minimal records created: 0
Full/detailed records created: 406
Specimens georeferenced: 0

CHIC
Specimens imaged: 0
Minimal records created: 0
Full/detailed records created: 0
Specimens georeferenced: 0

2) Subcontract CINC + CMNH + MU (Tepe)

CINC:
Specimens imaged: 1171
Minimal records created: 0
Full/detailed records created: 2039
Specimens georeferenced: 167

CMNH:
Specimens imaged: 422
Minimal records created: 0
Full/detailed records created: 422
Specimens georeferenced: 34

MU:
Specimens imaged: 2145
Minimal records created: 0
Full/detailed records created: 2721

Specimens georeferenced: 237

3) Subcontract OS (Freudenstein):
OS experienced a staffing issue which prevented work in year 1. A request has been submitted to extend OSU's subcontract for an additional year through 8/31/2023

OS:
Specimens imaged: 0
Minimal records created: 0
Full/detailed records created: 0
Specimens georeferenced: 0

Share Best Practices, Standards, and Lessons Learned
MICH: Nothing to report
CINC: Nothing to report
OS: Nothing to report

Share Identified Gaps in Digitization Areas and Technology
MICH: Nothing to report
CINC: Nothing to report
OS: Nothing to report

Share Opportunities to Enhance Training Efforts
MICH: Nothing to report
CINC: Nothing to report
OS: Nothing to report

Share Collaborations with other TCNs, Institutions, and/or Organizations
MICH: Nothing to report

CINC: CINC is also part of the GLOBAL bryophyte & lichen project, and efficiencies leaned in GLOBAL will be adopted in the All-Asia project (and vice-versa).

OS: Nothing to report

Share Opportunities and Strategies for Sustainability
MICH: Nothing to report
CINC: Nothing to report
OS: Nothing to report

Share Education, Outreach, Diversity, & Inclusion (EODI) Activities
MICH: The project was highlighted in the bi-annual University of Michigan Ecology and Evolutionary Biology Museums newsletter (https://mailchi.mp/2900b91b7613/introducing-the-eeb-museums-newsletter-4838557). Chad Machinski, a MS student, is conducting an internship

to complete the requirements for the Rackham Graduate School Museums Studies Program. Part of the internship is learning to use the Specify database to transcribe specimen data for this project. We met and gave a tour to members of the ReConnect/ReCollect group at the University of Michigan. This is a diverse group of faculty, librarians, archivists, curators, collections managers, students, and members of the Filipino/Filipinx community committed to developing models for culturally-responsive and historically-minded stewardship of the Philippine collections at the University of Michigan. We also met with Mahalina Dimacali, an undergraduate student working at the University of Michigan Matthaei Botanical Gardens, who is part of a project involving the creation of a framework for the display and education of plants from the Philippines.

CINC: The All-Asia project at CINC employs three student workers: two are women in STEM fields, one (female) is from an underprivileged background and is a work-study student, and another (male) is from an Appalachian background. CINC also has a collaboration with the University's Advancement and Transition Services in which students with developmental challenges image specimens with the supervision of a job coach. The repetitive nature of specimen imaging works well for helping the students develop skills, and the acute attention to detail of several of the students has resulted in excellent specimen images.

OS: Nothing to report

Share Information About Your Website and/or Portal Usage
MICH: Nothing to report
CINC: Nothing to report
OS: Nothing to report

Share Other Activities and/or Progress
MICH: Nothing to report

CINC: The 422 Philippine specimens from CMNH have been imaged and fully transcribed; the CINC collection is nearing completion.

OS: Nothing to report

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*
Jul. 27, 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/1kLnxZIcTx9tb_kODWq4dKT-q8XMDuYav?usp=sharing

Share Progress in Digitization Efforts

- Big Bee continues to have weekly meetings of PIs, ASU support HUB members, collection managers, and digitization specialists working on the project. The meetings are a working group for developing best practices in the project. This quarter the focus has been on developing our Notes from Nature project and tagging images in the Bee Library with standard views to improve searching.
- New Notes from Nature Big Bee Bonanza! launched on July 5th! In collaboration with the Big Bee partners, UNR built a custom Notes from Nature Project for the Big Bee project. This includes a designated bee-themed landing page and several pages that outline information about how community scientists can get involved in the Big Bee project. It includes information about the research goals, project team members, a place to track project statistics, and a forum for online discussion. The Big Bee Notes from Nature Project includes 3 custom workflows to suit the needs of the researchers and ensure standardized data outputs. Two of these workflows are focused on the transcription of label information. The third is for measuring bee tegula, a proxy for body size. In the first week, 76 volunteers measured or transcribed ca. 11,000 subjects. https://www.zooniverse.org/projects/md68135/notes-from-nature-big-bee-bonanza

UCSB

Formatted: Font: (Default) Calibri, 12 pt
Formatted: Normal

- UCSB hired two Postdoctoral Scholars for the project. Colleen Smith will be leading the digital imaging at UCSB and Madeleine Ostwald is researching bee traits and sharing bee trait data via the Bee Library and other methods.
- One UCSB undergraduate student started an internship with iDigBio for the summer investigating bee and plant interactions in California.
- One UCSB undergraduate received the Edison Scholarship to continue his investigation of quantifying hairiness using computer vision methods.
- Over the summer, two interns from the Office of Education Partnerships, Smithsonian Scholars program will be imaging bees and working with Notes from Nature at UCSB

MCZC

- Captured photo-stacked image suites for 173 species of Andrenidae, Colletidae,Megachilidae, and Mellitidae constituting 713 images of dorsal, lateral and frontal views.
- Photographed the labels/low-resolution dorsal habitus images for 14,192 specimens of bees in the family Andrenidae. Started transcription of labels.
- Workflows and scripts for renaming images, data quality control, and migration of taxon data into MCZbase are progressing smoothly, with no major issues. Started to implement a new workflow for bulk transcription of specimen labels.

ASUHIC

- 11,561 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 2,004 images representing 1002 specimens that have been imported/uploaded on the Bee Library portal.
- Hired one undergraduate to photograph labels with specimen or dorsal view of specimens.

FSCA

- For the 2022 Q1 time period, we report that FSCA has georeferenced 8,796 specimens and the data has been deposited in mbd.osu.edu. Dorsal images have been taken for 8,200 of these specimens, all of which have been uploaded to the Big Bee portal.
- FSCA has produced 610 focus-stacked images that have been uploaded to mbd.osu.edu and associated via specimen identifiers

LACM

- Photographed labels with dorsal view for 2,851 specimens in the families Andrenidae and Bombidae
- 687 records were transcribed by students at UC Santa Barbara
- Hired a second part-time technician.

UMMZI

- Digitized label and dorsal habitus images for 7,275 specimens for 202 species across two families, Andrenidae and Apidae. Andrenidae has been completed.
- A databasing workflow and protocol is being developed for subsequent label data capture post label imaging. Protocol discussions ongoing with IT to streamline upload processes for bulk uploads through Specify Workbench.
- Macropod systems have been set up and protocol and operations are being developed and tested for larger scale operational viability.

UNH

- During the third quarter of 2022, UNH provided a dorsal habitus shot for 350 specimens. We also created 270 high resolution brightfield images of the male terminalia of Andrena

species (120 images of Andrena specimens from the Mitchel's collection from NCSU) and collected 23 CLSM 3D datasets (dorsal and ventral view). We have also collected 108 3D suites images.

CAS

- Staff person Dylan Bergersen in full production mode imaging specimens.
- Hired summer intern Alaina Wehrly, student from Oberlin, to work on BigBee digitizing California Megachilidae.
- Labels for 3,333 specimens photographed (3928 running total)
- Submitted 2,437 label images to Notes from Nature for transcription, project went live 5 July 2022.
- 274 2D exemplar images were shot (564 running total)
- BigBee shared specimen tracking sheet continually updated by Dylan as species/specimens are imaged.
- Purchased 2 new wireless barcode readers for TCN staff to more quickly and easily scan CASENT barcode labels on specimens.

EMEC

- Six digitization assistants continued with label imaging. No new hires.
- Labels for 1,757 specimens photographed (9,806 running total)
- Submitted 8,550 label images to Notes from Nature for transcription.
- Four photography (focus-stacking) assistants continued hi-res imaging. No new hires.
- 2D focus-stacked images completed 315 (920 running total)

SDMC

- Ellie Deer, Digitization Technician continued with dorsal-label and exemplar imaging. 2 new part-time hires cross-trained and occasionally working on Big-Bee starting 7/6/2022
- Dorsal-label photos for 1026 specimens completed (1472 running total)
- 2D focus-stacked image suites (dorsal, lateral, head) completed for 11 specimens (33 images total)

SEMC

- We have generated more than 300 focus-staked exemplar images for 53 species of the bee genus *Andrena*.

UCMC

- As of 7/8/2022, we have captured 11,336 images of 5,599 individual specimens for dorsal label imaging
- Using two Samsung Galaxy Tab S7's, we have completed dorsal label and lateral imaging of 3,843 individuals of 17 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 installed a new stage, diffuser, and replacement lens on our new Macropod Pro 3D imaging station and have been continuing to learn and test both the 2D and 3D capabilities of the system
- We have captured 2D focused stacked image suites of exemplar specimens, from 101 specimens of 49 species within 8 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 seven 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
- 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 also hosted 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

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.

Share Identified Gaps in Digitization Areas and Technology

- FSCA has been able to successfully upload images and data to Big Bee, but are still in the process of developing an IPT for mbd.osu.edu. So, FSCA has been renaming their exemplar images so that they can be uploaded to Big Bee directly if needed.
- UNH is now in the process of transferring images and the volume rendered micrographs from CLSM to our SCAN repository.

Share Opportunities to Enhance Training Efforts

- We continue to use weekly meetings and slack to keep in touch and help information disseminate between participants. We continue to train new participants in imaging. Big Bee participants are trained using slack for communication and image sharing, online videos online at https://macroscopicsolutions.com/video-tutorial-big-bee-tcn/ and the Macroscopic Solutions YouTube channel, and one-on-one zoom training with Mark Smith (Macroscopic Solutions).
- ASUHIC staff attended 6th Annual Digital Data in Biodiversity Research Conference virtually.

- UMMZI developed a best practices protocol document for specimen handling and museum conventions for UMMZI. Developed a training manual for image capture through desktop machines. Currently developing a manual for digitizing label data in Specify and stacked image capture and processing using the Macropod systems.

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

- Seltmann & Erika Tucker (BON, Parasite Tracker) started working with the US Bee Monitoring Research Coordination Network to develop a two-day workshop about biodiversity informatics for bee specialists.
- ASUHIC staff assisted in a BigBee citizen science measurement project for Notes from Nature (NfN) providing by 807 images to Michael Denslow (Zooniverse).
- Graduate curatorial assistant, Rachel Wadleigh coordinates all TCN grants, at UMMZI leading to student worker interactions across TCN grants and synergizing protocols across TCN projects to streamline data entry and ease of learning for workers.
- UNH has gathered 4 males for about 36 species and 4 females for 40 species of Andrena from Sophie Cardinal (CNCI) and 56 specimens representing numerous Andrenidae genera from Florida Department of Agriculture. Specimens from FDACS have been identified by experts and specimens from CNCI have been barcoded. After removing the tips of abdomens, these specimens will be sent to the Karlsruhe Insittute of technology for synchrotron based micro CT (Thomas van de Kamp).
- PI Grinter visited the Essig collection and took notes from PI Oboyski's digitization setup, borrowed equipment, and setup a second photo station at CAS.
- Worked with Michael Denslow (Zooniverse) and Katja Seltmann (BigBee) to develop a BigBee citizen science transcription project for Notes from Nature (NfN) drawing on ten years of experience working on the NfN platform. Completed FAQ page for NfN users.

Share Opportunities and Strategies for Sustainability

n/a.

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

- Big Bee created a DEI survey for our annual report. The survey is based on a survey used for the CAP TCN that includes groups defined as underrepresented in Science and Engineering https://www.nsf.gov/statistics/2017/nsf17310/digest/introduction. lhttps://docs.google.com/forms/d/1LL8JnXoZDjZksCH1AAyUBil1_4_fnwqHENL63AltYsw/edit?usp=sharing
- Trained 4 undergraduate student interns (MCZC) and one high school student (MCZC) on digitization and entomology collections procedures.
- MCZ organized an insect collecting and preparation workshop for all MCZ summer student interns.

- MCZ organized a cross-institution virtual "happy hour" for all students and interns involved with the project.
- MCZ organized a museumwide Macropod imaging demo and workshop, with a focus on bee specimens.
- Hosted an Entomology week for the ASU Biocollections Justice, Equity, Diversity and Inclusion (JEDI) summer research scholars program. Demonstrated and taught collections management, imaging, and digitization activities used for Big Bee with the scholars.
- Hosted an Entomology day for the ASU Art Summer Camp with ASU Natural History Collections. Taught various specimens to learn the diversity of insects including bees as vital pollinators.
- UMMZI Trained two undergraduate workers, A'liya Spinner and Junkai Wang, and a EMU masters student volunteer, Sadie Baker on digitization and entomological collections standards and practices.
- At UMMZI, graduate curatorial assistant, Rachel Wadleigh, and EMU volunteer, Sadie Baker are taking point to develop 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 will be shared with the BigBee group for comments and will be made publicly available
- Chris Grinter led behind the scenes collection tours with a focus on bees and pollinators for a combined 42 people during the report period.
- Grinter lead a class tour focused on pollinators for U San Francisco and Dr Sevan Suni.

- Dylan Bergersen (and other departmental staff) participated in Bug themed nightlife at the Cal Academy on Thursday June 2nd titled “Buggin Out” https://www.calacademy.org/nightlife/nightlife-buggin-out Drawers of bees were included with specimens for live tabling event.
- Essig museum has an ongoing Pollinator Garden project as part of a Xerces Society Bee Campus. Students plant and manage native California plants in a demonstration garden on the UC Berkeley campus and collect qualitative and quantitative data on flower visiting insects.
- Essig Museum led an entomology lecture and field experience for the California Naturalist certification course at UC Santa Cruz. This ten week course exposes students to California ecosystems, flora, and fauna. The entomology section focuses on the diversity and role of insects, including as vital pollinators for native and agricultural plants.
- Santa Cruz Natural History Museum members hike. Led a hike for SCNHM members / donors focusing on native insects, particularly pollinators, and their interactions with plants and other organisms.
- Annual Sonoma Bee Count. This all-day event introduces local residents to California’s native bees and the flower resources they depend on through group discussions and hands-on data collection activities. Records from the day’s surveys will be added to the BigBee TCN data set.
- Museum tours including NSF-funded Research Experience for Undergraduate (REU) students; Local 4H chapter; UC Berkeley class “Ecology and Society”.
- A. Carper (PI) has included the project in three 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): Challenges in Conserving Colorado's Native Bees
- 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
- SDMC held 2 training sessions for Entomology new hires and department staff on using Macropod imaging system. Recruited volunteer to help complete exemplar image quota. Molly Rightmyer Gee (Osmia expert) held training session with Ellie Deer on basic bee morphology and identification
- Horsley (SDMC) participated in IUSSI meeting at SDNHM by having booth and discussing BigBee Project with attendees

Share Other Activities and/or Progress

- Published our quarterly report of indexed interactions
- Seltmann, Katja C., Poelen, Jorrit H., Allen, Julie, Eldredge, Taro, Engel, Michael, & Gonzalez, Victor. (2022). Big Bee indexed biotic interactions and review summary (0.4.0) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6950082

- MCZ Hired and trained two additional undergraduate student technicians and one high school student technician that will image labels and specimens for this project.
- MCZ Re-filled position vacated by Hannah Kernen, continuing collaboration with Hannah Kernan and the Purdue Entomological Research Collection.
- MCZ Shared photos generated by the project in social media posts on the Harvard Museum of Comparative Zoology social media accounts.
- PI Grinter participated in the 2022 meeting for the Society for the Preservation of Natural History Collections. Participated in talks on digitization, workflows, etc.
- CAS museum staff (not funded by TCN) sorted and integrated into the museum collection several hundred specimens from our unidentified bee section that were recently identified by visiting researcher Dr. John Ascher.
- CAS museum staff (not funded by TCN) accessioned and recurated a spectacular collection of South African oil bees in the genus Rediviva in advance of TCN staff digitizing them.
- EMEC museum staff (not funded by TCN) completed updating species names and higher taxonomy for Hesperapis (Melittidae), Bombus (Apidae), and Xylocopa (Apidae) ahead of digitization efforts.
- EMEC museum staff (not funded by TCN) sorted and integrated into the museum collection several hundred specimens from our unidentified bee section that were recently identified by visiting researcher Dr. John Ascher.
- SEMC will present the Big-Bee initiative at the XIII International Union for the Study of Social Insects—Andean and Caribbean branch (Aug 14-17, 2022) https://sites.google.com/site/iussiseccionbolivariana/ . This meeting attracts numerous researchers from Latin America and the Caribbean. The presentation will be in Spanish.
- Accounts within the Bee Library were created for both Carper (PI) and Scott (coPI)

Share Information About Your Website and/or Portal Usage

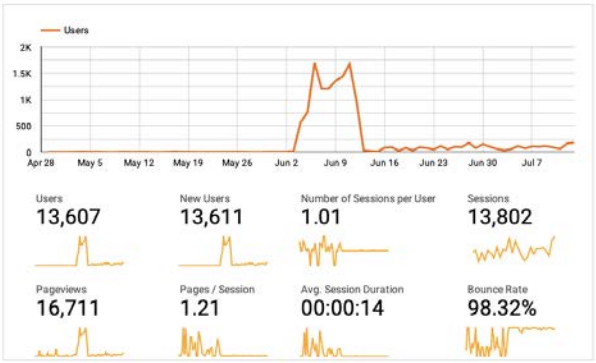
- Google Analytics for the Bee Library is shown below. We had 13,607 users between April 28 and July 13, 2022. This is a significant increase from the 131 users last quarter. The majority of the users are in the United States with new users in Australia and Africa. The majority of the use came between June 2 - June 10.
- ASUHIC facilitated upload of ~20,000 specimen records to the bee portal and uploaded and mapped ~8,000 images for other collaborating collections.

iDigBio
Integrated Digitized Biocollections

Google Analytics Audience Overview

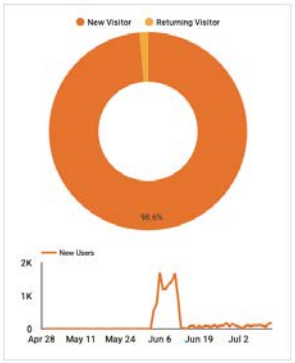
Continent | Region | Channel | Device | Apr 28, 2022 - Jul 13, 2022

Your audience at a glance



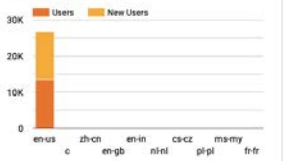
Users	New Users	Number of Sessions per User	Sessions
13,607	13,611	1.01	13,802

Pageviews	Pages / Session	Avg. Session Duration	Bounce Rate
16,711	1.21	00:00:14	98.32%



Let's learn a bit more about your users!

Language breakdown



	Language	Users	New Users
1.	en-us	13,493	13,459
2.	c	88	88
3.	zh-cn	23	23
4.	en-gb	14	14
5.	nl-nl	3	3
6.	en-in	3	3
7.	cs-cz	2	1
8.	pl	1	1
9.	en	1	1
...	es-419	1	1

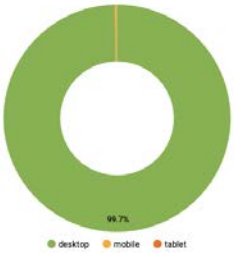
1 - 10 / 27

Country breakdown

	Continent	Users	New Users
1.	Americas	13,477	13,444
2.	Oceania	69	69
3.	Asia	62	62
4.	Europe	35	35
5.	Africa	2	1

1 - 5 / 5

What device are people using?



	Device	Users	New Users
1.	desktop	13,571	13,565
2.	mobile	42	42
3.	tablet	4	4

1 - 3 / 3

UF UNIVERSITY of FLORIDA
FLORIDA MUSEUM
NSF

CALIFORNIA PHENOLOGY TCN – QUARTERLY REPORT – AUGUST 2022

Assembled by Katie Pearson, 26 July 2022

PROGRESS IN DIGITIZATION EFFORTS

The CAP TCN has surpassed our imaging goal by 4% (over 943,000 specimens imaged), our transcription goal by 5% (nearly 316,000 specimens transcribed), and we have completed 85% of our georeferencing goal (nearly over 256,000 specimens georeferenced)(Figure 1).

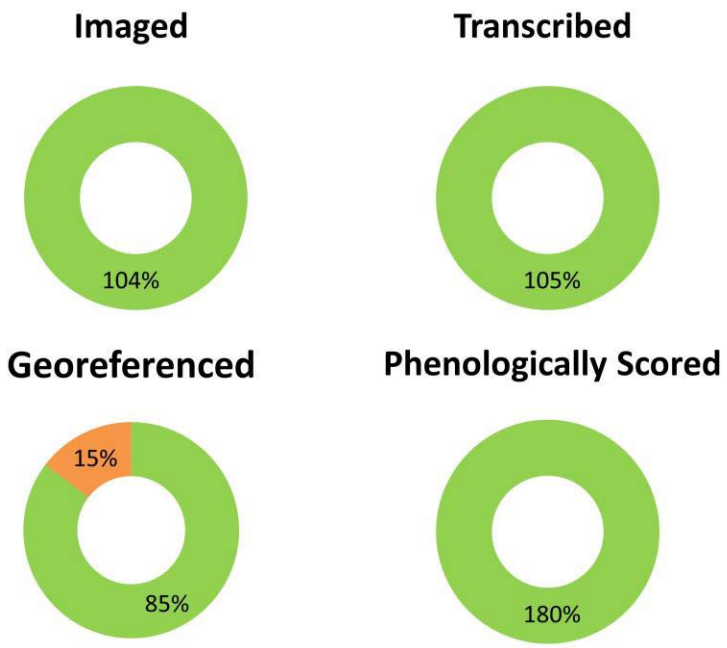


Figure 1. Progress in each of our four major digitization goals. Totals represent the original goals of the CAP grant: 902,400 specimens imaged and phenologically scored, and 300,000 transcribed and georeferenced. Additional specimens to be digitized by the PEN grant are tabulated in the PEN section 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.**

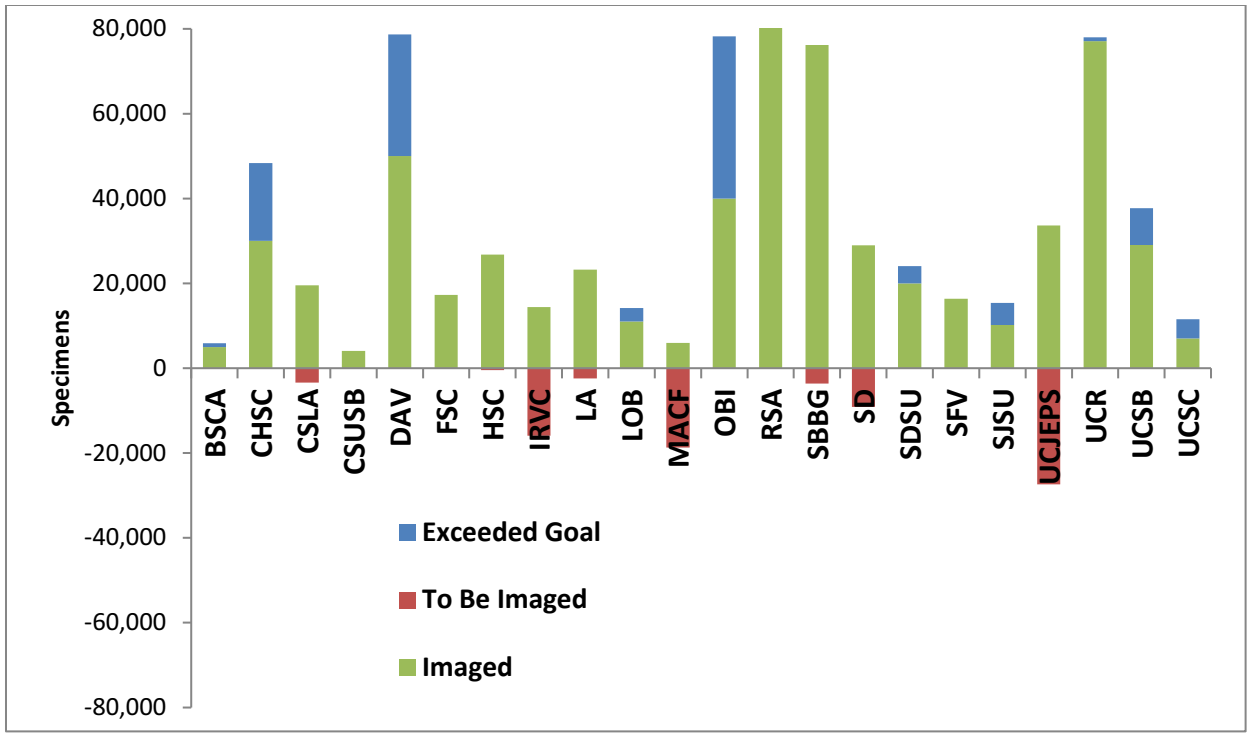


Figure 2. Herbarium specimen imaging progress. Blue portions represent the number of specimens that have been imaged, while green portions represent the number of specimens that have been imaged beyond the expected target specimens. Red bars below the zero line indicate the number of target specimens 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 29,462 specimens, exceeding their goal by nearly 300%.

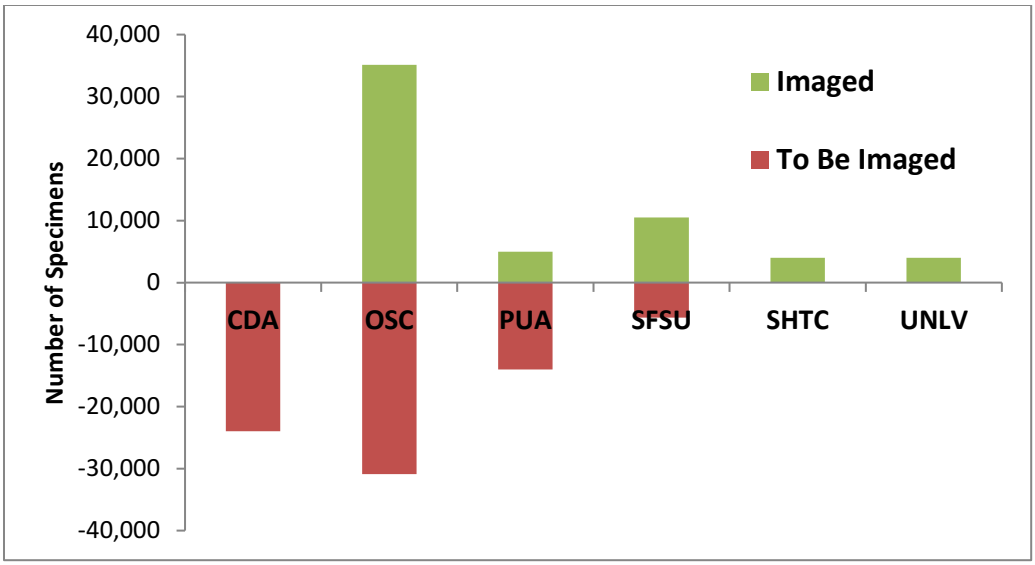


Figure 3. Herbarium specimen imaging progress for the seven PEN institutions. Green portions represent the number of specimens that have been imaged, while red bars below the zero line indicate the number of target specimens that have not yet been imaged. For SD, the total number of specimens to be imaged, 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)

Nothing to report

IDENTIFY GAPS IN DIGITIZATION AREAS AND TECHNOLOGY

Our users have identified key areas that they would like to be improved regarding the Symbiota code: https://github.com/CCH2-portal/CCH2-wish-list/issues.

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 have continued our "Data Portal Lunch Break" webinar series. These half-hour webinars led by the PM consist of one, brief demonstration of a particular tool or function in the CCH2 portal, followed by Q&A. These webinars are conducted on the first Wednesday of every month from 12:00-12:30 PM Pacific. From February to May, we conducted three Data Portal Lunch Breaks. Their recordings can be found here: https://www.capturingcaliforniasflowers.org/symbiota.html. CCH community members are also encouraged to participate in the Symbiota Support Hub's monthly "Symbiota Support Group" webinars.

We conduct monthly meetings of the Consortium of California Herbaria. These have led to excellent conversations on the sustainability of the CCH and the CCH2 data portal, as well as digitization and curation collaborations between institutions.

We concluded the spring 2022 quarter of our online herbarium digitization course. We had 13 students from 7 institutions in the spring quarter.

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

The PM and our website continue to be resources for the greater herbarium community regarding digitization and portal management. We have provided digitization consultation for the The PM has collaborated with individuals from the BLM Bishop Office Herbarium (BLMBI), Death Valley National Park Herbarium (DEVA), Inyo National Forest Herbarium (INF), and Klamath National Forest herbarium (KNFY). DEVA borrowed imaging equipment and digitized their collection in summer 2022, and KNFY is scheduled to borrow equipment and digitize their herbarium, as well as 2 local herbaria, in September 2022 with consultation from the PM.

Several herbaria have migrated some data into the Macroalgae portal and continue to manage data in the bryophyte and lichen portals.

SHARE AND IDENTIFY OPPORTUNITIES AND STRATEGIES FOR SUSTAINABILITY:

The monthly Consortium of California Herbaria meetings and Data Portal Lunch Breaks have increased communication within the CCH and improved community capacity to manage data and digitization in the data portal. We intend to continue these meetings far past the end of the TCN.

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

The PM shares updates on the project and phenology-related news via the network Twitter account (@CalPhenologyTCN).

Notes from Nature volunteers completed three expeditions this quarter, resulting in transcribed labels for 5,718 specimens from CSU Fresno, Oregon State University, and UC Irvine. One Notes from Nature expedition is ongoing, consisting of 1,500 specimens from CSU Fresno.

We concluded the spring 2022 quarter of the online herbarium digitization course, which included 13 students from 7 institutions. This course not only included transcription and georeferencing training, but we also piloted a mini research project in which the students scored specimens according to their phenological status, downloaded the data, cleaned the data in Excel, and visualized the data in Excel. Students then shared their results and their interpreted limitations for the class. Students were also asked to regularly share about their digitization progress, as well as one topic of their choice relating to the subject material. In this way, the student practiced digitization, communication, data analysis, data visualization, and presentation skills during this course.

WEBSITE AND PORTAL USAGE

Our project website (capturingcaliforniasflowers.org) has received 2,073 visits (a 57% increase from last quarter) and 2,697 pageviews (a 46% increase from last quarter) from April 1, 2022 to July 25, 2022. The data portal (cch2.org) has supported 29,979 sessions (approx. equal to last quarter), 262,700 145,872 pageviews (80% increase from last quarter), and 17,131 users (13% increase from last quarter) over the same time period. The number of automated bots originating from other countries has, fortunately, decreased this quarter and is likely to represent fewer than 500 of our purported users.

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: In the last quarter, we digitized 70 samples. My undergraduate assistants left for the summer in May so capacity was reduced.

AMNH: Christine Johnson: To date, we have added 11,182 new records and updated with images, locality information or card catalog records for an additional 8,990 records 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 2,876 images of specimens and/or labels have been taken; 1,458 have attached to new catalog records; 1,057 have been attached to existing, incomplete catalog records. 18,960 database records are associated with a locality record and of these 3,085 have an initial set of geographical coordinates. (Note: some of these numbers "decreased" due to counting some "duplicates" due to records containing more than one image per specimen catalog record.)

AUMNH: Nusrat Noor: 243 additional lots were entered into Excel.

BPBM: Holly Bolick: This quarter we focused on uncataloged crustaceans from previous surveys dating back to the 1950s. Metadata had to be retrieved and transcribed prior to digitization, which resulted in a slower workflow, but we were able to save some very valuable specimens that represented new holdings for the collection, including more Hawaiian specimens. We added 385 new specimen records into the database (total of 2,252 lots to date), and have updated and cleaned up an additional 385 specimen records. We mobilized approximately 120 more specimen images that are linked to catalog numbers and ready for upload. We acquired 42 new specimen images (including type specimens). Our specimen image total (mobilized and new images) is now 3,309.

CAS: Christina Piotrowski: CAS DigIn Digitization Technician, Hanna Baek, has been rapidly hand entering data records directly from specimen jars into preformatted spreadsheets (work supplemented by a volunteer), resulting in 5,229 records captured this quarter. Other CAS volunteers and our summer intern also transcribed pre-scanned specimen labels remotely and on-site (1,951 records). Spreadsheets of these records were cleaned, edited, and uploaded to our Specify database (7,180 records) where, once they have been georeferenced, they will be ready for export to iDigBio. We estimate Hanna's data entry rate as approximately twice as fast as our traditional hand cataloging rate, resulting from concerted efforts to streamline her efficiency.

Zooniverse, Notes from Nature–Invertebrate Time Machine Project (NfN-ITM):
Staff continued QA/QC/reformatting of transcribed NfN-ITM data to prepare it for ingestion, cleaning an equivalent of approximately 4,000 records (estimated metric since data is

cleaned by field rather than by specimen record). As QA/QC of these records requires a significant output of staff effort to ready them for upload, we have been self-training on Open Refine QC and look forward to our TCN's Technical Workshop with iDigBio staff in the coming quarter to advance our skills.
Following the attrition of onsite scanning volunteers this quarter, CAS volunteers scanned a little more than 721 specimen labels. These scans are destined to be transcribed by either in-house or remote Academy volunteers and staff who must work remotely. We are rethinking our application of Zooniverse – Notes from Nature for this project due to the heavy lifting required to clean records at the back end and the time required for staff support. Our current technical work to support data entry and other project work makes this no longer feasible.
We began pre-curating our photographic slides this quarter by physically numbering them (volunteer project) in preparation for scanning and attaching scanned photo slide images to specimen records, where applicable.

FWRI: Paul Larson: This quarter we digitized 1,354 new specimens.

HBOM: Dennis Hanisak: We have continued to reorganize HBOM from its remediation and renovation and to train HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project. We plan to initiate digitizing of mollusks in the coming quarter, and the HBOM PI has procured some additional non-NSF support to hire additional student help to help on that work.

MCZ: Adam Baldinger: This quarter, 810 uncataloged lots, equaling about 5,000 specimens (mostly echinoderms), were databased from spreadsheet data and specimens in hand. As of 21 July 2022, 11,507 records in MCZbase have been cleaned/vetted for accuracy. Of these, 11,326 records contain vetted/verified georeferences.

NCSM-NMI: Megan McCuller: We have finally completed and bulk uploaded all the non-molluscan invertebrate spreadsheet records of the NOAA National Benthic Inventory into our Specify 6 database, totaling approximately 5,600 lots. We've also photographed a good number of image labels. While the majority are labels of lots previously digitized, there are many which have either: (a) not been digitized at all; or (b) have been digitized, but before the migration of our database from Access to Specify 6. Starting next quarter, all jar label photos of databased lots will be connected to their catalog numbers as image attachments and QA/QC can begin. Those not databased can be bulk uploaded to Specify, where data can be entered directly from the label information.

NHMLA: Dean Pentcheff: This quarter continued full-scale data entry with over two dozen part-time staff (as long as USC work-study students were still available). Again this quarter, the full-time staff members of the Marine Biodiversity Center and Crustacea sections spent the majority of their time on DigIn work and supervision. We have made good progress in the Polychaete collection, but in this next quarter (2022-Q3), we are also expecting to begin work in the Echinoderm and Crustacea Collection space. In anticipation of another round of hiring of work-study students in the Fall Semester, we made a strong effort to further develop our training and evaluation processes. The program's new DigIn Project Manager (Dr. Vijay Barve) began work at NHMLA this quarter. We invested time in the hiring process for two new full-time staff members, one institutional (Assistant Collection Manager) and one grant-funded. These positions are expected to begin work in 2022-Q3.

RSMAS: Maria Criales: We continue entering collection records into excel spread sheets that can be uploaded into a database. In total this quarter 6,342 records were entered, and we have captured a total of 23,311/55,000 from catalogued cards and books.

SBNHM: Daniel Geiger: Over 30,000 lots were catalogued and sent to iDigBio including 1,617 types. We have completed areas in the systematic collection: Porifera, Cnidaria, minor

worms, Mollusca, Arthropoda, Brachiopoda, Echinodermata, Cordata. Remaining groups to complete: Annelida, Bryozoa, and the survey collections.

SIO-BIC: Charlotte Seid: Digitized 1,167 lots this quarter, largely backlogged processing by the collection manager of Q2 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 Q3.

SIO-PIC: Linsey Sala: We have continued training of our students and conducted direct data capture for 3,940 lots this quarter. Additionally, we have precurated 3,507 lots.

UCM: Kelly Martin: A total of 477 specimen lots have been imaged by our summer undergraduate intern Kayla Vasarhelyi. Kayla has helped us tremendously in our imaging push this summer. Kelly Martin has started work and is becoming familiarized with the grant.

UF: John Slapcinsky: This quarter we digitized 1,381 new specimens. We culled 18,598 images down to 7,090 images for uploading, and we edited 11,444 images for upload into our database. We now have 18,892 databased images ready to upload to our database which will then be shared to data aggregators.

VIMS: Jenny Dreyer: 1,000 specimen records were QA/QC'ed from card catalog records to get ready to import into Specify. This includes physically locating each specimen and recording any missing specimens, verifying if they are in good condition, and recording the volume of fluid in each vial (this is for a total ethanol volume in our collection for VA fire codes). Additional fields that were not recorded on the original card catalog cards are being added as each specimen vial label is double checked. I am still working on incorporating the taxonomic nomenclature changes that Nicolas Bailly processed with the WoRMS taxa matching tool. I spent a lot of time cleaning data but have not uploaded it yet. 20 records have been entered into Excel this quarter. I am deciding on how to set up a few different fields in Specify and don't want to have to go into each record and change it. I anticipate once those fields are worked out, uploading will go much faster. 275 specimen labels were photographed for an archive to attach to specimen records in Specify.

NOTE: that a selection of quanitative 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
	DigIn lots to digitize for upload	DigIn 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 GoGeo	Records QCed and repatriated after georeferencing	Specimens precurated for digitization	Specimen images taken	Specimen images QCed and databased	Records imaged from ledgers, cards, or labels	Records CCRed 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	5000	500	0	0	0	0	70	0	0	0							2	Capture seconds per specimen is difficult to calculate because my undergraduate students are spending a lot of time pre-curating specimens for digitization.
ANSP	22,060	1,600																								
AUMNH	10,000	5,000	3,262	0	1,095	0	0	0	0	0	0	0	0	0	0	1,801	1,095	0	n/a	n/a	n/a	n/a	n/a	n/a	0	
BPBM	6,238	3,900			2,252					77	3,037															
AMNH	56,708	7,000	0	0	0	~5000	0	0	N/A	2,876	2,515	19,948	19,312	19,312	19,948	264	264		762.31	imaging labels	286	transcribing				Hi. Note: some of these numbers "decreased" due to counting estimates do not included QC and uploading to dbase; number varies widely with worker experience and quality of label data
CAS	59,616	3,500	0	0	0	0	0	0	4,609	0	0	38,142	31,832	12,616	3,329	8,620	8,579	0	240	scanning label	282/174	direct label capture	90	label scan transcript	0	
FMNH	1,140	50																								
FWRI	33,582	150	0	0	7,184	0	0	0	1000	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								Hi
MCZ	31,564	4,631	10,787	43	720	11,326	0	0	0	0	0	0	0	0	11,507	0	0	0						420	Data entry of new re	0	Hi
NCSM-NMI	31,283	675	0	0	0	0	0	0	0	0	0	1,504	0	0	5907	0	0	0	400	imaging labels		not measurable		not measurable		Hi! The not measurable aspect in transcription is because it took a series of steps using a workflow I haven't really done yet to make spreadsheet data into a format to be bulk uploaded into Specify. The entire process took weeks, but in the end will have certainly reduced overall time spent databasing these lots.
NHMLA	320,000	2,572	0	0	0	0	0	0	2,000	0	0	25,920	0	0	0	65,520	0	0	170	label photos and direct capture						
RSMAS	55,000	-	0	0	3,565	0	0	0	0	0	0	0	0	0	23,311	0	0	0		not measurable		not measurable				Hi
SBNHM	100,000	4,500	30,399								7000									not measurable		not measurable		not measurable		Hi
SIO-BIC	29,300	30,000	0	0	5,965	0	0	0	0	789	11	0	0	0	0	5,965	5,965	0	135	data entry from labe	NA	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. In late Q2 I wrote a script to automate the most laborious parts of QA/QC, decreasing per-specimen processing time by 30% in Q3 compared to Q1.
SIO-PIC	34,371	-	0	NA	0	0	0	0	3,507	NA	NA	0	0	0	0	3,940	0	0		not measurable		not measurable		not measurable		Hi, and we document hours spent digitizing for a group of students each day with total # of lots, which seems to be the most reasonable/time efficient way for us to track progress. This does also include pulling lots from shelves, reshelving, digitally capturing the physical location of specimens (e.g. bay, shelf, drawer, box) and condition so that we can more easily relocate and determine best specimens for use.
UCM	3,285	1,000	0	0	0	53	0	0	0	702	0	3,554	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	Hi! Records image from ledgers are probably much higher, we will work to calculate and add these newer numbers found only in the ledger and not in the database
UF	20,000	400,000	7,914	25,782	26,000	10,638	0	0	22,219	400,000	18,982	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	Culled 18,598 images down to 7090 images for uploading and edited 11,444 for upload into our database
VIMS	6,000	125	0	0	0	1000	0	0	20	275	0	0	0	1000	0	20	0	0	180	imaging labels			120	QA/QC of card catalog specimen r		Images are of labels only and generally not specimens; spent a lot of time clearing data but have not uploaded it yet. I am deciding on how to set up a few different fields in Specify and don't want to have to go into each record and change it. I anticipate once those fields are worked out, uploading will go much faster. QA/QC of specimen records involve locating each specimen, verifying if they are in good condition, and recording the volume of fluid in each vial (this is for a total ethanol volume in our collection for VA fire codes). This also involves cross checking taxon names with the most current accepted name in WoRMS.

Access the quantitative table here.

Share and Identify Best Practices and Standards (including Lessons Learned)

AMNH: Christine Johnson: AMNH staff continue to attend the Expedition, Georeferencing, Nomenclature & Steering committees.

BPBM: Holly Bolick: Having metadata digitized prior to specimen cataloging is a very time-saving step in the process; bulking time for techs to digitize rather than asking them to fit it into their existing work schedule has been very helpful in productivity over all.

CAS: Christina Piotrowski: Academy staff participate regularly on the Specify WG, organizing meeting notes and reporting, and serve on the DigIn Steering Committee, while also contributing as members to most other data relevant working groups.

We've produced a rapidly growing number of written workflows specific for internal CAS historical specimen data, as we continue to develop and refine new workflows as the opportunities arise.

Following completion of our Zooniverse Project, we've had a chance to reflect on its success. Over the course of the ITM Project, we learned that online crowd transcription can be a very powerful tool, both for engaging the community with museum science and for digitizing specimen label data. However, in the future, simplifing workflows for online volunteers will be more efficient. Our two NfN workflows were designed for complete data capture of entire records, but in the future we would consider experimenting with partial data capture instead, or even with volunteer research of current taxonomy, locality standardization, and other workflows. Cleanup of complex Zooniverse data is an extremely arduous task, and much of the QA/QC of our ITM records must be done by hand due to the historical nature of our museum's specimen data. We also learned that many users of the platform engage in related research outside of the tasks requested of them in the project. This encourages non-traditional learning and engagement with natural history, and could also be harnessed in future Notes from Nature projects, alongside traditional specimen label transcription.

MCZ: Adam Baldinger: MCZ staff continue to be involved in the Steering committee and in the Expedition, Nomenclature and Georeferencing working groups. Information obtained is then shared with curatorial staff in other MCZ departments, including those working on other TCN's (e.g., ESB and PILSBRy). Various staff members working on the project participate (via Zoom) in monthly DigIn ESB general meetings and monitor communications shared on Slack.

NCSM-NMI: Megan McCuller: Recording notes and process workflows is incredibly important and will reduce future efforts. We have been developing workflows and guidance documents for our specific needs, such as what data needs to be cleaned or made consistent (holdovers from the import from Access in 2017), as well as processes we have used for data wrangling, Specify bulk import, and Specify tips and tricks that we haven't seen in official documentation (e.g., don't press Enter in Remarks fields because it seems to cause issues with the spreadsheet export files) that can be shared with other institutions. We have also found that some time can be saved in the label imaging process due to automated post-processing (e.g., not spending much time getting labels straight and instead using Adobe Photoshop auto crop and straighten photos function in post).

RSMAS: Maria Criales: We are in conversations with the Symbiota support group. We started uploading data to the InvertEBase portal thanks to Katie Pearson's support.

UCM: Kelly Martin: Bridget Chalifour, Cameron Pittman, and Erika Nielsen created standard operating procedures (SOPs) for continued use in the Invertebrate Zoology section for georeferencing and 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.

VIMS: Jenny Dreyer: I continue to attend All Hands meetings and participate in Nomenclature, Specify, Workflow, and Georeferencing WGs whenever possible. All working groups were recently consolidated and will only meet once a month for any agendized topics. Office hours will also be available for unagendized topics. I continue to actively participate with the general group via Slack to provide feedback on publicity content.

Identify Gaps in Digitization Areas and Technology

AMNH: Christine Johnson: We need an outlined georeferencing process.

BPBM: Holly Bolick: Having a database where images can be easily linked to specimen records would greatly improve efficiency in data capture and data cleanup. We are still waiting for this function to be available. Numerous server and IT issues at the museum have prevented forward motion on this front.

CAS: Christina Piotrowski: CAS has technology gaps related to georeferencing, and staff have participated in the Working Group meetings and trainings to keep current of DigIn progress in this area. Now that our Project Manager is on board, efforts are more active to develop solutions for importing newly georeferenced records back into Specify. We have also discussed leveraging the fact that several DigIn institutions are paying members of the Specify Consortium towards making this issue a priority for the Specify team.

We are working with CAS IT/Bioinformatics to help us set up a system for attaching media to Specify records, and IZ Staff have been working to standardize ITPC metadata, Creative Commons licensing, and credit/attribution in both our metadata and Specify field structure so that these records will be ready for online sharing once they are associated with records. Many of our existing specimen images are copyrighted by internal or external photographers, requiring that required attribution and usage requirements be made very clear for any copyrighted specimen images shared online by data aggregators.

We remain in the process of setting up a type specimen imaging station, continuing to troubleshoot equipment and lighting integration. We've made some headway this quarter with our camera and solving lighting issues, however now our image stacking equipment seems to not be functioning with the camera shutter. We will likely need to make some unexpected purchases for this for both macro and micro-photography to function properly. We are concerned about having sufficient time to complete this deliverable, alongside our primary focus of specimen record data entry. Our hope was to recruit a stipend-paid intern earlier in the project to assist with type imaging, however we have now missed our summer 2022 window for this so we will likely need to employ undergraduate or graduate level interns during the year since only one more summer remains in our funded period.

MCZ: Adam Baldinger: Images are beginning to be generated using our new macro-photography workstation.

NCSM-NMI: Megan McCuller: We still face issues with getting our data uploaded to the Vertnet IPT and thus GBIF and iDigBio aggregators due to problems with our database manager. We believe we may be nearing resolution of this issue and hope to have a more recent data upload to our publishers portal before the end of next quarter.

RSMAS: Maria Criales: Because we have been focused mainly on entering data in Excel spreadsheets, we haven't found big technical difficulties, but they will come.

SIO-BIC: Charlotte Seid: Scripps IT set up a new server to improve reliability of the public-facing SIO-BIC database, which aids users by providing more frequent (at least weekly) updates

than the iDigBio dataset. We look forward to the upcoming Technical Workshops, especially regarding pipelines for uploading images and data to iDigBio.

SIO-PIC: Linsey Sala: We currently do not have a pipeline to upload data to iDigBio.

UCM: Kelly Martin: As the collections experience turnover in the section staff as well as adjusting to the summer schedule, veteran student workers have trained incoming student workers as well as new staff. This process has been incredibly efficient and a great way to test our protocols.

UF: John Slapcinsky: We are currently investigating asset management systems for images that will not be served on our Specify database.

VIMS: Jenny Dreyer: I am not connected to iDigBio or InvertEBase yet and will work with Vijay Barve and Cat Chapman (iDigBio) to make this happen. The VIMS Fish Collection is on there so it should be straight forward, but I have not done this yet. I am still working on determining a standard error of uncertainty for specimen records before moving forward with georeferencing. This was discussed in the georeferencing working group, and it was decided a best practices document would be developed by Nelson Rios and Nicolas Bailly that would be available for DigIn. Some of other institutions have the same problem with error of uncertainty.

Share and Identify Opportunities to Enhance Training Efforts

ALMNH: Kevin Kocot: In June 2022, I co-organized a meiofauna diversity and taxonomy workshop at the Smithsonian Marine Station in Fort Pierce, FL. Currently I am co-teaching a course on Biodiveristy and Integrative Taxonomy of Invertebrates at Friday Harbor Labs in

Friday Harbor, WA with Gustav Paulay. Both courses emphasized integrative taxonomy, specimen curation and best practices e.g., preservation and data management for morphology, histology, barcoding, biodiversity studies as well as environmental DNA, transcriptomics and other genomic data. Both courses have been highly impactful on our next generation if marine invertebrate researchers. In the current 5-week FHL course, 18 students are being supported by 21 mentors who are discipline experts. Course resources and lecture recordings for both courses will be made available via the web. Some of these materials are directly relevant and valuable for training within our DigIn community and will so be used. More such workshops and courses would be valuable.

AUMNH: Nusrat Noor: Looking forward to technical workshop coming up at end of July.
CAS: Christina Piotrowski: Piotrowski attended the Society for the Preservation of Natural History Collections (SPNHC) meeting in Edinburgh this quarter to represent the Academy (and DigIn), as CAS will be hosting this international conference of museum professionals in 2023. Alongside distributing project stickers from the SPNHC 2023 table, numerous opportunities to share and discuss our project and best practices with other museum professionals were taken advantage of during this in-person event, where she also participated in a workshop on Nagoya Protocol standards and implementation that may benefit the greater team.

We are currently discussing the idea of hosting two DigIn specific sessions at SPNHC 2023 to share our workflow ideas and experiences, and to better familiarize the museum professional community with our project.

RSMAS: Maria Criales: The Technical Workshop planned for the end of July seems to be a very good idea to enhance training.
SIO-PIC: Linsey Sala: Looking forward to the upcoming Technical Workshops to help streamline data wrangling and setting up our workflow/pipeline to iDigBio.
UCM: Kelly Martin: Erika Nielsen and Kayla Vasarhelyi have trained one new student employee in dissecting scope imaging protocols. Kelly Martin became trained on the protocols for the grant.
UF: John Slapcinsky: Participating in the Technical Workshop on data carpentry with DigIn and ESB.
VIMS: Jenny Dreyer: I trained a new volunteer who is working up to 12hrs/wk in the Collection imaging specimen labels with our new document camera and when necessary transferring specimens into new vials. Many of the old vials have plastic caps that are prone to leaking or cracks. We are targeting the most critical specimens. Although not part of DigIn I attended the 6th Annual Digital Data Conference, Field Museum. The conference provided an opportunity to explore digital data tools, techniques, research protocols, discoveries, and outcomes across all biodiversity research domains.

Share and Identify Collaborations with other TCNs, Institutions, and Organizations

ALMNH: Kevin Kocot: I am co-teaching a course with Gustav Paulay (DigIn PI, UF) with guest mentors PI Regina Wetzer and Dean Pentcheff (DIgIn, NHMLA).
AMNH: Christine Johnson: In August, the Frank Barnwell fiddler crab collection will arrive to be deposited in the AMNH collection.
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 and biodiversity topics which museum collections and data may help inform. CAS regularly collaborates with regulatory partners for donations and services such as NOAA/NMFS, USFW, CDFW, the Nature Conservancy, and the EPA. For example, this quarter we planned for the impending donation of several thousand expert identified benthic invertebrate samples from 1990s-2010's EPA survey work, and we accepted confiscated collections seized by USFWS. We also connected with board members from the Great Barrier Reef Foundation to explore synergies in fundraising for coral reef conservation efforts.

As mentioned in our previous reports, our project staff regularly collaborates with the ESB TCN and various other project partners.

FWRI: Paul Larson: Continued collaborations in TCN working groups with ESB and other DigIn institutions.

MCZ: Adam Baldinger: Information continues to be shared among permanent MCZ curatorial staff working on other TCN's (e.g., ESB and PILSBRy) and on an NSF-CSBR cryogenic collections grant.
NCSM-NMI: Megan McCuller: We are participating in the DigIn/ESB Technical Workshop through August.
NHMLA: Dean Pentcheff: Co-organizing the Technical Workshop with Erica Krimmel (iDigBio) and Vijay Barve (NHMLA).
RSMAS: Maria Criales: Eastern Seaboard Mollusks TCN= Collaboration; FLMNH, support data entering; Symbiota= support group.
UF: John Slapcinsky: Continued collaborations in TCN working groups with ESB and other DigIn institutions.

Share and Identify Opportunities and Strategies for Sustainability

AMNH: Christine Johnson: Continue to attach our scanned card catalog records with digitized catalog records.
BPBM: Holly Bolick: Imaging cataloged specimens that we receive loan requests for has actually decreased the number of specimen loans we end up having to send out over the past couple of years. Many times the researcher needs can be met with images or measurements taken in-house. This decreases our carbon footprint and costs substantially.
CAS: Christina Piotrowski: The ~31,000 card label scans created by our Zooniverse – NfN ITM Project, alongside the thousands of additional jar labels from undigitized lots by onsite CAS DigIn volunteers will eventually will be pushed online, where they will prove invaluable for future reference and accessibility as a specimen data QA resource. Scanning CAS station list files and field notes also offers potential for historical marine data resource uploads and access by future workers.
NHMLA: Dean Pentcheff: This quarter, we began the first DigIn Technical Workshop, focused on planning data management, and using Microsoft Excel, Google Sheets, and OpenRefine for data improvement. This is an important step to ensure that all participating institutions have the technical skills that will be needed to keep collections data flowing into aggregators beyond the DigIn grant period.
VIMS: Jenny Dreyer: We continue to archive specimen labels that will be attached to specimen records in Specify.

Share and Identify Education and Outreach (E&O) Activities

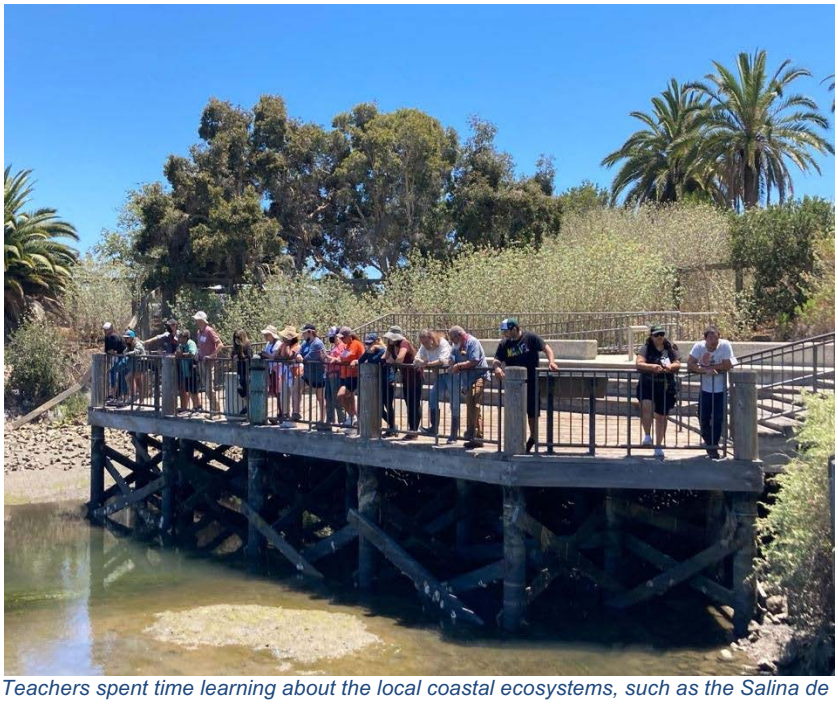
AMNH: Christine Johnson: As volunteers are returning onsite, we hope to be able to onboard new volunteers and bring back offsite volunteers, at which time new volunteers will be trained in curation, nomenclature and databasing. We gave a tour to a Marine Inverts class from Kingsborough Community College and several students were very interested in becoming volunteers so they could work with the collection.
AUMNH: Nusrat Noor: Conducted multiple tours; held two, week-long summer camps.
BPBM: Holly Bolick: I have not yet submitted any Media Assignments (lack of technical skills). But I met with Victoria Westover today to get back on schedule, and she was very helpful; I will be submitting content for 4 posts next week to be used during next quarter. We also opened an exhibit on Taxonomy on July 26th, and I will be doing some additional social media posts and activities in conjunction with that exhibit.
CAS: Christina Piotrowski: As COVID restrictions have eased, and with the busy summer season, CAS staff have continued to ramp up our in-person Outreach and Engagement. CAS staff participated in two Nightlife [https://www.calacademy.org/nightlife\outreach] events

showcasing the Academy's IZ collections geared towards an audience of young adults and the local Filipino community. Piotrowski was video interviewed for a NightSchool episode on snails (mollusk based, but the greater CASIZ collections were featured) [https://youtu.be/bXb0ysebaiw]. IZ Lab staff were also filmed while curating a recent Antarctic Greenpeace acquisition for the Academy's social media pages (link pending) to bring attention to Collections as they apply to deep sea Antarctic habitat conservation.
This quarter CAS staff provided collection tours to 30 REU Ocean Science Program students from CSU Monterey Bay and to Great Barrier Reef Foundation board members to explore future collaborations in coral reef conservation. We hosted 14 graduate level Smith Conservation Fellows, our 2022 cohort of 12 CAS SSI REU interns, Otago Museum and Steinhart Aquarium staff for collection tours and discussions.
Piotrowski was filmed by two Stanford University MS students via TikTok [https://www.tiktok.com/@istheam] for a Social Media post for Istheam, a graduate project geared towards engaging underrepresented high school students with science topics. Piotrowski was also interviewed by an undergraduate from the REU Ocean Science Program for advice on career and educational paths.
This quarter we also began exploring future opportunities for partnering with our CAS Education Department for Collections-based teacher interactions, and started planning for an initial lecture on the importance of museum collections and data for a set of high school teachers from an inner city school during a summer program hosted by the Academy.
CASIZ Collections provided a 3D scan of one of our specimens [https://sketchfab.com/3d-models/acanthaster-planci-casiz-102172-fabeaa874ae8476e97602fee4f303582?fbclid=IwAR3rZ6ujofdbxtcHGoo5OI5mCG5Y8RXNGpCoAntqNRWdJZZKaTMe2ngwJjo] to a Marine Studies Institute teacher at University of Sydney for use with her reef conservation curriculum.

MCZ: Adam Baldinger: Nothing to report specifically for E&O, but in terms of publicity, the MCZ submitted general content highlighting the Hassler Expedition.

NHMLA: Libby Ellwood – *Outreach*: From June 21-24, 2022 NHMLA co-hosted a K-12 educator workshop with California State University at Dominguez Hills (CSUDH). Building off of existing connections with 21 Noyce Science Fellow elementary, middle, and high school teachers from Los Angeles Unified School District, DigIn researchers and affiliates from NHMLA, along with two lead teachers, designed a four-day workshop focused on introducing teachers to local scientists and resources for scientific exploration. The major products of the workshop were lesson plans or units designed by each teacher that made use of the resources to which they were introduced over the course of the week. Elements of the workshop were designed to be local and/or easily accessible, e.g., through online video conferencing while also being modifiable to DigIn partners and their own local educators around the country.
The first day was hosted by the Center for Innovation in STEM Education at CSUDH and was focused on providing background scientific content on the major topics that would frame the week – climate change, marine biodiversity, and marine protected areas. Each day, we also led an example marine science lesson and provided time for workshop participants to work on their own lessons. At the end of each day, a brief survey was sent to participants to gauge progress and provide feedback to us for organizing activities the following day. All resources and notes were provided in Google folders that are accessible to all.
The rest of the week followed a similar format at various locations. The second day was hosted by NHMLA and focused on the educational and natural history collections-based resources of the museum and iDigBio. The teachers heard from museum educators, got

tours of the new LA Underwater Exhibition and the Crustacea Collection, and learned how to use iNaturalist to identify and document local biodiversity. The third day was a “field day” that started at AltaSea, a warehouse facility where we learned about kelp aquaculture. The rest of the day was hosted by the Cabrillo Marine Aquarium and included tidepooling, a visit to the salt marsh, and time exploring the aquarium. Aquarium staff provided information about the variety of workshops and field trips they offer to educators and classes. The fourth and final day was back as CSUDH. One of the highlights of this day was virtually connecting with the educators aboard the E/V Nautilus. They introduced us to the expedition and generously answered all of our questions about their education resources. The workshop ended with presentations from all of the participants on the impressive lessons they developed based on the week’s activities.



Teachers spent time learning about the local coastal ecosystems, such as the Salina de San Pedro Salt Marsh shown here.

DigIn researchers will be taking the successes and lessons learned from this week to create materials that other DigIn institutions can use with their teacher partners as part of our Broader Impacts plans.
NHMLA: Victoria Westover – *Publicity:* DigIn has published 61 Instagram posts, 20 Instagram stories, and 12 Twitter posts.
Our 61 Instagram posts include 13 Invertebrate of the Week posts, 14 Scientist Spotlight posts, 12 Friday Fun Fact posts, and 22 General Content posts.
The General Content posts consist of two introductions to DigIn, five posts that relate to trending hashtags in the scientific community (i.e., #MolluskMonday and #SeaSpiderSaturday), six posts about invertebrate specimens, four posts about specimen collection or observation events, one post about Earth Day, one post about a recently published study, one project update post from the Quarter 1 Report, and two random posts about a research vessel and the donation of no-data specimens.
The 20 Instagram stories included one introductory story on DigIn, 13 Invertebrate of the Week stories (where we link our Invertebrate of the Week Instagram posts to InvertEBase), one story showing what digitization looks like at an institution, one story about an NHMLA donor outreach event, and four stories about holidays (International Day of Women and Girls in Science, Valentine’s Day, World Wildlife Day, and Earth Day).
Our 12 Twitter posts consist of two introductions to DigIn, three holiday posts, one post on a trending hashtag in the scientific community, four posts about specimen observation or collection events, one post about invertebrate specimens, and one post on the Exploration Vessel Nautilus.

RSMAS: Maria Criales: We provided a tour at the Voss Marine Invertebrate Collection for 40 high school students. A video of Collections was presented at the RSMAS Sea Secret talks, with a large audience of the community. The video is now linked to the webpage. We continue developing an educational MPS track around the collection, which in the future should generate great learning outcomes.

SBNHM: Daniel Geiger: Provided no-data specimens to local colleges for teaching collections.

SIO-BIC: Charlotte Seid: Conducted 15 E&O presentations (10.2 hrs) for 168 visitors (elementary school through adult learners), highlighting invertebrate biology and the value of digitized museum collections.

SIO-PIC: Linsey Sala: We have had a busy quarter filled with tours of our collection as more in person activities resume. We express the value of digital data availability and important uses of natural history collections during all of our presentations.

UCM: Kelly Martin: We are in the process of creating a shared repository for outreach activities and instructions within UCM.

UF: John Slapcinsky: This quarter we had 11 tweets on our lab Twitter (@UFInvertZoo) directly about non-molluscan invertebrates. 2 in May, 6 in June, and 3 in July. Animals highlighted were Chaetognatha, *Thyca nardoafrianti, Gomophia gomophia, Galaxea, Nobia,* slipper lobster, lancelet, macrophiothrix, shrimp, bryozoa, brachiopoda, and a retweet linking to an article we had previously written about undersea vampires.

VIMS: Jenny Dreyer: I have done 4 tours of our Collection to the general public, as well as students/staff at VIMS. I participated in a 4 week Green Eggs and Sand Virtual Workshop (on Horseshoe crabs) with a weekend field trip to Delaware Bay. Outreach content and teacher lesson plans were demonstrated and we participated in hands-on activities. I provided foraminifera and hard clam specimens for a permanent exhibit at the Science Museum of Virginia. I was asked to give a seminar on deep sea biology and featured specimens from hydrothermal vents and the deep sea (with a few local specimens of squid and octopus). I was asked to provide taxonomic identifications for organisms through 10 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.

Other Progress (that doesn't fit into the above categories)

ALMNH: Kevin Kocot: This spring we hired a new collections manager who will be helping me in the collections and with Arctos. Brooke Bogan is currently training in this software.

AMNH: Christine Johnson: Things have been slower but we are in the process of onboarding a second digitizer. Via a tour to the Marine Inverts class at Kingsborough Community College, we are hoping to onboard new volunteers.

CAS: Christina Piotrowski: We are working to ramp up our on-site volunteer label scanning program after losing a couple of volunteers recently, collaborating with our newly reorganized Volunteer Program to recruit more IZ workers. We brought on a summer graduate intern this quarter who, among other tasks, assisted us with both label scanning and data entry of DigIn records with pre-populated collection event data to troubleshoot this newly developed workflow. We also brought on one of our Zooniverse project transcribers, who is also a Docent at the Academy, for in-person volunteering on the DigIn project to pre-curate our photo slides for scanning and to transcribe scanned label data.

FWRI: Paul Larson: We have taken action with the Specify consortium to get an RSS Feed started that will allow us to export data to iDigBio.

VIMS: Jenny Dreyer: Things have been a bit slower this quarter since field season is in full swing and I am in the field a lot. As field work slows down, I can make up any difference in hours on the Collection and make more progress.

Have you had any additional costs due to the COVID pandemic? [We ask this because, if there are ever COVID-relief funds available via NSF, documentation of costs will likely be required.]

AMNH: Christine Johnson: We haven't given wage increases. However should this become an issue, we would have to reduce the number of lots we projected to complete.

CAS: Christina Piotrowski: We've discovered that we may need to replace the stacking equipment for our macrophotography station, which we have been trying to cobble together without project funding. We also need to purchase microscope stacking equipment for small type specimen photography.

There remains uncertainty re: the impact of COVID conditions on our project budget over long term, however we're currently spending significantly more CAS staff time on basic project work in the absence of student and project staff support, and we will require many more hours of highly trained staff later in the funding period to complete the more high level tasks such as data research, cleaning, and upload.

COVID exposures and cases have been disruptive to our in person workflows and have made predictability and scheduling challenging. The current higher load of grant supporting activities and remote work have also prevented staff from attending to non-grant related projects, which will cut in to time available for these complex tasks later in the project. Full impact of this remains to be determined, but we may be unable to finish the work in the remaining funded 3 years and will need project staff to extend beyond the 4th year (currently not budgeted).

HBOM: Dennis Hanisak: Not really additional costs, but significant delays in the required remediation and renovation of our collection space and in receiving orders from vendors.

NHMLA: Dean Pentcheff: COVID and diversity-related work in HR continued to make hiring extremely slow at NHMLA. We are still using pre-existing collections staff time to offset the two full-time positions that are still in the hiring process.

RSMAS: Maria Criales: The COVID quarantine affected our productivity but not the cost of the project.

SBNHM: Daniel Geiger: Workforce issues have led to wage increases. The grant budgeted wage for Curatorial Assistant of $15–16 was bumped to Santa Barbara City minimum living wage of $19.60. With the same amount of funds, fewer hours of data entry will be available, reducing numbers of lots captured.

VIMS: Jenny Dreyer: No additional costs but significant delays in supplies related to the Collection. I was interested in purchasing a thermal printer (not with DigIn funds) and the production time is really long. Ideally it would have been nice to purchase with FY22 funds but with slow production times that was not possible. I hope this is something I can purchase in FY23 if given the funding. I can use the Fish Collection thermal printer but it would be easier to have one for the Invertebrate Collection since we are housed in separate buildings on campus and it would serve as a backup for Fish Collection should that go down.

Now that we are at the halfway mark of our DigIn grant, please try to estimate the overall progress of your work so far in terms of percentage with respect to the project commitments. Just a percentage figure.

Rationale behind the above estimate. We know that some of this estimation will be fuzzy, based on activities that you have not yet done. If there are key assumptions you've made that will help us all understand your estimate (and may help us make our own estimates), please let us know.

ALMNH: Kevin Kocot: Estimate of our total progress: 40%: I am over halfway done in terms of the number of specimens digitized, but I still need to port the data to GBIF and iDigBio.

AMNH: Christine Johnson: Estimate of our total progress: 30%: Our not having people being able to work on-site and in pairs has slowed down our databasing efforts significantly. We are onboarding another person for an additional 8 hours a week, who already has experience and we hope this will bolster the onsite activities.

AUMNH: Nusrat Noor: Estimate of our total progress: 25%: We have made some form of progress on roughly a third of the 15,000 specimens but I brought the percentage down since they have not all been fully digitized and uploaded to iDigBio.

BPBM: Holly Bolick: Estimate of our total progress: 60%: We are ahead on images and on track with specimen digitization.

CAS: Christina Piotrowski: Estimate of our total progress: 40%: Data entry: Of our commitment of 59,616 databased georeferenced specimen records so we should have completed 29,808 in half the project time. We've completed 12,070 data records (0 are georeferenced or online yet…but will be online SOON.

This is ~40% of where we need to be to have completed half our goal.

We've scanned labels for ~38,000 records (figure includes significant # of mollusks, due to numerically ordered catalog cards...not taxonomically). Zooniverse label scans, and those currently being produced, will assist us to use non-staff to enter data records to supplement grant staff data entry, hopefully making up for about a fifth of our 10% shortfall. Relatedly, we've had a large number of (~31,000) records transcribed via the Zooniverse platform (perhaps ~40% were mollusks). Once these records can all be QC'd and uploaded this will contribute immensely to our shortfall, however it's infeasible to know exactly by how much at this time.

To be conservative I've estimated our progress as 40% but we may well be doing better than that once we have better solutions to our Zooniverse QC issues and (external) georeferencing workflows can be implemented.

Imaging: We've completed ~40 specimen images (of 3500 committed). Since we are falling far behind on this goal, we aim to substitute online sharing of non-type specimen images (lab quality and images in life) associated with online specimen records in lieu of imaging all primary non-molluscan types, however we will also continue to move forward towards our original goal of including non-molluscan primary types in our imaging objective.

FWRI: Paul Larson: Estimate of our total progress: 21.4%: We are on-track. To date, we have spent approximately 15.2% of the salary funding and 21% of the specimens promised have been digitized.

HBOM: Dennis Hanisak: Estimate of our total progress: 0%: As mentioned above, we have had to reorganize HBOM from its remediation and renovation and to train HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project. We plan to initiate digitizing of invertebrates in the coming quarter and the HBOM PI has procured some additional non-NSF support to hire additional student help to help on that work.

MCZ: Adam Baldinger: Estimate of our total progress: 50%: Data entry of uncataloged specimens continues, with about 65% of our goals reached. Existing records continue to be vetted for accuracy with respect to specific localities, higher geography, sovereign nation,

georeferences, taxonomy, and agents. Data is regularly uploaded to iDigBio and other aggregators. Imaging of primary types remains to be done, but this work will be emphasized in years 3 and 4.

NCSM-NMI: Megan McCuller: Estimate of our total progress: 21%: While we are only at 21% in terms of digitization project commitments (we have databased 6,589 lots of 31,283 estimated lots needing digitization). This estimate does not take into account the 3,182 total internal jar labels imaged thus far, or approximately 12,000 previously databased records that have been reviewed for consistency and accuracy.

NHMLA: Dean Pentcheff: Estimate of our total progress: 20%: We have collected raw data for about 62,000 records out of a 320,000 committed. We used about 6,700 hours of labor to get those records, realistically over just the past year (post-COVID exclusion period), and including inefficiencies as we developed training and procedures. Based on labor to date and a very rough estimate of about 3,000 hours of other work (scanning logs, transcribing label images, QC, etc.), we estimate a total labor time of 35,000 hours for the whole job. That suggests that we will need about 9,500 hours of work per year for the next three years. We are increasing work-study and full-time staff, and are shifting to a 7 day per week digitizing schedule, suggesting that we just might complete our commitment (assuming a one year cost-free extension).

RSMAS: Maria Criales: Estimate of our total progress: 60%: The speed and efficiency of the students is very variable, making difficult to have a better estimate of the progress. Furthermore, with our limited resources it is difficult to attend other tasks (maintain physical collections, attend visitors, prepare loan material) while being productive in the digitalization.

SBNHM: Daniel Geiger: Estimate of our total progress: 30%: We cataloged over 30,000 of 100,000 lots to iDigBio standards. [July 20, 2022].

SIO-BIC: Charlotte Seid: Estimate of our total progress: 10%: Committed to 59,300 records + photos and have digitized 5,965 records ➔ 10%. Although the digitized records are not yet on iDigBio because we require a new IPT to be established, I am assuming that this final step will not present a major barrier, given that SIO-BIC previously had an IPT to route our data to GBIF/iDigBio.

SIO-PIC: Linsey Sala: Estimate of our total progress: 25%: While we have conducted direct data capture of ~9400 records of our total goal of ~34,400, which would indicated we are on track to be about 1/3 of the way completed by the end of Q4 2022, there is a tremendous amount of data QC to do that requires mostly Collection Manager time. Additionally, we have chosen to start digitizing some of the "easier" lots while we have been training new students these last couple of quarters. Thus, this rate may fluctuate due to the complexity of samples/data through time. There is also still quite a bit to set up regarding our pipeline to iDigBio/GBIF.

UCM: Kelly Martin: Estimate of our total progress: 52%: We have made great progress on imaging specimens (72% of our goal), but we have not fully digitized and uploaded to iDigBio and we are making progress on georeferencing.

UF: John Slapcinsky: Estimate of our total progress: 20%: We have a large amount of photo preparation including culling, selecting, editing and matching photos to complete before we upload the bulk of the photos promised for this project. New specimen digitization is going like gangbusters. We have two large collections being prepared for data import. These include more than 20,000 specimen records which will well excede our goals and projections.

VIMS: Jenny Dreyer: Estimate of our total progress: 30%: It took much longer than expected to get Specify up and running and the WoRMS taxon tree uploaded. When I was working from home during COVID entering card catalog cards into Excel, I made a lot of progress to where

I was at a point to upload specimen records into Specify. I did not have a taxonomic tree and decided to use the full WoRMS tree. There were long delays at Specify for this and by the time I returned to in-person work, I shifted back to other projects and lost some momentum. Finally by February 2022 the taxon tree was uploaded and ready to go so I could move on. I working my way through QA/QC of specimen records and updating nomenclature and anticipate being able to upload into Specify much faster. Much of my data has lat/long data but is not fully georeferenced since there is no error of uncertainty. While I have asked about assigning standard values of uncertainty for old cruise records, that has not been resolved quite yet. Nelson and Nicolas were going to come up with a general best practices guide for DigIn that would capture some of the various sources of error from various methods. I will hold off on assigning uncertainty error until I have a standard to apply to the few thousand records from the Albatross cruises in the 60's and 70's.
As always, since DigIn is funding only 5% of my salary and our Bio.Dept funds 35%, I am not able to work on this full time. I hired one employee on the DigIn grant but she only works 3 hrs/wk. I have one volunteer for the summer but she is an undergraduate and will go back to school in the middle of August. Essentially nothing was digitized prior to this grant so I've had to make a lot of decisions on how to organize everything, implement best practices that I've learned from other participating institutions and learn all the aspects of Specify and setting up a database. I am making much progress and hope moving forward I can get faster at getting records completely digitized.

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 306 de novo lots including vitality status, representing 3200 total specimens; updated 352 existing records with vitality status.
ANSP ESB: 992 lots totaling more than 5696 specimens were newly catalogued and digitized during this period and 75 lots had their data upgraded. 31,431 records for ESB totaling more than 358,000 specimens were uploaded to InvertEBase on 27 May 2022. 185 of these records included images, mostly of type specimens.
BMSM ESB: BMSM continues to digitize new entries, having cataloged 194 new ESB lots during the period, for a total of 748 specimens. In addition, BMSM cleaned and standardized ESB locality names (mostly in Florida) for 1,191 lots. BMSM uploaded 306 new composite images and georeferenced 150 localities encompassing 5,049 existing records (mostly from S and SW Florida), all including error radius.The total number of georeferenced ESB records so far is 20,062. Entire BMSM dataset (133,136 records [665,800 specimens], of which 24,504 [112,500 specimens] are from ESB) uploaded to InvertEBase on June 27, 2022, with 2,263 composite ESB images made available on the Symbiota portal on that date.
CM ESB: 1,595 total ESB records data cleaned; 888 total ESB records georeferenced. In 2nd quarter 2022, 1 additional record modified and 2 additional records georeferenced.

DelMNS ESB: In May, we uploaded the entire Mollusk holdings to InvertEBase for a total of 233,603 specimen lots and over 2 million individual mollusks. All of the ESB taxa are now present on-line and will be incorporated into the upcoming Community Georeferencing activities.
FWRI ESB: 118 newly georeferenced lots, 154 refined georeferences, and 704 de novo digitized specimen records generated.
HBOM ESB: We have continued to reorganize HBOM from its remediation and renovation and to train HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project.We plan to initiate digitizing of invertebrates in the coming quarter and the HBOM PI has procured some additional non-NSF support to hire additional student help to help on that work.
HMNS ESB: Nothing to report.
LACM ESB: 426 lots were digitized, representing 1,106 specimens. A total of 1,760 lots have been digitized to date, constituting 27% 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: 71 lots/records were databased this quarter; to date, 10578 records in our database were cleaned/vetted for accuracy, and of these, 9884 with verified georeferences. 10,237 records are available on iDigBio.
NCSM ESB: The Museum continues to enhance data. 89 localities and 168 records have been georeferenced, appended, and exported to portals. The number of lots digitized (***de novo***; ***in progress***) are 2,444, totaling 30,432 specimens. All the specimens that have been digitized for this grant have a live/dead determination.
PRI ESB PEN: Between April 1 and June 30, 2022 we have digitized 1,093 lots totaling 14,426 specimens. Cumulatively, 1,760 lots (27% of goal) containing 31,044 specimens (20% of goal) have been digitized; 518 additional lots were added from the North Carolina locality georeferenced earlier in the grant. The remaining 575 lots are from 42 localities in Florida that were previously georeferenced. An additional 1,091 lots have been coded with live-dead status (1,756 lots in total have been coded so far). We hired a summer intern from SUNY - Binghamton who began in June. She has been instrumental in helping our digitization and physical curation efforts .
RSMAS ESB: We have to-date digitized by getting the data into spreadsheets: 16,306 lots. 3,565 cephalopod data were uploaded into InvertEBase via Symbiota.
UF ESB: Newly digitized 6062 lots containing 31695 specimens that are available in our online Specify Portal and InvertEBase. Georeferenced and estimated error radii for 12913 specimen lots. Two new UF students have joined the ESB project and two current students are developing independent research projects.
UMMZ ESB: 498 lots representing 4,874 specimens have been newly digitized; 498 lots uploaded to InvertEBase portal; 503 images generated, and 2 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: Recruited one additional volunteer (for a total of 5 new volunteers) to implement geographic workflows developed in preparation for digitization. Began updating taxonomic catalog for gastropod collection using the authoritative taxonomic database MolluscaBase. Generated sample ESB species checklists using 4 different geospatial datasets. These datasets were created in collaboration with YPM (Nelson Rios) based on NOAA Large Marine Ecosystems maps.
ANSP ESB: Nothing to report.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DelMNS ESB: Collaborated with YPM and ESB steering committee members to identify appropriate state-level and ecosystem level (Large Marine Ecosystem or LME) boundaries for developing species lists.
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 and PILSBRy). Various staff members working on the project participate (via zoom) in ESB monthly ESB general meetings and monitor communications shared on various Slack channels.
NCSM ESB: Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: We started very positive conversations with Katie Pearson (Symbiota) to move data into InvertEBase.
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: 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 ESB: Nothing to report.
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: 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: 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 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.

ANSP ESB: Macy Hafner, an intern in the department has been georeferencing Pacific Island localities for the PILS TCN. Starting in the fall, we expect that she will be able to use the skills developed for georeference in the Eastern Seaboard project.
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: We are currently working with the North Carolina Shell Club to use this data to create a new Seashells of North Carolina Identification Guide.
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: Nothing to report.
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: Nothing to report.
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. Arranged social media reciprocity with the Field Museum. PI Bieler presented a lecture ("Specimen databases and authority files – two tightly linked approaches to documenting global biodiversity") at the Digital Data Conference in Chicago (24 May 2022), with a component focusing on the ESB project. A virtual behind-the-scenes tour produced for the same conference, narrated by Collections Assistant Kalina Griffin-Jakymec, also referenced ESB activities. A keynote lecture presented by the PI ("Our Quest for the Bivalve Tree of Life") at the inaugural Southeast Asian Malacological Conference (Bangkok, Thailand, on 14 July 2022) likewise included a component on the ongoing ESB efforts.
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.
BMSM ESB: PI 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. PI organized and presented a talk about ESB TCN at Florida United Malacologists at BMNSM on April 2, 2022
CM ESB: Nothing to report.
DelMNS ESB: Provided the July Mollusk of the Month (MoM), and got DelMNS social media to follow the ESB social media, and vice versa.
FWRI ESB: Posted items to instagram as part of the outreach committee
HBOM ESB: Nothing to report.
HMNS ESB: Presented two lectures and gave presentations to the Conchologists of America Conference in June. Wrote 3 blogs for HMNS concerning mollusks and educational blogs for visitors. Created YouTube video about HMNS, mollusks, and conservation efforts that can make a difference, and the dangers of Helium Balloons on ocean life. Gave a presentation to the International Mensa Group concerning the efforts being made along the Texas coast to conserve and protect our oyster reefs; this presentation highlighted the efforts being made by Texas A & M Univ.-Corpus Christi and The Galveston Bay Foundation to establish new and old reef areas in the Bay systems locally.
LACM ESB: Nothing to report.
MCZ ESB: The iNaturalist public portal keeps growing and now includes 57 members, 2,881 identifiers, 78,864 observations and 888 species. https://www.inaturalist.org/projects/eastern-seaboard-mollusks
NCSM ESB: Instagram, TikTok, Twitter, and Facebook accounts have been used to reach the public. Each account seems to reach a different group of people. We also participated in Mollusk of the Month on the ESB Twitter and Facebook page. In June we had a social media reach of 65,647 people.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Interns continue working on digitization, website development, and documentation.

UF ESB: We regularly tweet ESB mollusks from our lab Twitter @UFInvertZoo. This quarter tweeting: *Vermicularia knorri*, May 23; *Spondylus americanum*, June 2; and *Dentimargo eburneola*, June 13. One of our ESB photogrammetry images was chosen as a New Staff Pick by Sketchfab: https://twitter.com/Sketchfab/status/1532346425295749122 and has received almost 1300 views and 9 retweets. We also post ESB observations in iNaturalist and add live dead status to other ESB observations.
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: Updated IPT in early June, and submitted to GBIF, iDigBio, and InvertEBase portals/aggregators for data upload.
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: Collection data are on InvertEBase, last updated 16 December 2020. 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 created an account in the Symbiota portal and started uploading 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: The search for a new Invertebrates Collections Manager has been successful; the individual will arrive in fall of 2023. Field Museum has provided funds for a temporary staff member to aid with ESB duties in the interim. A search for that person is underway.
ANSP ESB: The PI was the lead author on a paper published in PeerJ on June 21, "Adapting mark-recapture methods to estimating accepted species-level diversity: a case study with terrestrial Gastropoda", doi 10.7717/peerj.13139. The department hired Krasimira Seizova, a former intern in the department as a curatorial assistant.
BMSM ESB: Complete record set was uploaded to iDigBio and GBIF on 28 June 2022.
CM ESB: Nothing to report.
DelMNS ESB: Received official paperwork from IRS re: update our EIN and name change to the Delaware Museum of Nature and Science (DelMNS).
FWRI ESB: Nothing to report.
HBOM ESB: Nothing 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 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 April 1 – June 30, 2022.

Workflows, Equipment, and Personnel

Most GLOBAL institutions continued steady GLOBAL progress during 2022-Q2.

The ASU undergraduate who was hired for routine digitization graduated and left the university. She focused on taking bryophyte images. They plan to employ two undergraduates in the fall semester who will hopefully speed up digitization of the specimens now that they have a routine workflow established.

BRY's undergraduate finished the semester in April, and they will be returning to digitization efforts at the start of the fall semester.

[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

Four of five CINC & MU student workers graduated at the end of April, so they are down to one student worker who images and transcribes. They were able to convert their vascular imaging station to image bryophytes there as well. This helped when multiple students were interested in imaging at similar times and provided them with more imaging progress. Most of MU's remaining non-North American specimens needing to be transcribed are in Cyrillic.

COLO continued imaging, skeletal data, and transcription.

DUKE's three undergraduates who were working on the project during the academic year finished at the end of the semester (beginning of May). They will be continuing at the start of the fall semester.

F continued imaging and transcription of lichens and bryophytes.

FLAS now has four staff (work-study and part-time) trained on both barcoding/imaging and their second imaging station is set up.

ILL & ILLS continued imaging and transcription of bryophytes. Through institutional funds, 2899 bryophyte specimens donated from EIU to ILLS were rehoused in archival packets.

LSU's efforts this quarter were in imaging bryophyte specimens and full label transcription of existing skeletal records in the portals. A volunteer continued working to image specimens. Some of these specimens include more than one image to capture all the content in the packet. Two undergraduates were trained to transcribe labels for the summer. Additionally, they verified geolocations where labels included coordinates.

MICH continued digitizing lichens and bryophytes. Two technicians and three undergraduate students worked in the herbarium on digitizing lichens this quarter.

MIN's four undergraduates who were working on the project during the academic year finished at the end of the semester (mid-May) so progress has slowed. They will be continuing at the start of the fall semester.

MO worked on barcoding, imaging, and skeletal data. They improved their process so that they can capture skeletal data (country and taxon) at the same time as imaging.

MSC completed imaging and transcription.

NY completed barcoding of entire general lichen collection, is continuing to barcode lichen exsiccati, and started barcoding bryophyte collection. Transcription continues ad hoc to

accommodate remote work schedules. Their first intern's position ended, and they are looking forward to hiring more interns to get imaging back to full time.

PH had two dedicated staff working nearly full time digitizing and transcribing lichen packets. A curatorial assistant continued to transcribe lichen packet images before retiring in early June. An undergraduate student imaged lichen packets and these images were uploaded to the portal. Imaging of the non-North American lichen packets was completed during this quarter.

TENN students continued barcoding, imaging, and transcribing bryophyte specimens. One herbarium intern was hired as an additional technician for the summer.

UC is nearly done with the lichen digitizing, and will be moving on to the bryophyte digitizing in the fall semester.

WIS's two students continued imaging specimens in house. They graduated in May, but they were able to hire them as data entry operators and they will continue to image and contribute to georeferencing efforts through the summer months. They received lichen exchange material and were able to image labels and will easily pull in transcription data through the duplicate function in Symbiota.

YU continued imaging bryophyte specimens, uploading images to the portal, and creating skeletal records.

Digitization

Nineteen institutions (ASU, BRY, CINC & MU, COLO, DUKE, F, FLAS, ILL & ILLS, LSU, MICH, MIN, MO, MSC, NY, PH, TENN, UC, WIS, and YU) reported progress on digitization deliverables, with a total of 63,158 specimens barcoded (41,419 bryophytes and 21,739 lichens), 58,051 labels imaged (30,515 bryophytes and 27,536 lichens), 48,966 specimens imaged (30,577 bryophytes and 18,389 lichens), 34,685 specimen records uploaded to the portal (17,947 bryophytes and 16,738 lichens), 58,654 skeletal records created (36,617 bryophytes and 22,037 lichens), 27,277 labels fully transcribed (21,031 bryophytes and 6,246 lichens), and 39,706 specimens georeferenced (23,066 bryophytes and 16,640 lichens) (See Table 1 & Figure 1). These quarterly totals are the highest yet for barcoding, skeletal data, and georeferencing (See Figure 2).

Table 1: Digitization progress by GLOBAL collaborators in 2022-Q2, separated by Bryophyte (B) and Lichen (L) specimens.

	# Barcodes Added		# Labels Imaged		# Specimens Imaged		# Uploaded to Portal		# Skeletal Records Created		# Fully Transcribed		# Georeferenced	
	B	L	B	L	B	L	B	L	B	L	B	L	B	L
ALA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASU	101	0	101	0	101	0	0	0	101	0	101	0	101	0
BRY	0	0	0	0	0	0	0	0	150	0	0	0	0	0
CINC & MU	2,362	0	2,992	74	2,992	74	2,179	0	2,362	74	3,436	28	0	0
COLO	0	4,755	0	6,255	0	0	0	6,255	0	6,255	0	2,473	0	0
DUKE	558	0	689	0	461	0	1,150	0	558	0	255	0	9	0
F	6,125	3,750	3,837	4,692	3,837	4,692	3,837	0	4,934	123	0	0	0	0
FLAS	3,160	0	2,147	0	2,147	0	2,745	0	0	0	0	0	0	0
ILL & ILLS	2,272	0	2,272	0	2,272	0	0	0	0	0	194	0	0	0
LSU	0	0	0	0	1,550	0	0	0	0	0	706	1,095	724	175
MICH	1,400	6,000	1,400	6,000	140	600	834	79	1,400	6,000	834	79	95	2
MIN	0	2,995	0	2,995	0	2,995	0	0	0	2,995	2,558	0	0	8,110
MO	4,503		5,368		5,368		0		4,950		298		69	
MSC	0	763	0	763	0	763	0	3,976	0	763	0	614	0	614
NY	10,791	1,124	1,022	2,354	1,022	2,354	0	0	10,794	1,124	3,705	1,111	863	474
OSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PH	0	2,352	0	2,352	0	2,352	0	2,352	0	2,352	0	766	0	0
TENN	5,878	0	6,418	0	6,418	0	6,384	0	6,405	0	8,944	0	5,368	0
UC	0	0	0	1,760	0	1,760	0	0	0	2,060	0	0	0	0
WIS	0	0	0	291	0	2,799	0	4,076	0	291	0	80	15,837	7,265
YU	4,269	0	4,269	0	4,269	0	818	0	4,963	0	0	0	0	0
Totals	**41,419**	**21,739**	**30,515**	**27,536**	**30,577**	**18,389**	**17,947**	**16,738**	**36,617**	**22,037**	**21,031**	**6,246**	**23,066**	**16,640**
B+L Totals		**63,158**		**58,051**		**48,966**		**34,685**		**58,654**		**27,277**		**39,706**

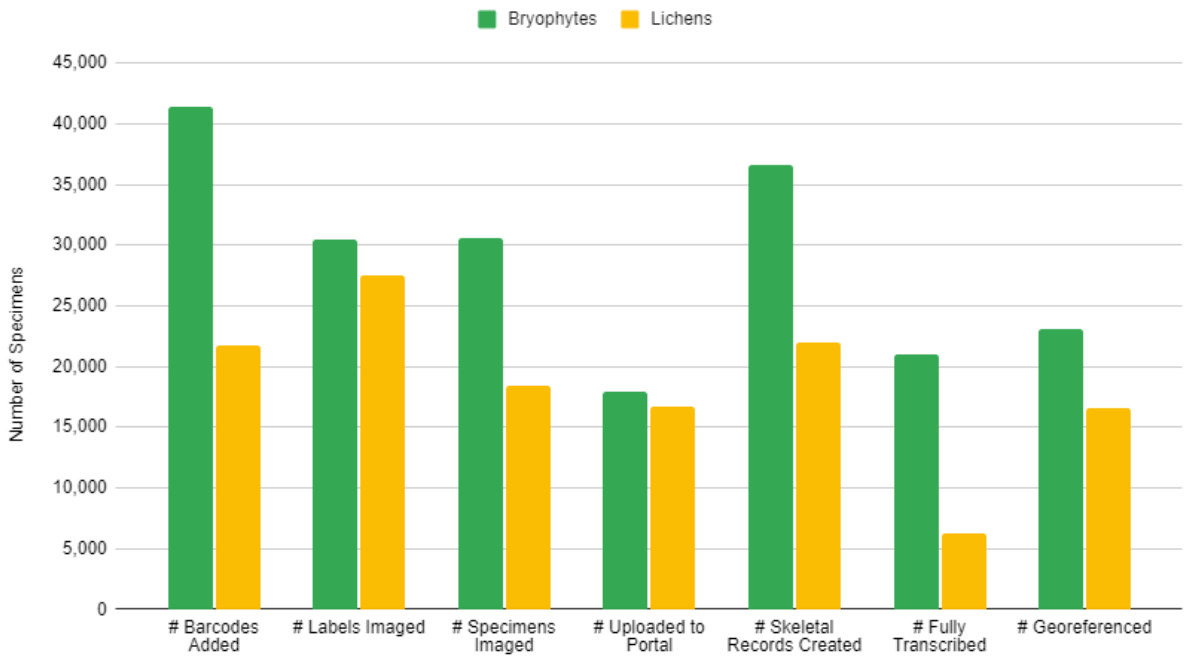


Figure 1: Digitization progress for the GLOBAL collaboration in 2022-Q2, separated by Bryophyte and Lichen specimens.

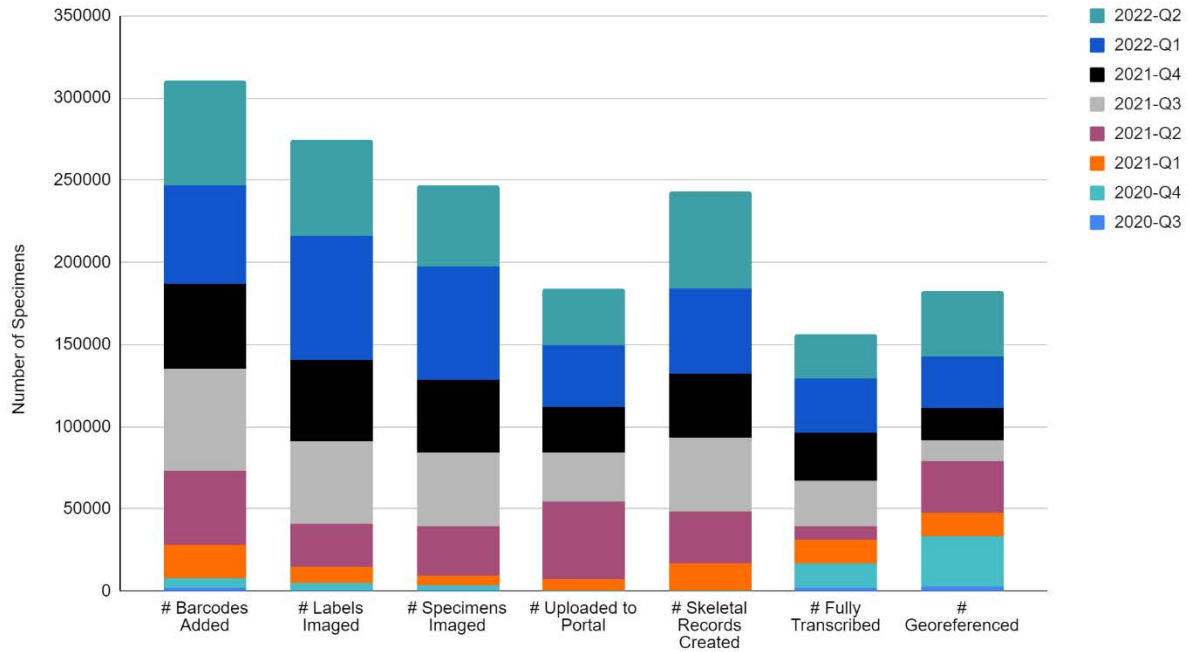


Figure 2: Cumulative digitization progress for the GLOBAL collaboration by quarter.

Share Best Practices, Standards, and Lessons Learned

Flexible Workflows

The GLOBAL teams continued to make use of flexible digitization workflows in 2022-Q2, including some use of virtual transcription work and prioritizing label imaging, while most collaborators were able to begin or continue on-site work.

Taxonomy

ASU integrated two taxonomic resources, F-dex (for fungal species) and BryoNames (for bryophyte species) into the taxonomic cleaning tool in both CNABH and CNALH. This will leverage the taxonomic work of these resources and enable the addition of new lichen and bryophyte names into these portals' taxonomic thesauri.

Collaboration

Team members continued to make use of Basecamp, Zoom, and email to communicate and collaborate during 2022-Q2. New collaborators and students were given access to Basecamp group resources. The Outreach & Education Group met in preparation for the April WeDigBio event. The IT Team met in June to share updates on deliverables and priorities, new and upcoming tools / developments.

A Management Committee Meeting was held in May open to all GLOBAL team members to review quarterly grant progress. The GLOBAL Project Manager (TENN) competed spring check-in meetings with collaborators which began in 2022-Q1, Zooming with MICH and PH in April to discuss progress, concerns, and plans.

WIS continued its collaborative georeferencing, creating new communities in the CoGe interface and georeferencing as fully transcribed records become available. The GLOBAL Project Manager also facilitated a meeting between the GLOBAL Geoferencing Manager (WIS), Portal Manager (ASU), and the team at MIN to coordinate their centralized georeferencing plans.

Share Identified Gaps in Digitization Areas and Technology

Barcode Renaming

ASU provided support & troubleshooting for the BCRwatcher software that renames image files with their barcode and captures skeletal metadata for upload to the portal. Upon request by a user the next version of the software will allow to capture some additional metadata like verbatimCoordinates, identifiedBy, etc. Staff at MSC assisted in testing new versions of BCRWatcher imaging software.

Transcription Challenges - Handwriting

Handwriting and non-English languages / alphabets is a challenge faced by all collections to varying degrees due to a range of older, globally-collected specimens. Best practices for working through these labels are needed. F continued developing and adding to a document aiding with collectors handwriting. This is shared with all transcribers to help with handwritten labels.

Georeferencing

WIS Georeferencing through the CoGe interface has shown that duplicate records transcribed slightly differently will require separate treatment. Verbatim transcription and standardizing higher geographies may help. TENN Project Manager met with the GLOBAL Georeferencing Manager in May to discuss progress and challenges, including some limitations in CoGe. Some follow up and helpful tools in development were discussed during the GLOBAL IT Meeting. TENN Project Manager manually copied coordinates for TENN locality duplicates from a number of countries in an excel export, but this process would be quicker if it could be more automated.

Share Opportunities to Enhance Training Efforts

ASU's Symbiota Help and Documentation has significantly improved with the launch of a new documentation website by the SupportHub team: https://biokic.github.io/symbiota-docs/, which was announced to the GLOBAL group via Basecamp.

As part of the overhaul of the character matrix for lichenized fungi in the Lichen Consortium at ASU, several collaborators have been trained and joined efforts in updating taxonomy and

taxon profiles of lichen species, such as K. Knudsen (Acarospora), A. Fryday (southern subpolar lichens), G. Perlmutter (North Carolina), etc. G. Perlmutter, J. Holinger and A. Fryday joined the team of taxonomy editors, helping to update the taxonomic thesaurus in the lichen portal.

The GLOBAL Project Manager shared Georeferencing resources and gave a basic overview training on Geolocate to University of Tennessee Professor Dr. Charlie Kwit and four undergraduate students from his class in May.

WIS worked on creating Help Sheets for georeferencers for difficult countries. They continue to work on the best strategy to effectively verify georeferences and track corrections and progress.

The GLOBAL Project Manager (TENN) and Georeferencing Manager (WIS) continued compiling transcription and georeferencing resources during 2022-Q2 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.

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

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.

Katie Pearson, the Portal Manager for the Lichen and Bryophyte Portals, now also works as a member of the Symbiota Support Hub and has been actively involved in developing the documentation resources at: https://biokic.github.io/symbiota-docs/.

The Field Museum and the GLOBAL TCN supported iDigBio with the conference Digital Data 2022: Enhancing & advancing the quality of digitized data in May.

TENN PI and Project Manager, along with CINC's Eric Tepe and FLAS's Alan Franck, continued communications with the Bishop Museum herbarium (BISH) staff to facilitate their upcoming PEN proposal, in conjunction with the University of Hawaii (HAW) and the National Tropical Botanical Garden (PTBG).

TENN PI and Project Manager, along with DUKE's Blanka Aguero met virtually with Karen Golinski and Cassandra Bradshaw from the University of British Columbia herbarium to share information and advice about crowdsourcing in the Symbiota portals.

Digitization resources and workflows compiled during the GLOBAL project were shared with Diego Knop Henriques, a Brazilian Bryologist working at the Federal University of Parana on a project aiming to create a network of Brazilian Bryological Collections.

TENN Project Manager participated in the quarterly iDigBio Internal Advisory Committee Meeting in May and demoed the GLOBAL project website https://globaltcn.utk.edu/ for the other TCN participants.

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.

The Symbiota portals like the Lichen and Bryophyte Consortium have for a long time facilitated publishing data directly to the Global Biodiversity Information Facilities (GBIF). Symbiota is now officially recognized as an Associate Participant of GBIF. DUKE Personnel Aguero continued assisting the Portal Manager in bryological matters of Bryophyte portal management.

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.

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.

ASU PI Bungartz will teach a workshop about the Lichen Consortium (in Spanish) at an international meeting of the Grupo Latinoamericano de Liquenólogos (GLAL XV), to take place virtually in Argentina at the end of July. As part of revising the lichen identification character matrix F. Bungartz is finalizing the glossary definitions of lichen characteristics which we plan to share through the Lichen Consortium in the fall. Once these resources become available, the portal will become a more attractive resource for species identification and learning about lichens.

CINC gave a tour of the herbarium to collaborators among the staff of the Lloyd Library and Museum.

In April 2022, DUKE Personnel Aguero hosted a two-session class on mosses and liverworts at Duke Gardens for 14 participants. One tour of the lab and the herbarium given in May. Aguero also taught a week-long seminar on liverworts at Eagle Hill Institute for 12 participants in June 2022. Bryophyte portal was demonstrated and frequently used during the seminar.

F participated in, led or co-led many education and outreach activities ranging from participatory events to behind the scenes tours. For example: 1) April 2022: WeDigBio (Worldwide Engagement for Digitizing Biocollections) (see more below); May 2022: WeDigBio strategic planning; Onsite school visit from Northside Prep including a 4 hour event ranging from hands on work to tours; Began a new fieldwork program in Nachusa Grasslands focusing on bryophytes and lichens enabling to train students and researchers from the field to the Field; Participated in the annual iDigBio Digital Data conference, including presentations, workshops, behind the scenes virtual tour, and mentoring program; June 2022: Summer Camp behind the scenes tours; Collaborating with Learning Center and Digital Learning high school students developing online tools showcasing the significance of herbaria, research collections and different plant groups; Reviewing and wrapping up lesson plans that includes bryophytes and lichens; Published in *Research Ideas and Outcomes*: People-Powered Research and Experiential Learning: Unravelling Hidden Biodiversity - connecting digitized bryophyte (liverwort) images to youth, educators, the general public - receiving widespread media coverage e.g.,

https://www.chicagotribune.com/news/environment/ct-community-science-field-museum-20220630-pf7eipu6vngz7i7lzwijwu27pa-story.html

PI von Konrat (F) presented "People-powered research and experiential learning: Unraveling hidden biodiversity" at the Digital Data Conference, a virtual conference hosted by the Field Museum and the University of Florida, May 23-25, 2022.

LSU gave four herbarium tours to elementary children from the LSU Laboratory School which included basic science lessons to distinguish between a plants and fungi, and included bryophyte and lichen examples. These tours included 8 teachers and nearly 200 children. The LSU Herbarium display case in the Life Sciences Building was rotated in May, concluding a 1-year focus on bryophtyes.

The NY Herbarium's tours for new staff and for internal outreach have consistently featured bryophytes and lichens. Several new pieces for *The Hand Lens* featuring cryptogams, cryptogam collectors, and specialists have been published.

TENN continued hosting the GLOBAL weekly transcription event on Fridays during 2022-Q2. Thirteen community science volunteers from five countries participated (US, Canada, UK, China, Pakistan) and transcribed skeletal data for over 700 specimens. Volunteers were also able to see presentations on bryophyte / lichen topics by visiting researcher Dr. Jenna Ekwealor (Biodiversity Genomics Postdoctoral Fellow, Smithsonian Institution), Julia Butler (Graduate student, TENN), and a number of "Specimen Spotlight" presentations on specimens and collectors compiled by the TENN GLOBAL Project Manager. One transcription event volunteer, June Novalich, was featured in an article in the Journal for the CSA Fraternal Life June 2022 Journal: https://csalife.com/doc/journal/June.pdf?v=33.

The TENN Herbarium hosted "Collections & Cones" on April 20, an event sharing herbarium tours and information about the herbarium's projects and services - and ice cream - with students, faculty, and staff in the Ecology and Evolutionary Biology department.

UC started a cryptogram volunteer program, which is helping to prepare more global bryophyte specimens for accessioning and digitizing.

WeDigBio

Five GLOBAL collaborators (DUKE, COLO, CINC & MU, F, TENN) participated in the April 2022 WeDigBio. The team from F again helped host and manage the event with assistance from the GLOBAL team. Over four days 141 community scientists databased 4,174 specimens, including

early land plants, lichens, and insects. The GLOBAL day, April 7, included presentations from TENN PI Budke on bryophytes and a tour of the COLO herbarium.

Share Information About Your Website and/or Portal Usage

The GLOBAL project website, https://globaltcn.utk.edu, was utilized by 302 users during 2022-Q2, including 37 from Europe, 31 from Asia, 2 from Africa, and 1 from Oceania (see Figure 3).

The Bryophyte and Lichen Portals, created as part of the original LBCC grant, host new images and data produced by the GLOBAL collaborators. Over 7,000 users visited the Bryophyte Portal (a major increase over the 3,700 from the prior quarter) and over 20,100 users visited the Lichen Portal during 2022-Q2 (see Figures 4 & 5).

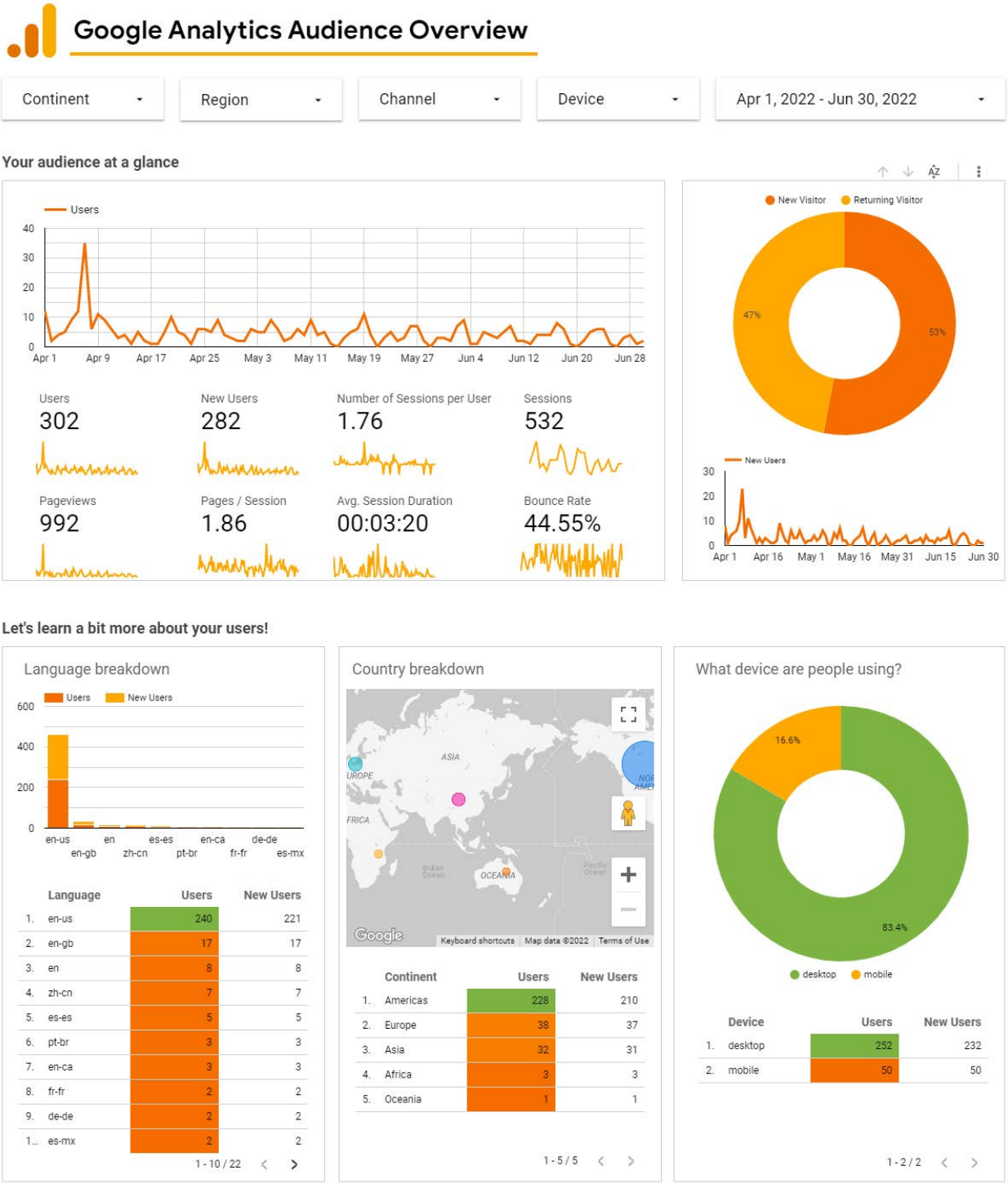


Figure 3: Use metrics for the GLOBAL project website (https://globaltcn.utk.edu) from April 1 – June 30, 2022.

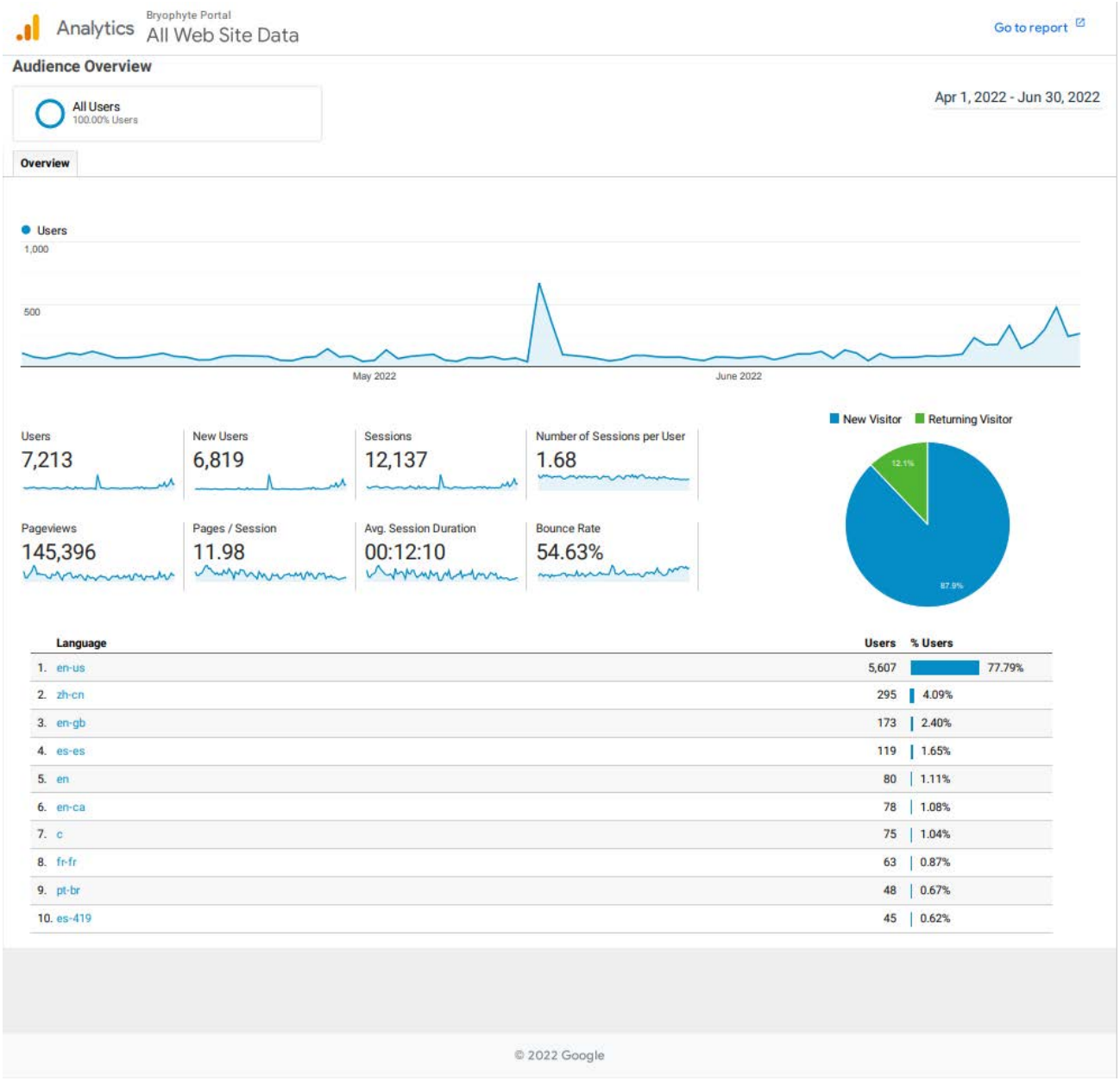


Figure 4: Use metrics for the Bryophyte Portal (https://bryophyteportal.org/portal/) from April 1 – June 30, 2022.

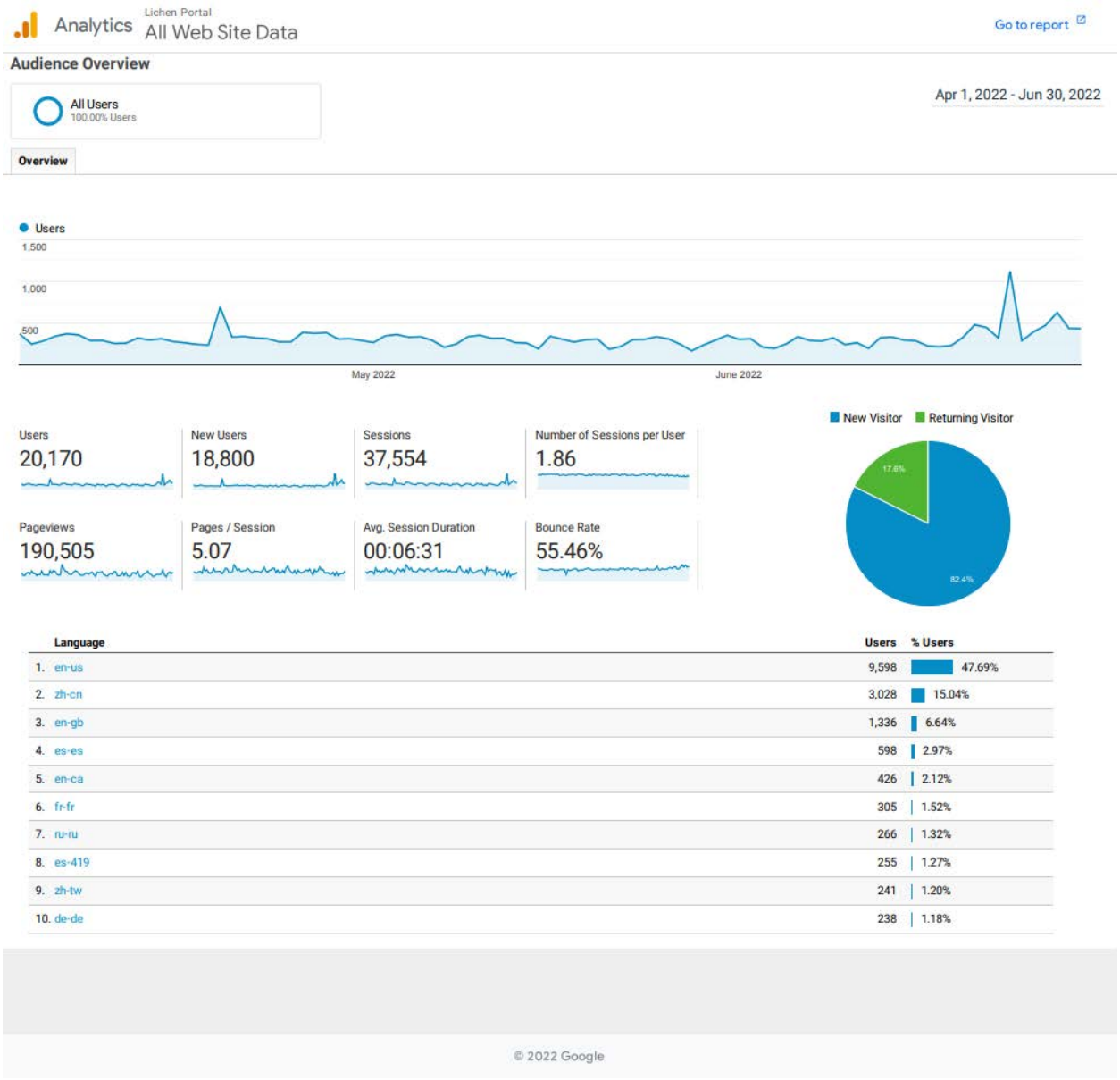


Figure 5: Use metrics for the Lichen Portal (https://lichenportal.org/cnalh/) from April 1 – June 30, 2022.

Share Other Activities and/or Progress

Annual Reporting

TENN Project Manager updated reporting sheets for the Year 2 NSF Annual Reporting that will be completed in July.

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

The Pteridological Collections Consortium: An integrative Approach to Pteridophyte Diversity Over the Last 420 Million Years (PCC)

Person Completing the Report

Amy Kasameyer (former Project Manager)

Share Progress in Digitization Efforts

For extant specimen progress during this reporting period, Pteridophyte Collections Consortium members created skeletal records for **18,172** specimens, fully transcribed **17,833** specimens, imaged **43,744** specimens, and geo-referenced **5047** specimen records. The total pteridophyte extant specimen progress including work done prior to the start of the grant is **663,662 (40% of goal)** skeletal records created, **1,2287,979 (80% of goal)** extant specimens imaged, **1,158,658 (70% of goal)** extant specimens fully transcribed, and **303,539 (18.5% of goal)** extant specimens geo-referenced.
In the Pteridoportal (http://pteridoportal.org), we currently have **1,790,351** extant specimen records, **1,557,972** (87%) of which are imaged and **487,564** (27%) of which are georeferenced.

For fossil specimen progress during this reporting period, Pteridophyte Collections Consortium members imaged **1923** specimens, databased **850** specimens, and georeferenced **771** specimens. The total pteridophyte fossil specimen progress including work done prior to the start of the grant is **39,449** (45% of goal) specimens databased, **39,903** (46% of goal) specimens imaged, and **19,794** (23% of goal) specimen records geo-referenced.

In the Pteridoportal (http://pteridoportal.org), we currently have **25,315** fossil specimen records, **21,121 (**83%) of which are imaged and **15,501** (61%) of which are georeferenced.

Yale Fossil Data was loaded into the Pteridoportal for the first time during this quarter, adding 9901 new fossil images to the portal.

During this period, **NYBG** PI-Watson reviewed and imported to the NYBG collections database 5827 PCC records transcribed by community scientists through the crowdsourcing platform DIGIVOL. Another ±8000 are in the queue to be reviewed, and ±2000 are undergoing transcription through the platform.

Share Best Practices, Standards, and Lessons Learned

Missouri Botanical Garden began using a barcode reading software to automate image renaming, and it has dramatically increased imaging efficiency. Due to this time saving, they are able to capture folder metadata (taxon filed-as name and geographic region) that they were previously unable to include, increasing the value of the project from a collection management perspective.

Share Identified Gaps in Digitization Areas and Technology

At the **Missouri Botanical Garde**n current limitations on digitization speed are in the application of barcodes and the physical setup of the imaging rig. They are exploring options to improve both, including an automatic barcode dispenser and a more open copy stand setup.

Because the **University and Jepson Herbaria** relies heavily on work-study students to digitize specimens, work on the project slows over the summer when students are on break.

Share Opportunities to Enhance Training Efforts

Missouri Botanical Garden trained a new digitization technician as well as two herbarium assistants on pteridophyte curation and imaging.

At **UCMP,** PI Erwin mentored Alexander Singh, an undergraduate participating in Berkeley's Undergraduate Research Apprentice Program. Alex was trained in all aspects of specimen identification databasing, labeling, imaging, and georeferencing.

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

Share Opportunities and Strategies for Sustainability

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

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

The **Field Museum** participated in Collections Club and corporate volunteer events that involved specimen transcription.

Missouri Botanical Garden Co-PI Teisher was featured on a virtual Member Speaker Series showing garden members a behind-the-scenes look at herbarium operations, including the active digitization projects.

Share Information About Your Website and/or Portal Usage

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

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.

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

TCN Name and short code, such as: Enhancing Access to Taxonomic and Biogeographical Data to Stem the Tide of Extinction of the Highly Imperiled Pacific Island Land Snails (PILSBRy)

Person Completing the Report

Name and role of the person completing the report, such as: Norine Yeung (Lead PI)

Share Progress in Digitization Efforts

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

Digitization Overview

- All 6 collections have uploaded their Pacific Island land snail specimen records onto the PILSBRy symbiota portal – these are continually refined as data are cleaned
    - Totals: 277,191 lots, 3,386,167
- Currently, there are 5,974 organismal images linked across 1,775 records. Of these records, 1,241 are putative types.
- All historical ledgers except for the Field Museum have been scanned, uploaded and linked to associated records. Assessment of the Field Museum ledgers indicated that these ledgers do not provide significant information to the specimens or collecting events. Currently, 77 ledgers containing 5,638 ledger pages have been linked to 278,182 specimen records within the PILSBRy portal. Additionally, 2,771 pages of original labels have been scanned and linked to 140,466 specimen records and 263 hand-drawn maps have been scanned and linked to 19,120 records. Currently, 1,589 annotated maps have been scanned and are being transcribed in order to link field locations with the correct specimen records. As additional materials are transcribed (field notebooks and maps), these data will be linked to associated specimen records. These historical specimen data are currently being used by conservation managers and researchers to develop habitat suitability models for native and non-native species and identify areas for biodiversity surveys and monitoring.
- All localities have been parsed out into regions, and various regions have been assigned to partners for georeferencing. Currently, 7 out of 24 regions have been completely

georeferenced (~15% of all ungeoreferenced localities) and 4 regions representing ~69% of ungeoreferenced localities are currently working. In total, 90,933 records (~25%) contain appropriate georeferencing information.

Share Best Practices, Standards, and Lessons Learned

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

Same as previous report

- Standardized higher level data is imperative for reporting, gathering and querying data. We continue to discover incorrect or missing records purely due to discrepancies in these areas.
- If a collection already has protocols specifically designed for their collection management system, it is better to let the collection continue to use those systems and gather that data periodically.
- On an efficient note, setting the start date of your project around the time of quarterly or annual idigbio meetings is rather handy. You've written all the info in your annual report and can easily translate into these idigbio reports and annual summit presentations =)

Share Identified Gaps in Digitization Areas and Technology

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

Same as previous report

- It is still amazing in a sense how COVID19 continues to impact access to collections and recruitment of staff and volunteers. Staff occupancy is still limited in some institutions and recruitment has also been challenging for some.
- Gazetteers and other digitized location information are not widely available for Pacific Regions in general, highlighting a need to make those resources digitally available. We are hoping the resources developed in this project will help with accessing Pacific Island localities
- Repatriating data is and remains an issue for Symbiota portals. These data could be published from the portal to GBIF directly, but we've decided not to do this since most (4/6) of our collections already share their data via an IPT and we want to avoid duplicates.

Share Opportunities to Enhance Training Efforts

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

- Collectively, we aimed to recruit 10-13 high school, undergraduate, post-baccalaureate students annually to be trained in museum studies, systematics, malacology, and digitization and enhancement of specimen records. Despite the COVID19 pandemic which caused lack of access into the institutions and remote work and learning had to be developed, we have recruited and trained 42 participants. In summary, we have recruited 6 high school students, 27 undergraduates, 3 post-baccalaureate, 2 graduate students and 4 volunteers. Recruitment within STEM minority fields have been successful and includes 34 females, five Pacific Islanders and three Hispanics. Eight participants have been retained from previous years and are continuing to participate in the project

- Virtual educational and social media material have continued to be developed to share with the research community and public. Several institutions have developed virtual collection tours, connecting with several hundred participants within the research community and public. Additionally, COVID19 restrictions loosened in several states and some of the institutions were able to participate at in-person science festivals, taxonomic workshops and conferences to present current updates and work from this TCN as well as for professional development.

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

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

- We are continuing to work with local conservation agencies to incorporate species data and GPS information. Additional geographic areas besides Hawaii are now parsed out to the various collections to start tackling GPS data.
- Now that a significant number of records have been clean up taxonomically and geographically, some agencies are using these data to develop habitat suitability models for endangered species. Additionally, these data are allowing others to update conservation status for IUCN and state lists.

Share Opportunities and Strategies for Sustainability

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

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

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

- See above in training section

Share Information About Your Website and/or Portal Usage

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

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.

TCN Quarterly Progress Report

TORCH TCN — Quarterly Report

Reporting Period: May 1st, 2022 - July 31st, 2022

Assembled by BRIT on August 4th, 2022, for Aug. 10th 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
KANU – University of Kansas **(completed)**
MO – Missouri Botanical Garden
NOSU – Northeastern State University
NY – New York Botanical Garden **(completed)**
OKL – University of Oklahoma, also including data for Oklahoma City University **(OCU, completed)** and the University of Science and Arts of Oklahoma (**OCLA**).
OKLA – Oklahoma State University
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
UTEP – University of Texas at El Paso **(completed)**

Share Progress in Digitization Efforts

Progress in Digitization Efforts:

* Number Number of skeletal records created:

BAYLU = 0

BRIT = 0

HUH = 156 minimal records created this quarter
(1,600 minimal records total)

KANU = 0 **(completed)**

MO = 205

NOSU = 0

NY = 0 **(completed)**

OKL = 0

OKLA = 2,175 (15,593 total)

SHST = 9,279

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)	1,585
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: 1,585

TTC = 637

UTEP = 0 **(completed)**

Total skeletal records created this quarter: 14,037

* Number of fully-transcribed records created:

BAYLU = 7,130

BRIT = 12,088 (6,088 staff and volunteer transcriptions + 6,000 community science Notes from Nature-generated transcriptions)

HUH = 1,459 detailed records created this quarter (47,838 detailed records total)

KANU = 1 **(completed**; total number of fully transcribed records from OK and TX = 27,566**)**

MO = 205

NOSU = 0

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

OKL = 1,160 (OKL: 374 + OCU: 786)

OKLA = 3,600 (69,800 total, including previous import from Oklahoma Vascular Plants Database)

SHST = 18,063 (staff and Volunteer transcriptions)

TAES = 3,000

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	851	
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)	250	
Texas Lutheran University (TLU)	115	
Texas State University (SWT)	0	
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0	

Sub-Total for TEX-LL & data providers: 1,216

TTC = 60

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

Total fully-transcribed records created this quarter: 47,982

* Number of specimens imaged:

BAYLU = 2,965

BRIT = 993

HUH = ~1,639 (estimated)* (47,632 specimens imaged total; *"not able to track quarterly imaging per project")

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

MO = 193

NOSU = 0

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

OKL = 6,405 (OKL: 1,542 + OCU: 1,642 + OCLA: 3,221)

OKLA = 3,367 (OKLA = 632 (76,446 total) + 2,735 at University of Central Oklahoma)

SHST = 8,783

TAES = 10,000

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	10,390	
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)	1,585	
Texas Lutheran University (TLU)	2,601	
Texas State University (SWT)	0	
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	1,637	

Sub-total for TEX-LL & data providers: 16,213

TTC = 3,478

UTEP = 0 **(completed)**

Total number of specimens imaged this quarter: 54,036

* Number of specimens georeferenced:

BAYLU = 404

BRIT = ~100 (estimated)

HUH = 5,420 specimens georeferenced this quarter (35,135 specimens georeferenced total). [Numbers include both successfully applied geocoordinates and skipped records]

KANU = 1 **(completed**; total number of georeferenced specimens from OK and TX = 27,351**)**

MO = 7

NOSU = 0

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

OKL = 0

OKLA = 55 (11,429 total)

SHST = 0

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	568
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)	0
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0
Sub-Total for TEX-LL & data providers:	568

TTC = 50

UTEP = 0 **(completed)**

Total number of specimens georeferenced this quarter: 6,605

* Other digitization or pre-digitization efforts:

BAYLU: Nothing new to report.

BRIT:

Data-cleaning of records generated in Notes from Nature, including coordinates being placed in proper fields, is ongoing, resulting in an increase in records with coordinates.

We continue skeletal transcriptions of images from image sets containing a mix of project and non-project specimens in the VDB collection at BRIT to prioritize records for complete transcription for the TORCH TCN. We are utilizing the Symbiota crowd-sourcing module, providing training and ongoing support.

We have prioritized the complete transcription and record cleaning for Texas counties in the Trans-Pecos and in East Texas. Prioritizing Trans-Pecos counties will hopefully reduce redundant data entry for duplicates shared with herbaria holding specimens from that region (e.g. Sul Ross University) by using the duplicate discovery tool in Symbiota. Prioritizing East Texas counties makes these specimens readily available for current floristics projects in that region (e.g., Illustrated Flora of East Texas, Vols. II and III, BRIT Press).

We received a loan of the Balcones Canyonlands National Wildlife Refuge Herbarium (Herbarium Code BCNWR) for digitization through the TORCH grant. Although this collection was not listed in the original proposal, initial overestimates in Texas and Oklahoma specimens in other collections for which BRIT is responsible have allowed for inclusion of this new herbarium. We encouraged Chris Harper, Deputy Refuge Manager, through the registry with Index Herbariorum, and will continue the relationship with him, with retired manager Deborah Hole, and with primary collector Chuck Sexton, to aid in digitizing the collection and building continued support and advocacy.

BRIT launched three Notes from Nature expeditions concentrating on Texas specimens, two of which were completed during this reporting period.

HUH: Nothing new to report.

KANU: None. **(completed)**

MO: Herbarium staff have started sorting specimens for this project from the general North American folders to save time on the imaging process. Additionally, we have developed new workflows and Tropicos features to expedite the imaging and transcription process that will be beneficial to this and other digitization projects.

NOSU: Talked with two students who may work on transcribing in the fall.

NY: (completed)

OKL: OCU and part of the OCLA herbaria have been brought to Norman for digitizing.

OKLA: Nothing new to report.

SHST: Nothing new to report.

TAES: Nothing new to report.

TAMUCC: Nothing new to report.

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.

UTEP: (completed)

* Comments about digitization progress:

HUH: The HUH has **largely completed** the imaging, transcription, and georeferencing that was estimated for the project. While undertaking our broader North America digitization efforts, we have discovered that we likely have more specimens than originally estimated. Beyond this project, we intend to continue digitizing our North American vascular plant specimens and contributing those records to relevant community portals. Specimens digitized beyond the life of the TORCH project may be created with minimal data (as opposed to detailed data capture and georeferences), in accordance with our mass digitization efforts.

KANU: All KANU specimens from OK and TX are transcribed, georeferenced, and imaged, except for occasional ones missed during earlier work, problematic specimens (such as those with ambiguous locality data), or new accessions. Post-processing of images was **completed** in December 2021. Images were supposed to have been uploaded to our Specify attachment server and made available via web portals during cache refresh in February 2022, but personnel turnover has delayed that work. We currently are working with a new staff member to complete that task.

MO: COVID closures and staff turnover were major obstacles to digitization at MO, which was in the middle of two other TCNs (Endless Forms and Pteridophytes), in addition to TORCH. We have picked up the pace on these other projects and reestablished/modified the necessary infrastructure to tackle TORCH and subsequent digitization.

NY: (completed)

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.

* The contractor who is working for us at UT Rio Grande Valley – Edinburg (PAUH) continued to make slow progress, mainly because of chronic IT and access issues with that university.

* We finished barcoding and imaging the first third of specimens from Texas Lutheran University (TLU), and have moved the second third of that herbarium to our facility. We are also ready to start moving specimens from Texas State University (SWT) over for imaging and barcoding, and have received a spreadsheet of that herbarium's label data.

* Finally, our efforts toward the TORCH grant suffered a severe setback with the departure of Assistant Curator, Amber Horning, for a new job elsewhere. Amber departed on 15 April and her replacement, Lauren Hoff, did not start until 1 July, so we were understaffed for 2.5 months.

* During the summer months, we typically have fewer student workers than we do during fall and spring semesters. Thus, after about 15 May our progress slows for this reason.

UTEP: (completed)

All other institutions: Nothing new to report.

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

BAYLU = 0

BRIT (Searched all collections on July 29th, 2022, with Kingdom = Plantae, and collected in Texas or Oklahoma):

BRIT-SMU-VDB-NLU:	179,437
TAC:	7,064
NTSC:	0
ACU:	0
HSU:	0
TCSW:	0
BCNWR:	0

Sub-total for BRIT Lead: 186,501

HUH = 49,272 TORCH-related specimens
[1,558,011 total specimen records]

KANU = **(completed)** All KANU records are uploaded to GBIF and iDigBio at the beginning of each month. This continues to be done for all transcribed records. **(for this count, assumed 27,566, from KANU's "Fully Transcribed Records" above)**

MO (Searched August 3rd, 2022, with Kingdom = Plantae):

30,439 TORCH-related specimens
(23,913 TX + 6,526 from OK)
[4,818,461 total specimen records]

NOSU = 0

NY = **(completed) (for this count, assumed 84,500, from NY's "Fully Transcribed Records" above)**

OKL = 0

OKLA = 0

SHST = 0

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	242,951
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)	7,573
Texas State University (SWT)	0
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	0

Sub-total for TEX-LL & data providers: 273,433

TTC = 23,605

UTEP = **(completed)** 27,573 [assumed same as TORCH Portal number, searched Aug. 4 th , 2022, collected in either TX or OK]

Total number of records available in iDigBio portal (cumulative):

702,889 from Texas and Oklahoma

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

BAYLU = 50,664

BRIT: (Searched TORCH Portal for geographic distributions within each collection's profile on August 3rd, 2022, without taxonomic constraints & collected in TX or OK.)

BRIT-SMU-VDB-NLU:	210,806
TAC:	7,029
NTSC:	11,306
ACU:	3,739
HSU:	3,965
TCSW:	0
BCNWR:	0

Sub-total for BRIT Lead: 236,845

HUH = 43,857

KANU: **(completed)** All KANU records uploaded to GBIF and iDigBio should be accessible via the TORCH portal **(for this count, assumed 27,566, from KANU's "Fully Transcribed Records" above)**.

MO = 21,261 TORCH-related specimens (17,706 TX + 3,555 OK) (527,787 total specimen records), searched August 3rd, 2022.

NOTE: MO data on the TORCH Portal have not been updated since 2017-11-29.

NOSU = 0

NY = **(completed) (for this count, assumed 84,500, from NY's "Fully Transcribed Records" above)**

OKL = 138,177 (OKL: 137,391 + OCU: 786 + OCLA: 0)

OKLA = 71,975

SHST = 0

TAES = 238,856

TAMUCC = 0

TEX-LL (including Data-Provider Institutions):

University of Texas at Austin (TEX-LL)	241,452	
Angelo State University (SAT)	38,984	
Fort Worth Nature Center (FWNC)	1,918	**(completed)**
Howard Payne University (HPC)	26,657	
Lady Bird Johnson Wildflower Center (JWC)	3,315	**(completed)**
Our Lady of the Lake University (LLC)	0	
Saint Edward's University (SEU)	8,308	**(completed)**
Sul Ross State University (SRSC)	32,471	
Texas Lutheran University (TLU)	7,930	
Texas State University (SWT)	0	
Univ. of Texas Rio Grande Valley-Edinburg (RUNYON)	7,487	

Sub-total for TEX-LL & data providers: 368,522

TTC = 23,605

UTEP = **(completed) (47,895 records from Texas & Oklahoma)**

Total number of records available in TORCH Symbiota Portal from Texas and Oklahoma (cumulative):

1,353,723

Share Best Practices, Standards, and Lessons Learned

MO: MO was not set up to capture file-as information as part of its existing workflow, nor was Tropicos well-equipped for efficient transcriptions of specimens from images. We switched to an imaging process that images the folder first, then all relevant specimens within the folder. An automatic barcode extractor renames image files according to image name, making the folders (which lack barcodes) easy to pick out and annotate with species name and geographic region. This information is then entered into a custom-built Tropicos plug-in so that images being added to the database have this essential information concerning the physical location of the specimens. A

‘Stored As” set of fields will be launched as part of a larger set of changes to the way Tropicos handles specimens data later this summer.

TAMUCC:

* Maintaining alphabetical order of specimens
* Removing dirt or detached specimen matter to ensure clear image
* Keeping computer files in the correct folders

All other institutions: Nothing new to report.

Share Identified Gaps in Digitization Areas and Technology

BAYLU: The BAYLU Herbarium was moved on May 15th. We are still recovering facilities for further digitization.

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: Initial run-ins with not being able to access computer/internet

TEX-LL:

Amber Horning’s departure last April and the delayed recruitment of her replacement (Lauren Hoff, who started on 1 July) slowed down our work to process images and move them from local drives to storage at TACC, and also delayed uploading of images to the TORCH portal.

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 from SEINet, where the records currently reside.

All other institutions: Nothing new to report.

Share Opportunities to Enhance Training Efforts

The 2022 TORCH Summer Internship is currently underway at the five co-lead institutions on the TORCH TCN (BRIT, OKL, OKLA, TAES, and TEX-LL). Four interns are being hosted at each institution, for a total of 20 interns. The internship will run for ten weeks, from June 10th through August 12th, 2022. Each TORCH intern will be presenting a poster on their research project at the TORCH Meeting to be held at BRIT on August 10th, 2022.

BRIT:

* We continue to host weekly zoom conversations with the Armchair Botanist program to engage Notes from Nature volunteers transcribing project specimens. Ten 1-hour sessions were held, with 62 attendance events from 25 unique individuals.

* Hosted one additional virtual training session for individuals interested in joining the Armchair Botanist program, with nine attendees.

* Ashley Bordelon, TORCH Digitization Coordinator, attended the C*Sci 22: Connected Where You Are virtual conference May 23-26, 2022, with the goal of making sure our existing engagement with virtual volunteers is inclusive, leads to the retention of existing volunteers, and is attractive to new ones.

* BRIT TORCH Staff have participated in Symbiota Support Hub meetings.

* Four TORCH interns joined the project: Ulysses Oles, Lezlie Dominguez, Basil Gaffney, and Sarah Butler joined the BRIT Herbarium for a 10-week TORCH Internship funded through the TCN. The internship has been co-directed at BRIT by Tiana Rehman and Brooke Best, providing mentorship and direction in research projects for presentation in the TORCH Annual Meeting poster session. Interns receive training in digitization (imaging, transcription, georeferencing) and other herbarium skills (collection, mounting, filing system and organization, Botany 101) and have contributed to digitization efforts with priority counties and their taxa/projects of interest. Additional training on GIS software (ArcGIS,) and data cleaning tools (e.g. OpenRefine, Excel) was also provided and utilized. Interns were taken out into the field to learn about specimen and data collection, as well as to meet and network with the larger intern and mentor group across the TCN. Although lodging was at the Oklahoma Biological Station on Lake Texoma, students collected on private property in Coal Co., OK and received a guided

session at Hagerman National Wildlife Refuge. Students have participated in a weekly Journal Club led by Abby Moore at the University of Oklahoma, via Zoom. Interns joined networking teas at BRIT, meeting with such environmental professionals as those working at Bartlett Tree Services, Texas Parks and Wildlife, and the New York City Department of Parks and Recreation. Interns attended monthly lectures, including those from TORCH TCN Project Manager Diego Barroso, USDA-APHIS Plant Safeguarding Specialist Jeremy Whisenhunt, and NatureServe representatives Patrick McIntyre and Wesley Knapp. The first week of this internship included concurrent virtual sessions with the full 20 students from across the TCN, and included joint lectures and guided activities, as well as introductions to each herbarium.

* TORCH Project Manager Diego Barroso presented a virtual “Introduction to Digitization” session on June 6th, 2022, with our 20 TORCH Interns and five P.I.’s in attendance.

* TORCH Project Manager Diego Barroso attended the 6th Annual Digital Data Conference, organized by iDigBio, from May 23rd through the 25th, 2022.

OKLA:

* Trained one new undergraduate student in transcribing who is conducting research for credit.

* Training activities for four interns were developed and conducted in person, virtually, and via recorded materials.

* Trained two undergraduate students 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

TAES: We are enjoying our internship program this summer. We have hired four interns, who are participating in digitization, fieldwork, and research.

TEX-LL: The four TORCH interns participated in a weekly journal club (starting in early July) along with interns from the other four collaborating institutions. Papers discussed involved topics relating to digitized herbarium specimens.

All other institutions: Nothing new to report.

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

The 2022 TORCH Summer Internship is currently underway at the five co-lead institutions on the TORCH TCN (BRIT, OKL, OKLA, TAES, and TEX-LL). Four interns are being hosted at each institution, for a total of 20 interns. The internship will run for ten weeks, from June 10th through August 12th, 2022.

TORCH Project Manager Diego Barroso held two meetings with Drs. Bruce Hoagland and Todd Fagin, of the Oklahoma Vascular Plants Database (OVPD), to discuss the ingestion of the remainder of OVPD into the TORCH Portal (to date, only the data for the two largest collections, OKL and OKLA, have been ingested).

BRIT: Continued collaboration with TORCH Steering Committee to organize the 2022 TORCH annual meeting, to be held August 10th, 2022. Call for (free) registration and title submission for posters and oral presentations was sent to 73 emails in the TORCH membership, an additional ca. 11 Texas Plant Conservation Conference past attendees, the TORCH TCN Google Group, iDigBio's Education and Outreach mailing list, and the NHCOLL listserv for the Society for the Preservation of Natural History Collections (SPNHC).

KANU: KANU is a collaborating collection on a new digitization proposal that was submitted earlier this year. We don't have precise numbers, but roughly 5,000 specimens digitized for the TORCH grant will be available for the new project if it is funded.

MO: We started planning with Joey Shaw for students to visit MO to image specimens from Arkansas and Tennessee. The plan is for these students to work alongside our TORCH digitization crew, to make more efficient use of specimen sorting and to allow them to learn from one another.

NOSU: Working with BCEENet on Herbarium based CURES.

TAMUCC: Texas A&M University College Station (TAES)

All other institutions: Nothing new to report.

Share Opportunities and Strategies for Sustainability

The TORCH TCN began working with Kuvio Creative, a software development group, to develop a digitization management platform to streamline the TCN workflows. Work began in April, and the proof of concept was delivered in early June. Work on a second phase continued in June, and is expected to be completed in September. The second phase will include a functioning cloud-based platform with full documentation and source code, and will be a TORCH contribution to the digitization community at large.

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

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

TORCH Project Manager Diego Barroso gave a BRIT virtual “Lunchtime Lecture” on June 7th, 2022, focusing on the TORCH TCN Project. Over 35 people were in attendance.

OKLA:

Three segments were produced and aired for the public television program “Oklahoma Gardening”, on OETA (Oklahoma Public Television). These three segments covered preparing plant specimens, what is an herbarium, and herbarium digitization, respectively, with specific information about the TORCH NSF-funded project. The YouTube links are provided below:

https://www.youtube.com/watch?v=zEevM61u4Ew

https://www.youtube.com/watch?v=bRU0w0-tt8I

https://youtu.be/Exxrj1OfSjc

TAMUCC: Use of herbarium for students enrolled in the Plant Taxonomy course this semester. Students had the opportunity to add to the collection with their own collected specimens.

TTC: TTC supported two student presentations at the 2022 Botany Conference in Anchorage, Alaska:

Madison Bullock (Ph.D. Student): Herbaria uses in ecosystem health assessments: Impacts of land use and climate change on flora in the Guadalupe Mountains over 50 years

Sherese Price (M.S. Student): Phylogeography of the Abronia fragrans (Nyctaginaceae) species complex using Angiosperms353

All other institutions: Nothing new to report.

Other Education and Outreach Activities:

BAYLU: Andrew Kim (working with Joseph White) has been utilizing the database for his Honor Thesis on CO2 effects on leaf morphology and stomatal characteristics.

BRIT: T. Rehman and A. Bordelon (5 May 2022): “Armchair Botanist: Digitizing the Plants of Texas” for the May 2022 Texas Master Naturalist Virtual Volunteer Fair, showcasing this community science project (through Notes from Nature) to 160 attendees.

HUH:
PI C. Davis finalized a large public exhibit on digitized herbarium specimens and climate change in New England opening at the Harvard Museum of Natural History. The exhibit is titled “In Search of Thoreau’s Flowers: An Exploration of Change and Loss,” and was a collaboration with former Davis lab postdoc, Emily Meineke (UC Davis) and three visual artists (Marsha Gordon, Leah Sobsey, and Robin Vuchnich). The work features our analyses of climate change response in plants using field observational data from Henry David Thoreau and digitized herbarium data. Two links are provided below:

https://hmsc.harvard.edu/news/henry-david-thoreau%E2%80%99s-vast-botanical-collection-inspires-new-exhibition-search-thoreau

https://www.linkedin.com/feed/update/urn:li:share:6947509231700893696?utm_source=linkedin_share&utm_medium=member_desktop_share&utm_content=post)

OKLA:

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

* Four interns and one graduate student were taken on a local field trip and a grant-wide field meeting for training in field observation, data collection, and specimen preparation.

TAES: We are hosting four undergraduate students who are participating in the 2022 Summer Internship Program.

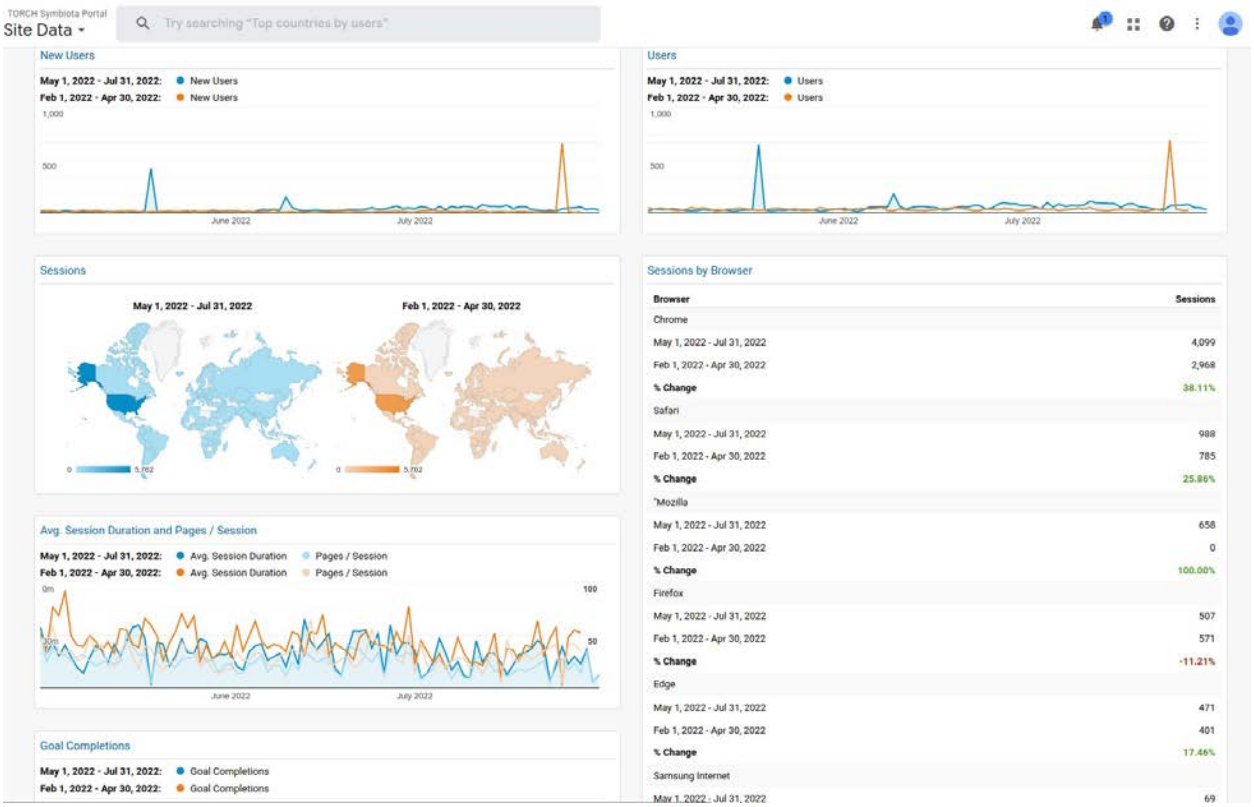
TEX-LL: We gave one tour to an on-campus summer REU group, presented two tours to amateur naturalist groups, gave one tour to a class from one of our data provider institutions, gave one tour to a staff and volunteer group from another data provider institution, and one tour to a staff group from the Texas Parks and Wildlife Department. All of these contained information on the TORCH TCN digitization activities. In-person tours continue to recover from disruptions caused during the pandemic.

TTC: Hosted 15 members of the South Plains chapter of the Texas Master Naturalists for a tour of the Herbarium (June 2, 2022)

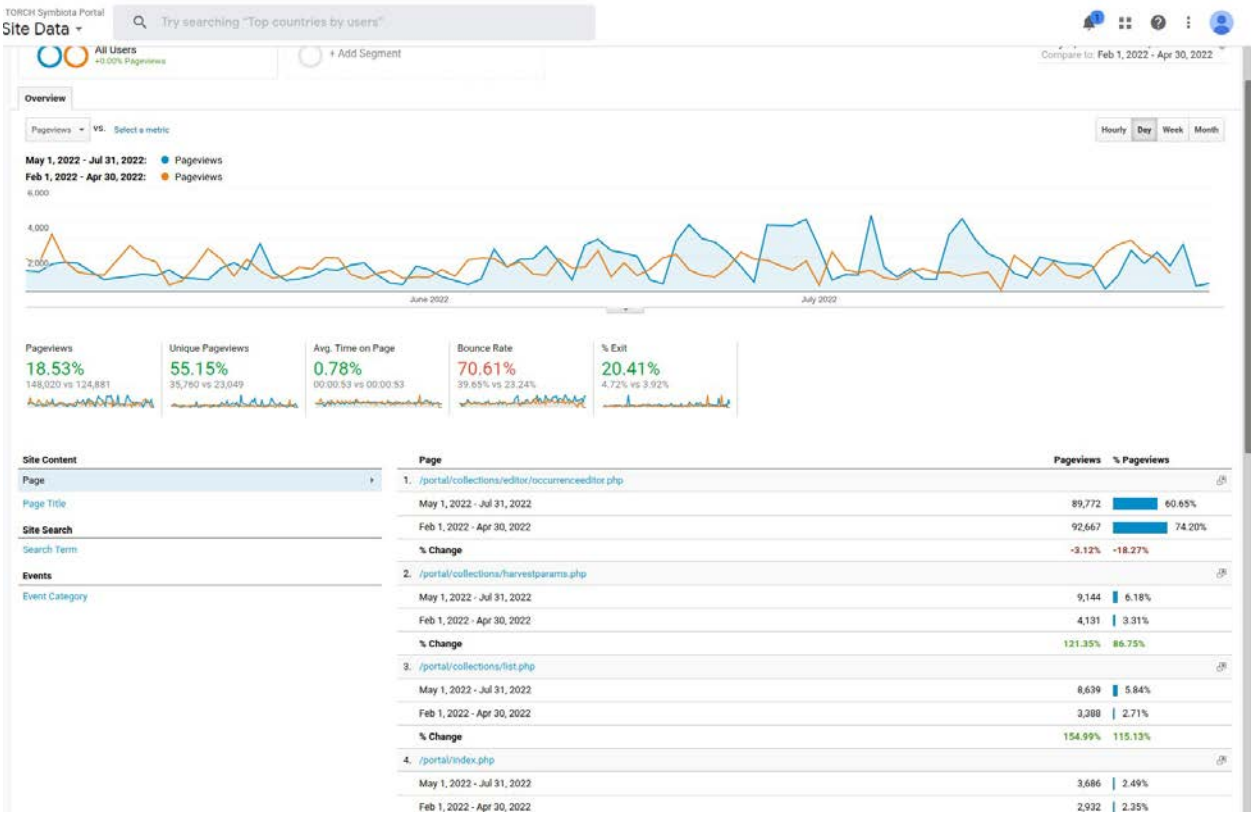
All other institutions: Nothing new to report.

Share Information About Your Website and/or Portal Usage

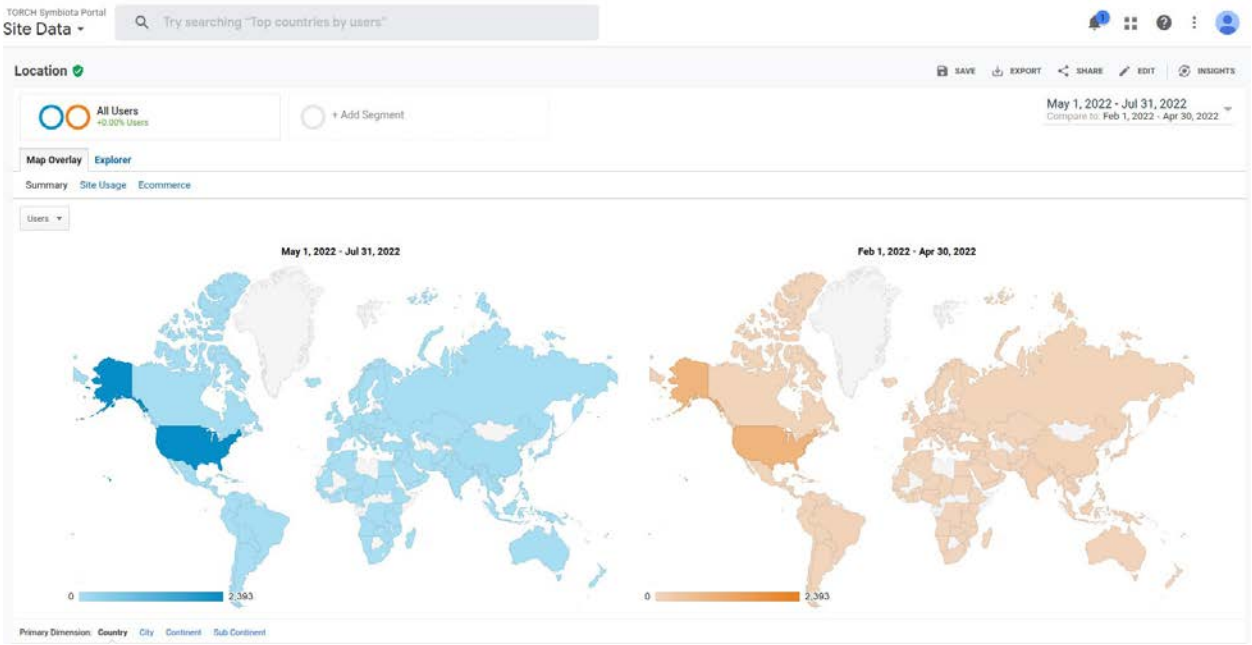
Dashboard, May 1st, 2022 – July 31st, 2022, compared to previous Quarter (note WeDigBio effects!)

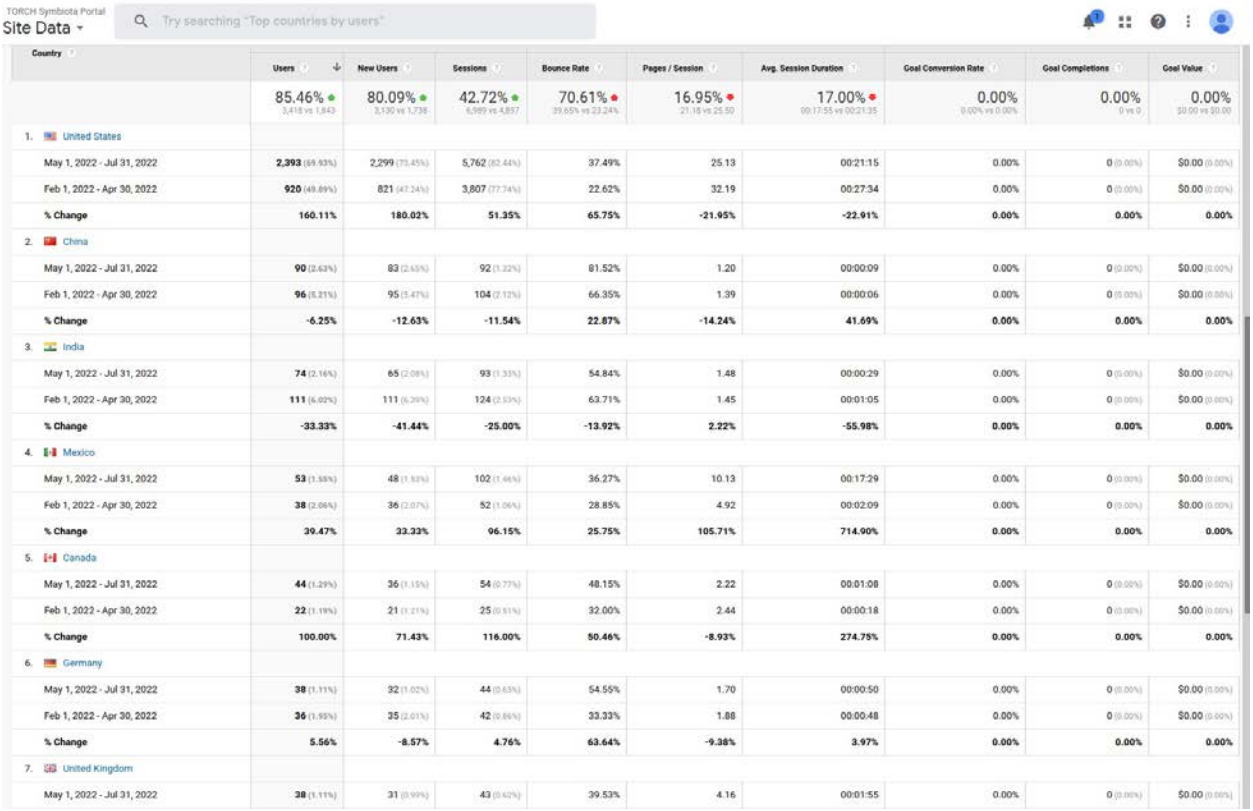


Pageviews, May 1st, 2022 – July 31st, 2022, compared to previous Quarter.



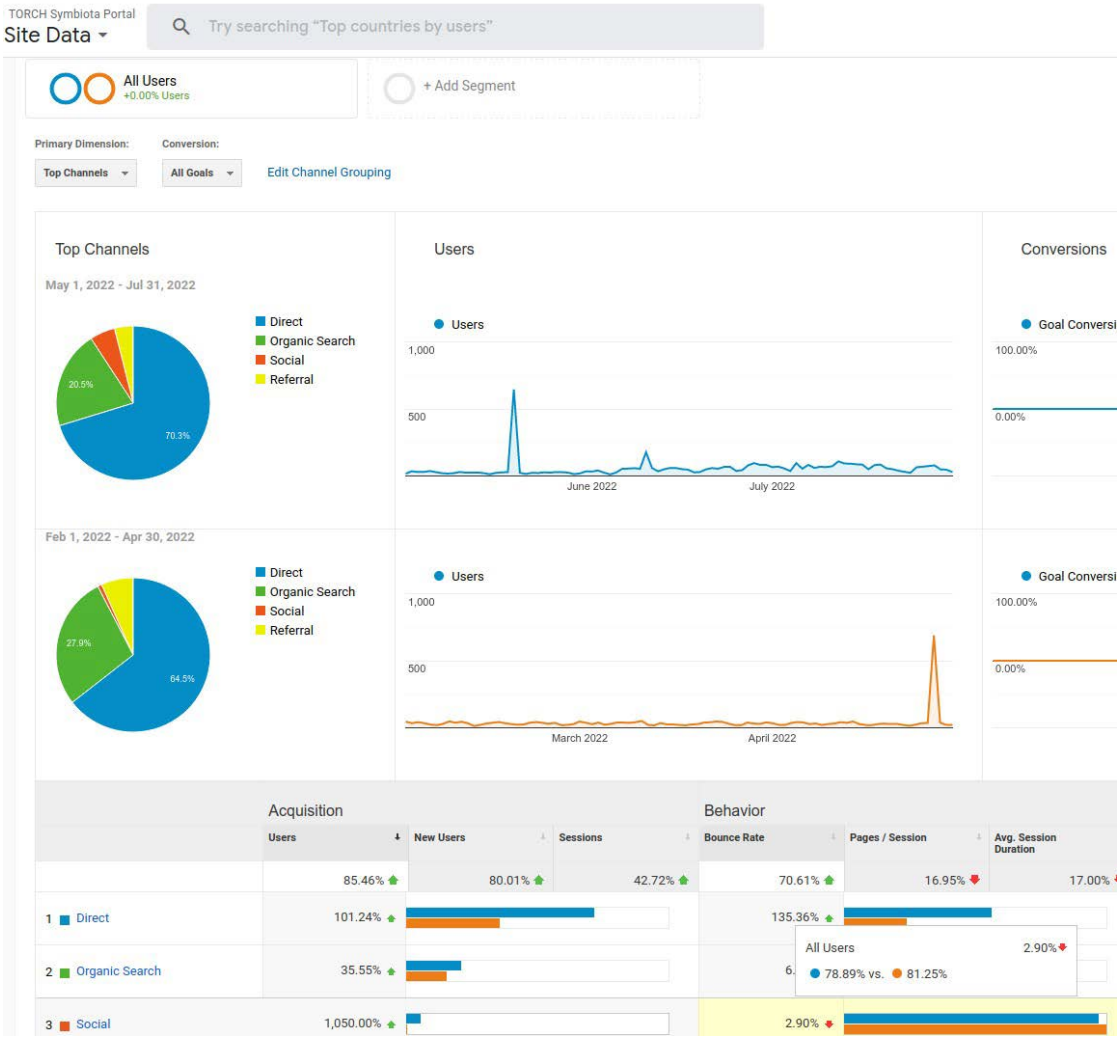
Users by Country, May 1st, 2022 – July 31st, 2022, vs. previous Quarter.



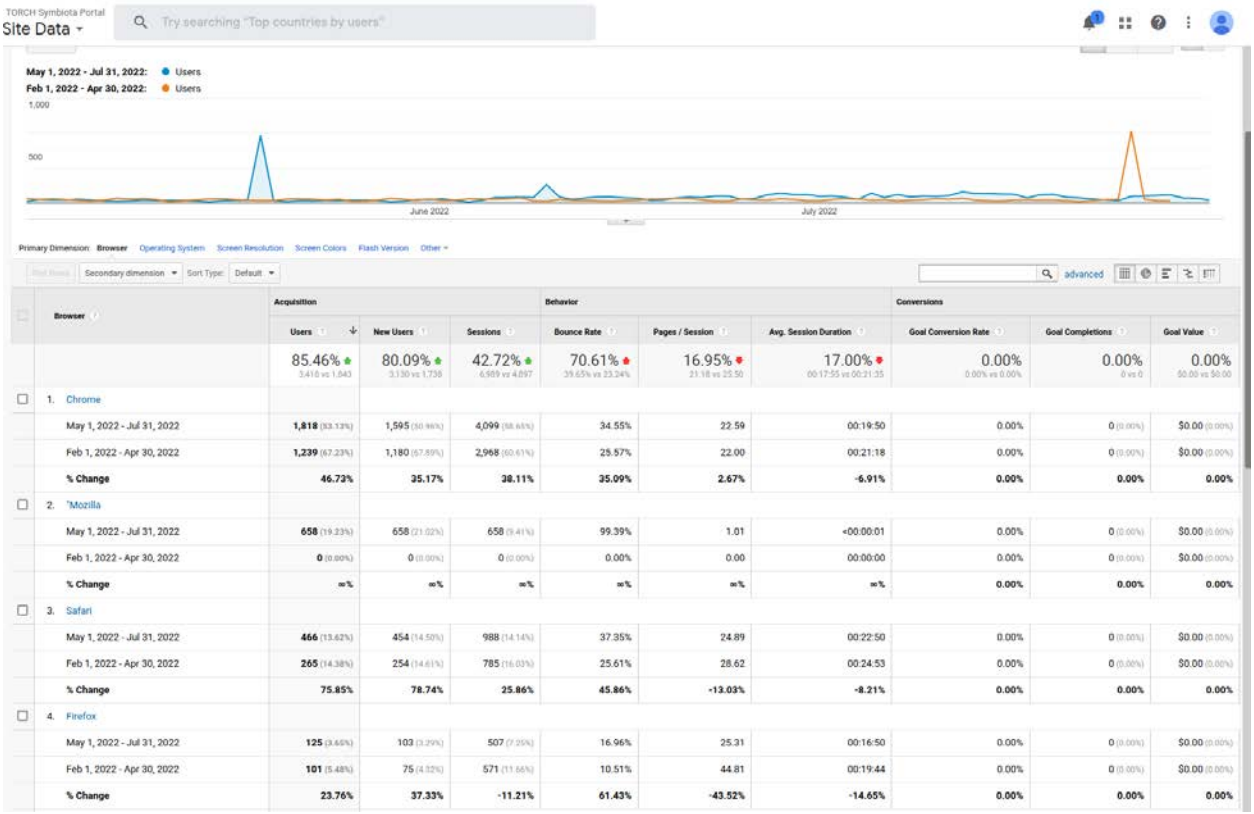


Country	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
	85.46% 3,418 vs 1,843	80.09% 3,130 vs 1,738	42.72% 6,989 vs 4,897	70.61% 39.65% vs 23.24%	16.95% 21.18 vs 25.50	17.00% 00:17:55 vs 00:21:35	0.00% 0.00% vs 0.00%	0.00% 0 vs 0	0.00% $0.00 vs $0.00
1. United States									
May 1, 2022 - Jul 31, 2022	2,393 (69.93%)	2,299 (73.45%)	5,762 (82.44%)	37.49%	25.13	00:21:15	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	920 (49.89%)	821 (47.24%)	3,807 (77.74%)	22.62%	32.19	00:27:34	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	160.11%	180.02%	51.35%	65.75%	-21.95%	-22.91%	0.00%	0.00%	0.00%
2. China									
May 1, 2022 - Jul 31, 2022	90 (2.63%)	83 (2.65%)	92 (1.32%)	81.52%	1.20	00:00:09	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	96 (5.21%)	95 (5.47%)	104 (2.12%)	66.35%	1.39	00:00:06	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	-6.25%	-12.63%	-11.54%	22.87%	-14.24%	41.69%	0.00%	0.00%	0.00%
3. India									
May 1, 2022 - Jul 31, 2022	74 (2.16%)	65 (2.08%)	93 (1.33%)	54.84%	1.48	00:00:29	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	111 (6.02%)	111 (6.39%)	124 (2.53%)	63.71%	1.45	00:01:05	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	-33.33%	-41.44%	-25.00%	-13.92%	2.22%	-55.98%	0.00%	0.00%	0.00%
4. Mexico									
May 1, 2022 - Jul 31, 2022	53 (1.55%)	48 (1.53%)	102 (1.46%)	36.27%	10.13	00:17:29	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	38 (2.06%)	36 (2.07%)	52 (1.06%)	28.85%	4.92	00:02:09	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	39.47%	33.33%	96.15%	25.75%	105.71%	714.90%	0.00%	0.00%	0.00%
5. Canada									
May 1, 2022 - Jul 31, 2022	44 (1.29%)	36 (1.15%)	54 (0.77%)	48.15%	2.22	00:01:08	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	22 (1.19%)	21 (1.21%)	25 (0.51%)	32.00%	2.44	00:00:18	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	100.00%	71.43%	116.00%	50.46%	-8.93%	274.75%	0.00%	0.00%	0.00%
6. Germany									
May 1, 2022 - Jul 31, 2022	38 (1.11%)	32 (1.02%)	44 (0.63%)	54.55%	1.70	00:00:50	0.00%	0 (0.00%)	$0.00 (0.00%)
Feb 1, 2022 - Apr 30, 2022	36 (1.95%)	35 (2.01%)	42 (0.86%)	33.33%	1.88	00:00:48	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	5.56%	-8.57%	4.76%	63.64%	-9.38%	3.97%	0.00%	0.00%	0.00%
7. United Kingdom									
May 1, 2022 - Jul 31, 2022	38 (1.11%)	31 (0.99%)	43 (0.62%)	39.53%	4.16	00:01:55	0.00%	0 (0.00%)	$0.00 (0.00%)

Channels, May 1st, 2022 – July 31st, 2022, vs. previous Quarter.



By browser used, May 1st, 2022 – July 31st, 2022, vs. previous Quarter.



TORCH Symbiota Portal
Site Data

Try searching "Top countries by users"

May 1, 2022 - Jul 31, 2022: Users
Feb 1, 2022 - Apr 30, 2022: Users

1,000
500
June 2022
July 2022

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

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
		85.46%	80.09%	42.72%	70.61%	16.95%	17.00%	0.00%	0.00%	0.00%
		3,410 vs 1,843	3,130 vs 1,738	6,989 vs 4,097	39.65% vs 23.24%	21.18 vs 25.50	00:17:55 vs 00:21:35	0.00% vs 0.00%	0 vs 0	$0.00 vs $0.00
☐	1. Chrome									
	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%)
	Feb 1, 2022 - Apr 30, 2022	1,239 (67.23%)	1,180 (67.89%)	2,968 (60.61%)	25.57%	22.00	00:21:18	0.00%	0 (0.00%)	$0.00 (0.00%)
	% Change	46.73%	35.17%	38.11%	35.09%	2.67%	-6.91%	0.00%	0.00%	0.00%
☐	2. "Mozilla									
	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%)
	Feb 1, 2022 - Apr 30, 2022	0 (0.00%)	0 (0.00%)	0 (0.00%)	0.00%	0.00	00:00:00	0.00%	0 (0.00%)	$0.00 (0.00%)
	% Change	∞%	∞%	∞%	∞%	∞%	∞%	0.00%	0.00%	0.00%
☐	3. Safari									
	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%)
	Feb 1, 2022 - Apr 30, 2022	265 (14.38%)	254 (14.61%)	785 (16.03%)	25.61%	28.62	00:24:53	0.00%	0 (0.00%)	$0.00 (0.00%)
	% Change	75.85%	78.74%	25.86%	45.86%	-13.03%	-8.21%	0.00%	0.00%	0.00%
☐	4. Firefox									
	May 1, 2022 - Jul 31, 2022	125 (3.66%)	103 (3.29%)	507 (7.25%)	16.96%	25.31	00:16:50	0.00%	0 (0.00%)	$0.00 (0.00%)
	Feb 1, 2022 - Apr 30, 2022	101 (5.48%)	75 (4.32%)	571 (11.66%)	10.51%	44.81	00:19:44	0.00%	0 (0.00%)	$0.00 (0.00%)
	% Change	23.76%	37.33%	-11.21%	61.43%	-43.52%	-14.65%	0.00%	0.00%	0.00%

Share Other Activities and/or Progress

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

BRIT:

Bordelon, A., J. Lane, T. Rehman. Specimen Discovery Through Community Science Efforts. Poster presented at Society for the Preservation of Natural History Collections (SPNHC) Annual Conference; 5-10 June 2022; Edinburgh, Scotland, United Kingdom.

Jason Best and Diego Barroso presented a poster at SPNHC 2022: "TORCH Digitization Hub: Streamlining Digitization Workflows for Natural History Collections" and Best also presented "TORCH Light Box: An Open Source Light Box Design for Herbarium Specimen Imaging".

TTC: TTC supported two student presentations at the 2022 Botany Conference in Anchorage, Alaska:

Madison Bullock (Ph.D. Student): Herbaria uses in ecosystem health assessments: Impacts of land use and climate change on flora in the Guadalupe Mountains over 50 years

Sherese Price (M.S. Student): Phylogeography of the Abronia fragrans (Nyctaginaceae) species complex using Angiosperms353

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

BRIT:

Ashley Bordelon, Digitization Coordinator (virtual engagement); abordelon@brit.org
Joe Lippert, Digitization Technician; jlippert@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
Rachel Carmickle, Herbarium Technician, rcarmickle@brit.org
Kelly Carroll, Digitization Technician; kcarroll@brit.org
Natch Rodriguez, Digitization Technician; nrodriguez@brit.org
Kimberlie Sasan, Herbarium & ResearchAssistant; ksasan@brit.org
Lezlie Dominguez, BRIT TORCH Intern; lezlie.dominguez37@gmail.com
Ulysses Oles, BRIT TORCH Intern; ulyssesoles@gmail.com
Basil Gaffney, BRIT TORCH Intern; colleengaffney01@yahoo.com
Sarah Butler, BRIT TORCH Intern; sarah.butler047@gmail.com
Brooke Best, BRIT Director of Research Programs; bbest@brit.org

MO:
Colin Robinson
Victoria Patrick
Mike Blomberg

OKL: Four new interns: Michael Dugger, Grace "GP" Payne, Ethan Korn, and Anna Thomas

OKLA:

One undergraduate assistant (Rillo) continued transcribing; one assistant (Sutton) joined three external students (McElroy, Risano, Wood) as interns working on imaging and transcribing; one undergraduate student (Short) was trained and worked on transcribing for class credit.

SHST:

Shae Stafford (Paid Employee) Srs111@shsu.edu
Rosario Rocha(Paid Employee) Rxr117@shsu.edu
Luke Holmes(Paid Employee) Lah069@shsu.edu
Joshua Canterberry(Paid Employee) Jnc038@shsu.edu
Tomas Lewis (Paid Employee) Til003@shsu,edu
Landon McCoy(Paid Employee) Lam124@shsu,edu

TAES: Four TORCH Interns:
Madison Marzullo
Breonna Snead
Juan Barrientos
Matthew Bradley

TAMUCC: Dr. Barnabas Daru and Anna Swanson

TEX-LL:

* Lauren Hoff, Assistant Curator, started in her position on 1 July 2022.

* Four TORCH interns (under our grant-funded undergrad internship program) started ten-week appointments on 1 July:
  1. Elizabeth Clark (University of Texas at Austin)
  2. Desiree Rodriguez (Weber State University)
  3. Bonnie Semmling (Rutgers University)
  4. Blair Young (Rutgers University)

TTC:

* Sara Vaca – summer graduate assistant

* Undergraduate digitizers supported by TORCH:
  Hannah Homoya (new)
  Mara Hosaka
  Sam Thornton
  Kelly Mata
  Alexisari Martinez
  William Onyedionu

All other institutions: Nothing new to report.

<u>Other progress not listed above (anything else to share)</u>:

BAYLU:

Joseph White is currently working at Trinity College Dublin in the Dept of Botany. They have some herbarium specimens from Darwin's Beagle voyage; hope to share pictures.

BRIT:

Staff leaving the project: Full-time Digitization Coordinator Joe Lippert went on to pursue further education and a change in career paths, and Part-time Digitization Technician Kelly Carroll has decided to concentrate fully on completing their M.S. degree at Tarleton State University.

Staff joining the project: Kimberlie Sasan was hired part-time on the TORCH TCN to contribute to the digitization of project specimens. Kimberlie begins by taking on the pre-digitization curatorial steps for the BCNWR herbarium. There were 144 applicants for this position which was made full-time in combination with other funds.

NY: Nothing new to report **(completed)**. The NY subcontract for TORCH is finished – our last report was written after all the funds had been expended, and included all the work that was done until the end. Therefore, we will no longer be submitting quarterly reports. (from Dr. Barbara M. Thiers).

[From the previous Quarterly Report for NY:

Deliverables from the original TORCH proposal budget justification:

“For this project, NY will provide 95,000 completely digitized specimens (i.e., database record including geocoordinates and image) to the project. This total includes 57,000 specimens that require complete digitization; 77,000 that require data transcription and 91,022 that require georeferencing.”

Thus, we have completed about 107% of the work promised. Our grant funding is now expended, so these are the final statistics for the NY contribution to the TORCH project.]

OKL: We **completed imaging of the OCU (Oklahoma City University)** collection and are on our second batch of specimens from OCLA (University of Science and Arts of Oklahoma).

OKLA: Subawards at New York Botanical Garden and University of Kansas are complete. Digitization was initiated and continues at University of Central Oklahoma.

TEX-LL: The TEX-LL group, including the PI and the four TORCH interns, participated in an enrichment activity based at the University of Oklahoma Field Station on 6–8 July, where they interacted with interns from the other four collaborating institutions on the grant. This was an opportunity to collect

specimens at a private ranch in southern Oklahoma and subsequently to process these collections into the digitization workflow. Subsequently, the PI accompanied the four TORCH interns for two days on a trip to Port Aransas, Texas, completing field work in support of one student's project and as an enrichment activity (10–11 July).

TTC: We have now officially launched TTC-Bryophytes, a collection of 330 mosses and liverworts. TTC has not had a bryophyte collection since 2012, when the previous collection was donated to TAES. The new collection was curated in palm folders, organized by genus, and digitized by Hannah Homoya, an undergraduate in the herbarium. The new collection is primarily duplicates of Texas specimens from Eula Whitehouse donated by BRIT, and duplicates from recent Texas collections by T.S. Quedensley.

UTEP: Since all remaining images are now linked to the TORCH Symbiota Portal and to our internal Arctos database, we have **completed** our contribution to the TORCH TCN Project, and will no longer be submitting reports. (from Dr. Michael L. Moody)

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 (May through July 2022) falls within Year 3 of the TPT project. The last overarching annual report was submitted to NSF on July 05, 2022 and we have filed a one-year no-cost extension request with NSF due to pandemic related digitization impacts. Below is a summary of our digitization progress (cumulative). While we are still continuing to recover from the impacts of the COVID-19 pandemic on museums and collections involved in the project, we are making great progress and expect to complete the project on time with the no-cost extension period.

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
ANS	11,284	359	11,871	1,226
BPBM	23,085	4,928	19,103	10,247
BYU	13,096		13,096	
CAS	21,733	1,754	17,602	
CMNH	35,562	303	303	
CU	9,995			1,758
FMNH	10,774	599	61,166	138
HWML	19,943		3,666	

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
INHS	21,559	348	10,813	5,296
MPM	2,609		1,228	1,500
MSB	1,617	618	1,500	2,140
MSU	13,507		2,200	505
OSU	2,254		2,254	
PERC	10,082	10,082		
PSU	21,178	1165	2,139	1,816
TAMU	67,445		6,773	13,595
UH	5,018	95	3,402	
UM	112,826	259	50,546	
UMSP	56,252		94,495	
UNH	10,500	2,125	10,500	1,763
UU	13,000		15,000	
UWSP	7,845		8,383	
WIRC	23,668	26,219	6,942	2,327
YPM	17,607	2,015	3,409	2,581
Totals	**542,097**	**52,012**	**350,391**	**43,392**
Total records	**987,892**			

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

So far, TPT has completed 38 Notes from Nature expeditions and transcribed 158,856 slide images with the help of volunteers. We currently have three active expeditions, *Jumping into the Field Museum Flea Collection 6.0*, *Flea Circus IV,* and Mite at the Museum.

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 has already completed their digitization goals for the project 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 goals.

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.

Share Opportunities to Enhance Training Efforts

ANSP has completed digitizing all 6,689 slides they have on loan from FMNH and shared the data and images. They have also continued to digitize their own specimens making progress in the overall project goals. ANSP has secured institutional funding to keep their collection manager on the TPT project through summer 2023 and has also been discussing with MPM ways to potentially accelerate digitization workflows.

BPBM has completed about 68% of their digitization goals. Recently a new volunteer joined the TPT project and has primarily been assisting with label transcriptions.

BYU has provided educational opportunities and support for 18 undergraduate students associated with the TPT project.

CMNH has trained seven students and two staff members across six computers and two imaging systems this past year. These efforts have resulted in CMNH already completing more than twice their original transcription goals. They have imaged and fully databased 303 flea slides comprising all but 52 of the world's ~254 flea genera, as well as providing coverage for a number of families previously missing from both GBIF and TPT records.

PI Turcatel and PM Albion (**FMNH**) attended the Entomological Collections Management Workshop in Tempe, Arizona this quarter, completed the course, and received ECM certificates of completion.

INHS has resolved its previous IPT related issues and is now serving TPT data to SCAN, INHS Biocollections Portal, & GBIF. All fields are in DWCA format and as such host data can be found by searching the "habitat" field. Additionally, students are actively parsing biological associations into TaxonWorks, with export methods currently being worked out.

MSU databased 505 vials of fly immatures and adult specimens as well as 1,100 slide-mounted mites. Records are shared and accessible via SCAN. Tabanidae will continue this fall with MSU's new imaging system.

PI Porturas (**PSU**) coordinated with the department's financial coordinator to file for a 1-year extension on the project. Additionally, Porturas attended the Entomological Collections Management Workshop (ECM) virtually this quarter, completed the course, and received a ECM certificate of completion. PSU personnel databased approximately 1,052 records in TaxonWorks and imaged approximately 405 collection objects which were uploaded to TaxonWorks and SCAN.

TAMU is preparing many more specimens for the imaging and transcription. This quarter TAMU digitized over 4,000 slides and 2,277 pinned specimens. They also started imaging of the Tabanid group using the Macropod System and have continued to work on adding taxonomic names to the database. Additionally, the collection received a lice donation of 2,157 specimens that will be incorporated into the TPT project and have written a new procedure and metadata protocol that will be shared shortly.

UWSP has completed about 80% of their digitization goals. PI Orlofske learned how to navigate the procedures for hiring and training research technicians. One new research technician was trained for the project, however he has since graduated and moved to pursue graduate school.

UM hired two new student technicians over the summer who have been working on slide scanning and databasing records in Specify. Additional parasite collection data is being migrated from FileMaker to Specify and students received training in both databases. A third student will be starting in fall to help with databasing and CM Taro plans to hire a fourth student technician to get the project fully staffed again and expedite ongoing digitization efforts. MPM continues to work with CM Taro to make sure he has the support resources needed for the project.

UU has prepped about 3,000 more slides for new Notes from Nature expeditions. Additionally, PI Bush gave a presentation at a conference in Kenya featuring the collection and TPT digitization in the methods section. She also discussed proper identification and vouchering of parasites during this presentation.

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 has recently started 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 in review 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

This quarter, the Frost Entomological Museum (**PSU**) gave tours to approximately 33 people (We Are Weekend alumni weekend ~ 15 people, Food Science office staff 6 people, Sustainability summit 2 people, PSU museum walk ~10 people). In all of PSU tours, we talk with visitors about the active TPT project, how and why collections digitize specimens, and what can be learned from the historical data.

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.

PI Orlofske (**UWSP**) hosted a "Meet a Scientist" day for the Auburndale elementary school STEM club. There was a discussion about parasitology and examples of arthropod parasites provided on microscope slides.

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: https://www.globalbioticinteractions.org/ecm-workshop/.

Share Information About Your Website and/or Portal Usage

To date, the TPT Notes from Nature project has completed **38 expeditions, 158,856 transcriptions** for 48,622 unique specimens, and provided learning experiences for **2,214 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 June 22, 2022. The total number of interactions included in this reporting period is **786,168** records (500,000 interactions was the overall goal for TPT). The full TPT biotic interaction dataset published on Zendo has been **viewed 884 times** and been **downloaded 328 times:** https://zenodo.org/record/6761707#.YuQ5d-zMLFQ.

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

- A team of five undergraduates presented a poster at the College of Letters and Science Undergraduate Research symposium. That same poster was presented by two of the undergraduates at the Annual Midwestern Conference of Parasitologists at Southern Illinois University - Carbondale June 9-11. (UWSP)
- Orlofske presented a poster generated from the TPT project at the American Society of Parasitologists annual meeting July 9-12 at Texas A&M. (UWSP).
- Allen, Julie (2022). (Re)using Published Georeferences with Biodiversity Enhanced Location Services (BELS). Entomological Collections Management Workshop. Remote.
- Poelen, Jorrit (2022). On Interpreting Biotic Association Records. Entomological Collections Management Workshop. Remote. https://zenodo.org/record/6686306#.YrspYezMJZo
- Seltmann, Katja (2022). Current TCNs: Big-Bee & TPT. Entomological Collections Management Workshop. Remote.
- PM Tucker and Jorrit Poelen restructured and led the *Interaction Data Interpretation Workshop* (2022). Part of the Entomological Collections Management Workshop. Hybrid: Remote/Tempe, Arizona. https://www.globalbioticinteractions.org/ecm-workshop/
- Bush, S. (2022) Ecology and Evolution of Grooming Behavior. Kenya, Africa.

Publications

- Tucker, Erika, Poelen, Jorrit, & Seltmann, Katja. (2022). A lesson plan for better understanding entomological specimen interaction data in collections by NSF funded Terrestrial Parasite Tracker Thematic Collection Network [website: https://www.globalbioticinteractions/ecm-workshop/]. Zenodo. https://doi.org/10.5281/zenodo.6704580.

- 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., Young, Daniel, Brabant, Craig, Sullivan, Kathryn, Turcatel, Maureen, Shuman Baquiran, Rebekah, Albion, Zoe, Austin, Kyhl, Rubinoff, Dan, Cognato, Anthony I., Caywood, Alyssa, Colby, Julia, Allen, Julie, Zaspel, Jennifer M. (2022). Terrestrial Parasite Tracker indexed biotic interactions and review summary (0.6) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6761707.
- Poelen, Jorrit (2022). On Interpreting Biotic Association Records. Zenodo. https://doi.org/10.5281/zenodo.6686306.