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

May 2022

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

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

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

~~Cretaceous World~~	~~InvertEBase~~	~~NEVP~~
~~EPICC~~	~~LBCC~~	~~Paleoniches~~
~~Endless Forms~~	~~MaCC~~	~~SERNEC~~
~~FIC~~	~~MiCC~~	~~TTD~~
~~GLI~~	~~MAM~~	~~VACS~~
~~InvertNet~~	~~MHC~~	

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.

All Asia 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: Jonathan Kennedy, Director of Biodiversity Informatics, Harvard University Herbaria

Reporting Period: Jan 1 – Mar 31, 2022 (* We are reporting up to the end of the previous month to capture complete statistics)

Share Progress in Digitization Efforts

Total Specimens imaged: 17,433
Total Minimal records created: 25,728
Total Full/detailed records created: 25,613
Total Specimens georeferenced: 5,741

Overview: We are in Y1 of the project and most partners are scheduled to begin digitizing in Y2. Y1 is primarily dedicated to technology development/deployment (imaging stations/workflows, portal development, data coordination). The collections with smaller Asian holdings have begun digitization activities and some partners have been able to start digitizing early. Others are coordinating technology deployment, staff hiring, and pre-digitization curation. Lead (HUH) activities for this quarter included coordinating photostation design updates and fabrication, coordinating technology development work with BU Spark (AI-based label transcription, working with partners to understand local digitization workflows, organizing phase 1 georeferencing with COLO, and organizing data needs for upcoming All Asia portal (geography, taxonomy, collectors, Himalaya-Hengduan gazetteer).

	Images	Minimal	Detailed	Georef	Comments
ALA	0	0	0	0	Starting Y2
BISH	2,500	0	1,683	0	Digitization started
BRIT	0	0	0	0	Starting Y2
BRU	49	0	49	0	Digitization started
CHIC	0	0	0	0	Starting Y2
CINC	605	0	325	0	Digitization started
CLM	0	0	0	0	Starting Y2
COLO	588	588	0	0	Starting Y2 (some specimens digitized from other projects)
HUH	4,369	0	4,369	0	Starting Y2 (some specimens digitized from other projects)
MASS	1,312	0	187	0	Digitization started
MICH	0	0	0	0	Starting Y2

MO	0	0	0	0	Starting Y2
MU	0	0	0	0	Starting Y2
NHA	0	0	0	50	Digitization started (but on hold due to facilities move)
NY	7,591	24,721	15,195	2,917	Digitization started
OS	0	0	0	0	Starting Y2
RSA	419	419	8	0	Starting Y2 (some specimens digitized from other projects)
VT	0	0	3,805	2,774	Digitization started

* Reports from 3 partners still pending.

Share Best Practices, Standards, and Lessons Learned

BRU: We have a rotation of several undergraduate workers who do the bulk of out digitizing. Usually, they work alone but will leave notes if they need help deciphering labels. They have created a shared Google doc with images of difficult-to-read labels to facilitate interpretation of localities, collector signatures, etc. We also have an old early-1900s atlas that is a good resource for interpreting localities from our historical specimens.

RSA: Our collection is organized first alphabetically by family and genus, then by geographic region. Geographic regions are large and include some countries that are not part of the All Asia TCN. We have found that, with previous digitization projects, it was much easier, and just as fast or faster, to barcode and image the whole folder of specimens, even if non-target specimens were included in the folders. To remedy this situation, we add staff to the project that are supported by institutional funds.

Share Identified Gaps in Digitization Areas and Technology

HUH: HUH is coordinating with BU Spark! on the development of the AI-based transcription tool. BU Spark! has organized a team of ~7 graduate computer science students for this development. So far, they have made progress in key areas of functionality, including: 1) ingest of taxonomic and geographic controlled vocabularies, 2) segmentation of labels from images, 3) transcription of handwritten text from images, 4) matching text against controlled vocabularies and returning accepted names from synonyms. All areas are undergoing improvements and accuracy scoring is a forthcoming key deliverable in order to successfully integrate the tool into the TCN workflows.

Development of Rapid Data entry tool is schedule to begin in the summer with a new group of students. HUH is coordinating with the Symbiota HUB about establishing a portal and integrating this development with the Symbiota codebase.

HUH continues coordinating digitization workflow issues with certain partners utilizing the HUH photostation design. We are uncovering differences between local practices (file naming conventions, file types, needed metadata) that necessitate workflow adjustments or workarounds.

COLO: COLO plans to use the ImagingWorkflow application from the LBCC TCN to capture skeletal data during the imaging process. CO-PI Allen is developing a list from World Flora Online to create a list of names for the dropdown menu in the application.

MASS: Precapture includes taxon entries in database, marking and/or refoldering of specimens. Asian specimens have been separated from other geographical regions in folders. Taxa clarified and entered into Specify database using sources: Kew Plants of the World Online and Tropicos. Scientific names are taxa "as is" in the folders regardless of latest name update. If a taxon can't be found in resources, it is entered "as is" including authority even if no publication can be found (there are a few). Workflow developed with 2 student assistants during spring semester including pulling folders, imaging, electronic file organization and access, database geography populated, and label transcription training recently begun. Pulling specimens with only Cyrillic alphabet or Chinese or Japanese characters to batch transcribe using a translator application or respective language expert.

RSA: Our collection is organized first alphabetically by family and genus, then by geographic region. Geographic regions are large and include some countries that are not part of the All Asia TCN. We have found that, with previous digitization projects, it was much easier, and just as fast or faster, to barcode and image the whole folder of specimens, even if non-target specimens were included in the folders. To remedy this situation, we add staff to the project that are supported by institutional funds. We are not slated to begin our digitizing efforts until the second year of the project, but to help us get a jump-start on the project we have begun to barcode target families of the project with strong representation in our collection. We have nearly completed barcoding Rosaceae.

Share Opportunities to Enhance Training Efforts

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

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

CINC: CINC is also involved with the GLOBAL TCN, and best practices, etc. will be shared between the two projects. CINC is also processing MU specimens for both projects, as well as Cincinnati Museum Center (CMNH) specimens for the All-Asia TCN.

HUH: HUH is also participating in the Southern Rockies TCN led by COLO, TORCH TCN led by BRIT, and the Endless Forms TCN led by NY. We are currently coordinating with collaborators at the Royal Botanic Gardens (Kew), Museum of Natural History (London), and Botanic Survey of India to create a gazetteer of Himalaya-Hengduan localities.

RSA: We are part of the California Phenology TCN (CAP) to digitize target taxa for scoring phenology and using this as a proxy to investigate how climate change may be influencing flowering and fruiting times in California native plant species. California State Polytechnic University, San Luis Obispo is the lead institution. In 2019 we received a PEN for the SoRo TCN to digitize our holdings from the Southern Rocky Mountain region. Lead PI is Erin Tripp at COLO. We are also digitizing for the Endless Forms (EF) digitization project, the goals of which are

to fully digitize specimens from 15 plant families exhibiting unusual or peculiar morphological adaptations. The lead TCN and PI are NY and Matthew Pace, respectively.

Share Opportunities and Strategies for Sustainability

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

ALA: **Ickert-Bond, S.M.,** Zaborac-Reed, S., & C.O. Webb. 2021. Documenting Alaska's flora at the crossroads of Beringia. Arctos Webinar. 2021. Nov. 2, 2021 youtu.be/1zMgQYwWArI

Share Information About Your Website and/or Portal Usage

HUH is currently coordinating portal development with Symbiota Hub.

Share Other Activities and/or Progress

NHA: At the beginning of April 2022, NHA moved to temporary location for a two year renovation of Spaulding Hall, its permanent home. Between Jan 1 – March 31, 2022 NHA Collections Manager Sigel and all herbarium staff were engaged in packing and preparing the collection for the move. For this reason, work on the All Asia TCN project was put on hold, with the exception of some georeferencing. NHA is now nearly operational in its temporary location, and we plan to resume work on the All Asia project during the last week of May 2022.

VT: This past period we made substantial progress on several interesting collections including Leopold Charette's collections from Japan, A.D.E. Elmer's collections from the Philippines, and J.D. Hooker's collections from Khasia. The Charette collections are not widely distributed, duplicates are mostly confined to VT and BRIT. The Elmer collections are very widely distributed, but are still largely lacking transcription on the Symbiota portal. The Hooker collections are important historically, and their transcription will be of widespread value.

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-Big Bee-TCN-CODEN

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

Oct. 28, 2021
Jan. 26, 2022
Apr. 27, 2022
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

Concatenated metrics for the all Big Bee project participants can be found here: https://docs.google.com/spreadsheets/d/1twhePUfhI0tZ28LcwAocJLXrlAYzZ4apJYc5_UKm8X4/edit?usp=sharing

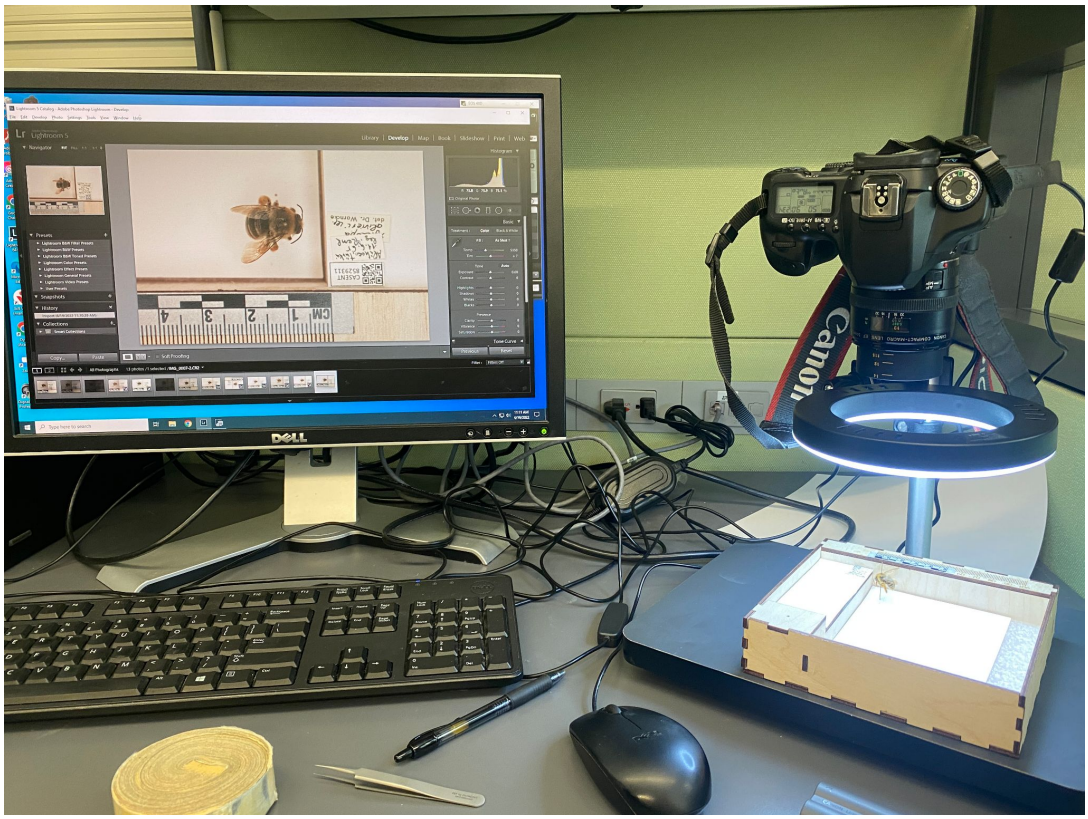
Participating institutions across the network have generated 33,758 new label images and transcribed the labels and georeferenced localities of 8,887 new bee specimens. The network also captured 2,204 new focus-stacked exemplar images, 287 focus-stacked diagnostic images, and 1,441 images for 3-D image suites. Interaction data is available for 131,656 specimens through Global Biotic Interactions.

ASU

- ASU digitized 11,543 specimen records of seven families of Anthophila with 100% georeferenced on Ecdysis portal

(https://serv.biokic.asu.edu/ecdysis/index.php). All are imported/uploaded on Bee Library portal (https://library.big-bee.net/portal/index.php).
- ASU Produced bee images of label-specimen or specimen: total 1,146 images for representing 573 specimens that have been imported/uploaded on Bee Library portal.
- Hired two undergraduates for digitizing label data of individual specimen and imaging of dorsal specimen and label.
- ASU Trained three undergraduates in imaging and data management.

CAS
- Volunteer Alaina Wehrly working virtually to rename file images (1,139 images she took while in San Francisco)
- Volunteer Bill Perry has completed 80 high-resolution images of 25 *Xylocopa* species.
- Dylan Bergersen hired as full time on Big Bee starting April 5th, 2022.
- 595 Dorsal label photos of *Xylocopa* sp. have been completed by Dylan and are being uploaded to SCAN/BeeLibrary
- Workflow optimization being developed
- Macropod set up complete and technicians have become comfortable operating and producing high quality exemplar images
- Streamlined desktop size imaging setup has been created for dorsal label images (image below)
- Big Bee shared specimen tracking sheet continually updated by Dylan as species/specimens are imaged.



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EMEC

- New part-time digitization assistants hired and trained for a total of 6 assistants
- New part-time photography (focus-stacking) assistants hired and trained for a total of 5 assitants
- Fourth imaging workstation constructed and launched
- Workflow training documents for label imaging and focus-stacked images completed
- Labels for 5,018 specimens photographed (8,049 running total)
- 2D focus-stacked image suites (dorsal, lateral, anterior) completed for 605 specimens

FSCA

- During the second quarter of 2022, we transcribed label data from ~3,200 specimens, georeferenced the data, and provided a dorsal habitus shot for each specimen. In addition, 128 extended-focus exemplar images were produced and uploaded in mbd-db.osu.edu. The bee library checklist of taxa will be very helpful to avoid over-emphasis on certain species.

LACM

- Photographed labels with dorsal view for 1,200 specimens in the family Andrenidae
- LACM interviewed multiple candidates and have hired two technicians to fill both open positions; one started 20 April, and the other will start in May. (One position was to replace the previous part-time technician, who left mid-February.)

MCZC

- Captured photo-stacked image suites for 69 species of Andrenidae, constituting 245 images of dorsal, lateral and frontal views.
- Photographed the labels/low-resolution dorsal habitus images for 9,038 specimens of bees in the family Andrenidae. Started transcription of labels.
- Developed workflows and scripts for renaming images, data quality control, and migration of taxon data into MCZbase

SDNHM

- 446 Dorsal label photos of Osmia sp. have been completed and are being uploaded to SCAN/BeeLibrary
- Workflow optimization is being developed
- Macropod set up complete and technicians have become comfortable operating and producing high-quality exemplar images
- Internal specimen tracking sheets created and being used

UNHC

- During the second quarter of 2022, we provided a dorsal habitus shot for 650 specimens, and created 118 extended-focus exemplar images of Bombus specimens. We also created 210 high-resolution brightfield images of the male terminalia of *Andrena* species and collected 60 CLSM 3D datasets (dorsal and ventral view

SEMC

- Trained students in specimen management, imaging and data management.
- Developed a workflow adjusted to research bee collection protocols and personnel.
- Experienced several problems with the Macropod Pro imaging system (i.e., flash was not working properly, insect stage broke, motor system failed, etc.) and are currently waiting for an AC flash pack and new lenses.

UCMC

- We received a replacement tripod for our Macropod Pro imaging station in February 2022 and were able to assemble and test the system
- We have subsequently received a new stage, diffuser, and replacement parts and are in the process of installing them
- We ordered and received an additional Samsung Galaxy Tab S7, ring lights, and acrylic risers to create a total of two dorsal label imaging stations
- A. Carper (PI) and G. Jolma (graduate student) have tested both 2D and 3D imaging on the system and have been writing/adapting protocols from previous imaging efforts for CU
- Carper (PI) and Scott (co-PI) are in the process of identifying digitization priorities, including target species and individual exemplar specimens
- Hired four undergraduate hourly assistants for dorsal specimen and label imaging and trained two in 2D focus-stacked imaging
- Trained two museum graduate assistants in imaging and data management

- Decided 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*); added only ~30 seconds to each specimen handling time.
- Captured 4,303 images of 2,130 individual specimens, including 956 *Hoplitis* and 1,174 *Bombus* specimens.

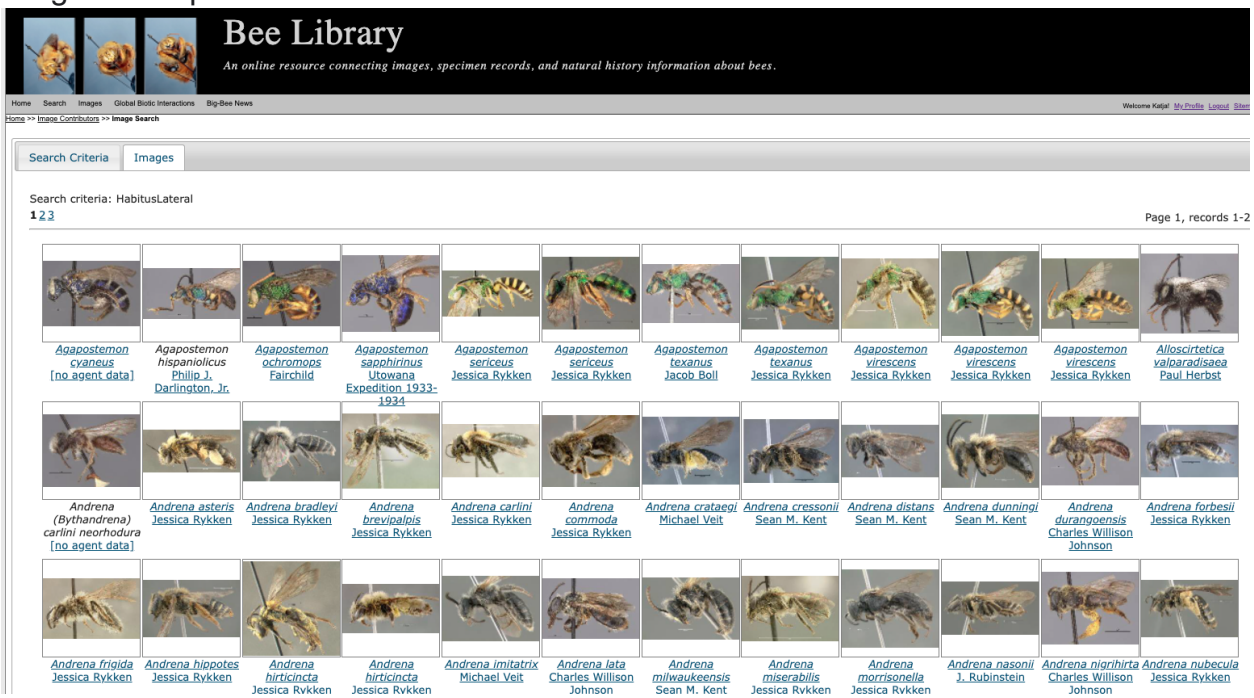
UMMZ

- Virtual meeting with Katja Seltmann regarding Big Bee on-boarding.
- A workflow is being developed for dorsal habitus + labels imaging.
- Student workstations for imaging and digitization efforts are being set up.
- All Macropod hardware has arrived and been set up. Waiting for digital hookup and test runs.
- Secured a graduate student collections assistant for summer 2022.
- Advertised and interviewed for student worker positions with the university and contacted relevant student groups for recruitment.
- Review of the UMMZ bee holdings, type holdings, and past bee digitization efforts and status.
- Signed up with Bee Library.

Share Best Practices, Standards, and Lessons Learned

- UCSB Participated in TDWG Audubon Core - Standard views working group as implementers using Big Bee images. This working group is proposing standard views about subject and orientation to improve the searchability of images in NHC databases.
- 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.
- Working with ASU Hub Ed Gilbert & Andrew Johnson, Big Bee defined the first set of image descriptive terms to use in searching the Bee Library for images. To do this, we adopted an abbreviated list based on the Harvard Entomology list of standard imaging views. The views are incorporated in Symbiota Bee Library as a “Tag” that can be applied to images, resulting in a person's ability to retrieve all

images of a specific bee view.



- UNR and the Big Bee working group have designed a project for Big Bee label transcriptions and taking measurements of bee body size. The first expeditions for both should be released next quarter.
- Pete Oboyski (EMEC) Worked with Michael Denslow (Zooniverse) and Katja Seltmann (Big Bee) to develop a Big Bee citizen science transcription project for “Notes from Nature” drawing on my ten years of experience working on the Notes from Nature platform.
- FSCA are now naming exemplar image files so that they can be parsed into the correct category by the bee library. A relatively small number (398) will need to be renamed. We learned that we were supposed to take wing photographs. This will be done moving forward, and we will revisit previously photographed specimens as necessary.
- UCMC have reviewed shared imaging protocols and practices from partner institutions and are adapting to existing protocols.
- Most collections have uploaded photos of digitization setups and example images to a share Big Bee Google Drive folder

Share Identified Gaps in Digitization Areas and Technology

- Previously, FSCA efforts to make data available through the Big Bee Library were limited because an IPT for mbd-db.osu.edu was not functioning. They have bypassed this issue for specimen records by exporting a DarwinCore file of records which Andrew Johnston is able to import into the Bee Library and they

are now in the process of transferring our dorsal habitus images to Andrew so that they can also be uploaded into the Bee Library.
- UNHC is now in the process of transferring images and the volume rendered micrographs from CLSM to the SCAN repository.

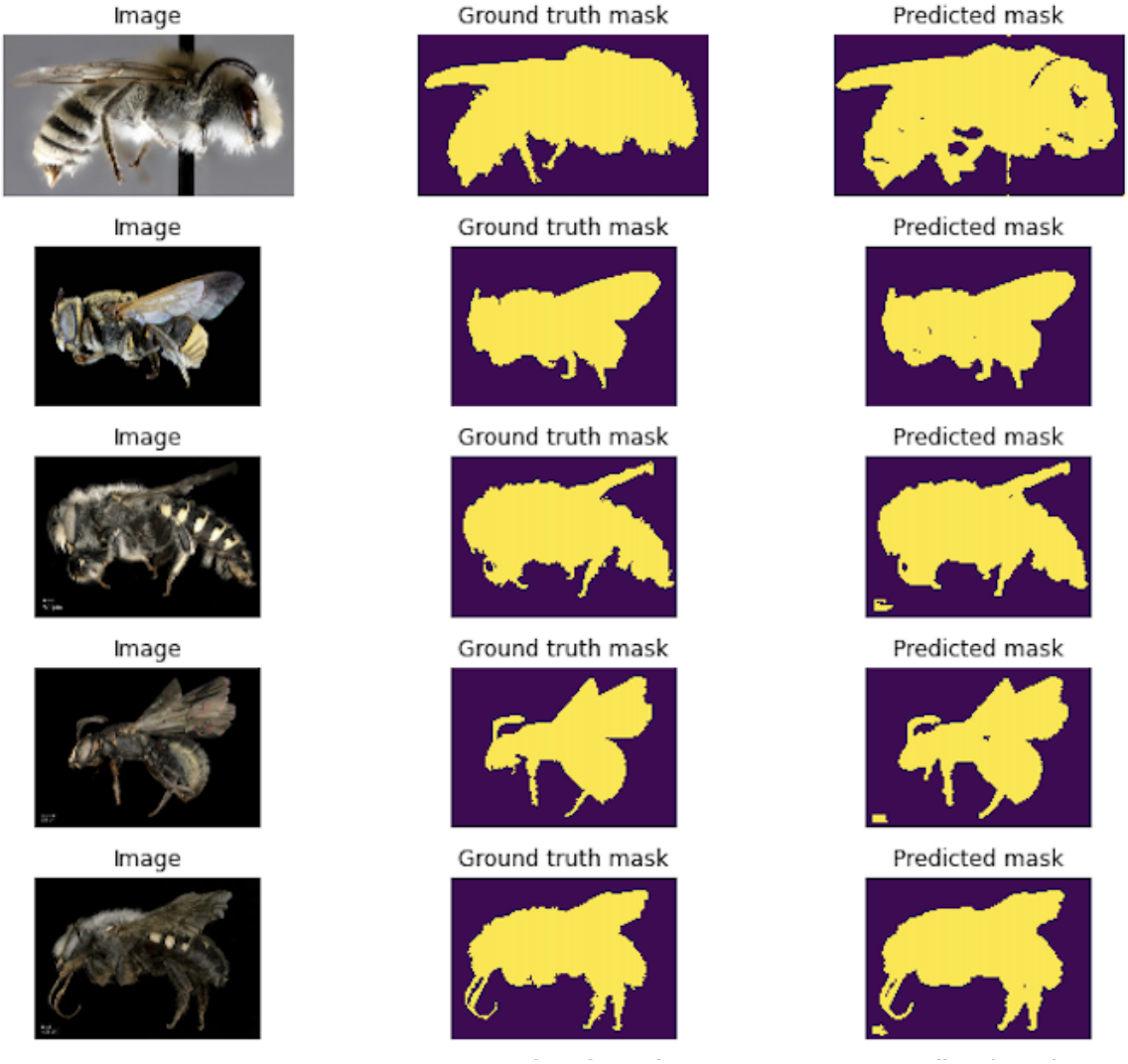
Share Opportunities to Enhance Training Efforts

- We continue to use weekly meetings and slack to keep in touch and help information disseminate between participants. Big Bee has spent a significant amount of work on the first quarters image training as multifocal stack imaging using Macropod was new for many of the participants. The Macropod system is an expert system that takes some understanding of lens, imaging and photography to execute well. 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).
- EMEC launched a training exercise to teach digitization assistants about scientific names and the spatial organization of a natural history museum followed by a scavenger hunt to find particular species in a collection of over 40,000 species and 5.5 million specimens.
- MCZ shared progress with the Big Bee group on the "BugFlow" workflow sharing platform on GitHub. Established standards across the Big Bee collaborative for documenting workflow metadata for all workflows created as part of the grant.

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

- Big bee mentioned in 4 talks by Julie Allen (UNR): University of Maryland, Biol dept, Biochemistry Dept. University of Nevada, Reno, Boise State University, LA County Museum
- UCSB Seltmann, in consultation with UNR & UF (Rob Guralnick), has been advising a UCSB Undergraduate PSTAT capstone course. During the course, students developed a “Universal Barcode reader” in python, released via the Big Bee Github (https://github.com/Big Bee-Network/Universal-Barcode-Rename). The students are also testing methods for quantifying bee hairs as a trait. To start, they tested a model using Big Bee images to extract the feature of bee within an image. The results shown here are preliminary, with a training dataset

that consists of only 60 images (so very few).



- Big Bee images are now part of a research project looking at bee visual acuity with faculty Todd Oakley and Eleanor Caves (UCSB). This collaboration is aimed at testing the use of images to predict the differences in vision between bee species or within a single species.
- UCSB Seltmann mentored Zoe Wood who received a Big Bee related NSF GRFP. Zoe will be attending UC Davis in the fall to work with Dr. Emily Meineke.
- UCSB undergraduate student, JT Miller, will be going to Dr. Pam Soltis lab this summer for a research internship. JT's research involves the spatial distribution of bees in California.
- Other research partnerships are developing between the Center on Biodiversity and Computing (www.biocomp.org.br), Universidade de São Paulo (José Augusto Salim); the United States Geological Survey (Graziella Vittoria DiRenzo,

PhD), Jorrit Poelen (Global Biotic Interactions) and several UCSB graduate and undergraduate students.
- Pete Oboyski advised individuals from several other institutions on label imaging standards and workflows via the Entomology Collections Network listserv
- The Florida State Collection of Arthropods hosted two visitors who specialize on bees. Dr. Robert Pemberton and Dr. David Roubik. Dr. Pemberton was interested in *Euglossa* bees in Florida, so they prioritized data capture from *Euglossa viridissima* and *E. dilemma* to make these available. They have also been in communication with Dr. Elif Kardas, curator of an insect collection in Puerto Rico, who intends to visit FSCA later this year to capture label data and images of Puerto Rican bees, which will be added to the bee library.
- UNHC personnel traveled to NCSU and gathered original male genitalia canada balsam preparations from the Mitchel collection for brightfield and CLSM data collections.
- UMMZ reviewed the SEMC's Big Bee digitization setup for ideas and inspiration.

Share Opportunities and Strategies for Sustainability

UCSB Seltmann and Jorrit Poelen are working on methods for publishing image datasets. A dataset publication method is important as a means of clustering groups of images together for repeatability in research. Examples of uses include 1) all of the images needed to create a photogrammetric model, or 2) images used to train a model for computer vision. The first example of this publication is an image corpus of all of the images coming from the UCSB Invertebrate Zoology Collection.

Cheadle Center for Biodiversity and Ecological Restoration, University of California Santa Barbara. (2021). UC Santa Barbara Invertebrate Zoology Collection (UCSB-IZC) Data Archive and Biodiversity Dataset Graph (0.2) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5660088 hash://sha256/80c0f5fc598be1446d23c95141e87880c9e53773cb2e0b5b54cb57a8ea00b20c

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

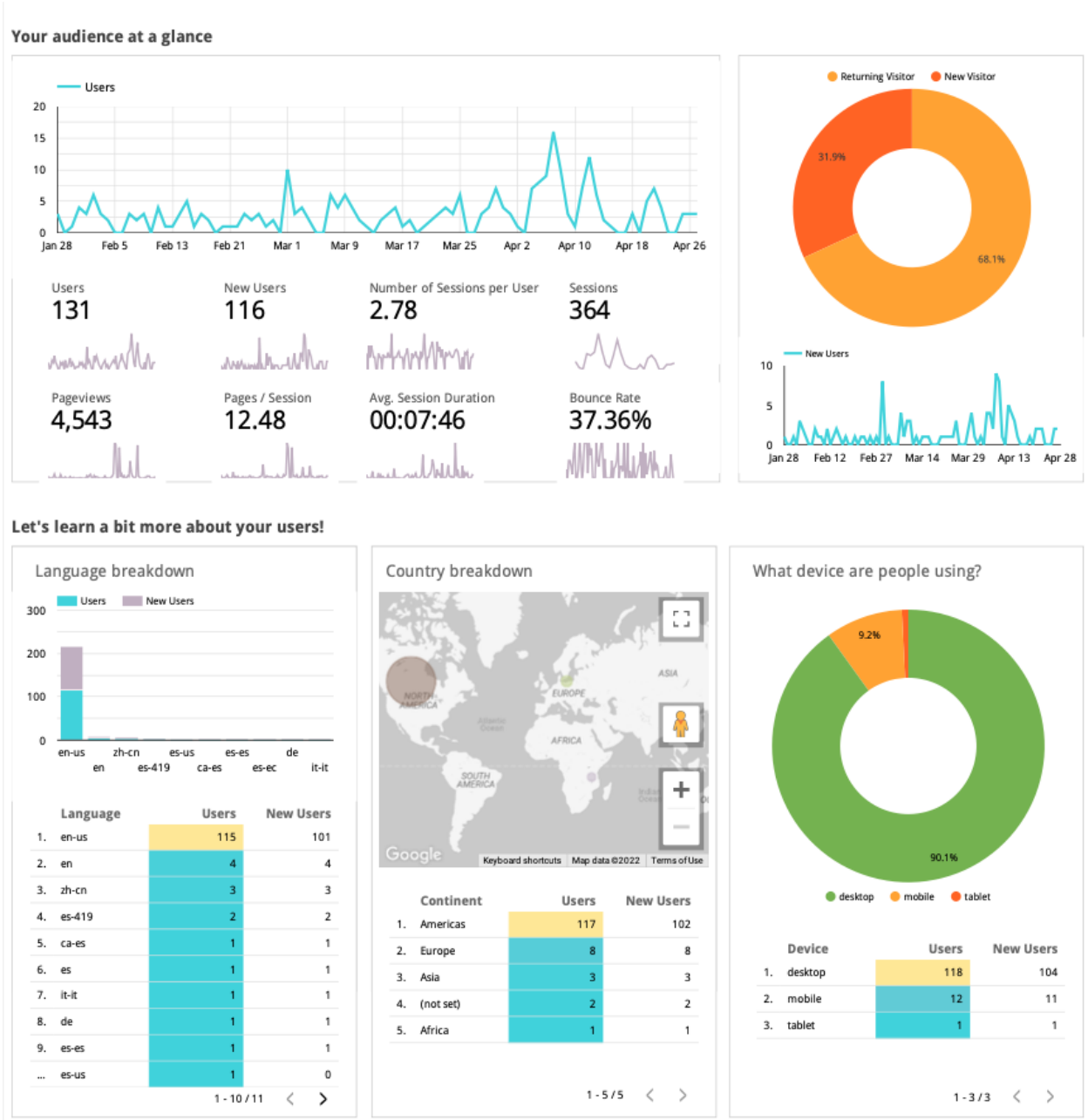
- Four undergraduate researchers participated in research credits at UCSB for independent work on the Big Bee project. Two persons are transfer students from Junior Colleges.
- UCSB Seltmann is teaching the "Collections Curation Skills Course" this Spring quarter (through June 2022) where 15 undergraduate students learn about collecting, curating, and digitizing bees. They are digitizing records from images of LACM within the Bee Library and participated in two collecting trips with Seltmann to learn about bee biodiversity.
- UCSB was certified as a Xerces Society Bee Campus. As part of this project, UCSB undergraduate students installed 3 pollinator gardens and led 2 bee-focused garden tours. https://www.ccber.ucsb.edu/bee-campus

- Grinter and Bergersen participated in CAS Nightlife on April 21st, which was Bee themed “Nightlife: Buzzzed”. Shared specimens and images from the collections, discussed the Big Bee digitization project, and hopefully recruited several new volunteers. https://www.calacademy.org/nightlife/nightlife-buzzzed
- MCZ trained 3 undergraduate student interns on digitization and entomology collections procedures.
- The MCZ shared photos generated by the project in social media posts on the Harvard Museum of Comparative Zoology social media accounts.
- SDNHM Big Bee personnel held a training session with SDNHM Paleontology personnel on using Macropod system for imaging small fossil specimens
- Charles Staff (UNHC) presented at the UNH undergraduate research symposium his work based on CLSM images he performed on *Andrena* species.

Share Information About Your Website and/or Portal Usage

- Google Analytics for the Bee Library is shown below. We had 131 users this quarter, with 116 being new users. The majority of the users are in the United States and they are using desktop computers. Remarkably, with only 131 users the page views are 4,543, demonstrating a large number of pages viewed by

each viewer.



- The data publication [4] from the Big Bee project was downloaded 55 times. This publication is delivered quarterly and includes all of the data and summary statistics from the Bee Library & Global Biotic Interactions.
- ASU Big Bee Library portal developments
  - Added image tag vocabulary to database (Andrew)
  - Wrote MySQL stored procedure to automate adding tags to images in batch (Andrew)
  - Image maintenance and cleaning tasks

        - Image thumbnail mapping and caching
        - Resolve Harvard duplicate image import and non-secure URL issues
    - Adjusted data import profiles that are used to update occurrence data snapshot
    - Updated various data snapshots?
    - Various SSH team members attended weekly planning meetings
- ASU Big Bee Library data ingestion
    - Aggregated and imported over 2 million specimen records of bees from collaborating institutions and other external data providers
    - Established data links to 14 collaborating institutional databases, automated data import and validation pipelines established
    - Newly uploaded ~3000 specimen images to the portal that were not previously online
    - Added over 10,000 metadata tags to images

Share Other Activities and/or Progress

- Macroscopic Solutions, LLC continues to update the Macropod Pro system to better perform photogrammetry. They delivered 2D imaging and 3D modeling workstations to all Big Bee project participants. With consultation and testing by Big Bee, they designed and created a new universal stage/gimbal/light dome for perfect lighting and easily re-orient small specimens. Supply chain issues were significant at the beginning of the project and this caused a delay in the start, but all Big Bee institutions now have the equipment they need for 2 & 3D imaging. Big Bee will continue to work with Macroscopic Solutions to refine the bee imaging process.
- Contributions of Jorrit Poelen to the Big Bee project included but were not limited to: the first publication of a verifiable Image Corpus of UC Santa Barbara Invertebrate Zoology Collection [1] using Preston, a biodiversity data tracker [2]. This image corpus contains 14,349 images related to 32533 occurrence/specimen records that can be independently stored, retrieved, and cited, regardless of where the images and their metadata happen to be stored. The image corpus was deposited at Zenodo and the Internet Archive and provides an example of how valuable image collections can be duplicated and distributed while guaranteeing the authenticity of both their content and provenance (or origin).
- UCSB Seltmann and Poelen collaborated to create a citable, and reusable, version of the existing and often used DiscoverLife bee species guide and world checklist [3]. Finally, a data monitoring page was created at https://globalbioticinteractions.org/bigbee to help review, and keep track of, the availability of Big Bee-associated natural history collections [4]. Both [1], [3], and [4], led to the improvement of existing open tools like Preston, Nomer, and Elton (see https://jhpoelen.nl for more info) to the benefit of other publicly funded

projects such as NIH R21 Grant 1R21AI164268-01, NSF OAC 1839201, NSF DBI:1901932, and NSF DBI:1901926 .

- LACM joined the University of California, Santa Barbara's Curation of Natural History Collections class, taught by Katja Seltmann, virtually twice. Once to tour the LACM collection and the other as the students transcribed LACM bee specimen data from specimen with label images captured as part of Big Bee.
- MCZ hired and trained two additional undergraduate student technicians that will image labels and specimens for this project.
- MCZ developed a workflow for high-resolution specimen imaging using the Macropod imaging system, integrated with MCZbase standards and protocols. All technicians are now trained and competent at using the Macropod system.
- Added Taro Eldredge, the new Collection Manager of the Insect Division, to the Big Bee TCN group.

References

[1] Cheadle Center for Biodiversity and Ecological Restoration, University of California Santa Barbara. (2021). UC Santa Barbara Invertebrate Zoology Collection (UCSB-IZC) Data Archive and Biodiversity Dataset Graph (0.2) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5660088 hash://sha256/80c0f5fc598be1446d23c95141e87880c9e53773cb2e0b5b54cb57a8ea00b20c

[2] MJ Elliott, JH Poelen, JAB Fortes (2020). Toward Reliable Biodiversity Dataset References. Ecological Informatics. https://doi.org/10.1016/j.ecoinf.2020.101132

[3] Seltmann, Katja, & Poelen, Jorrit. (2022). Tab and comma-delimited versions of Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila) (v55.2) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.6147345

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CALIFORNIA PHENOLOGY TCN – QUARTERLY REPORT – MAY 2022

Assembled by Katie Pearson, 20 April 2022

PROGRESS IN DIGITIZATION EFFORTS

Figure 1 shows our progress in imaging, transcribing, georeferencing, and phenologically scoring the target specimens for the original 22 CAP institutions, explained more in detail in the following sections.

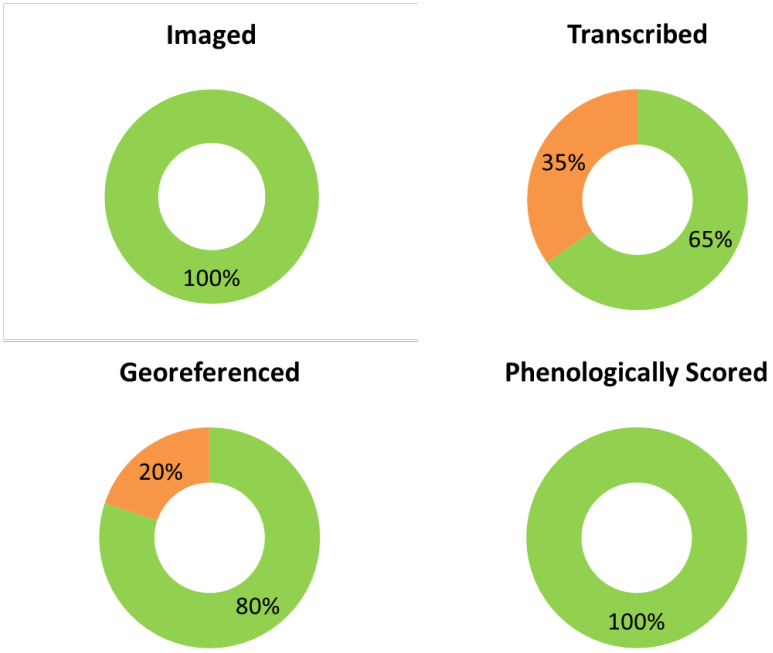


Figure 1. Progress in each of our four major digitization goals. Totals represent the original goals of the CAP grant: 902,400 specimens imaged and phenologically scored, and 300,000 transcribed and georeferenced. Additional specimens to be digitized by the PEN grant are tabulated in the PEN section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

TRANSCRIPTION

Over 196,026 specimen records have been transcribed across the CAP Network since the beginning of the project. This is approximately 65% of our goal.

Transcription has largely been accomplished by institutional volunteers and technicians in CCH2, the online herbarium digitization course, and online volunteers in Notes from Nature.

GEOREFERENCING

We have georeferenced over 240,236 specimen records, which is 80% of our goal. Georeferencing is conducted by trained staff and students at HSC, OBI, and SD, by naturalist volunteers are part of the "100 Club," and by undergraduate students in the herbarium digitization course led by Cal Poly. The CAP 100 Club currently has 26 active members.

IMAGING

Thirteen of our 22 herbaria have accomplished their imaging goals individually (Figure 2); however, because several herbaria have continued to image beyond their goals, **we have surpassed our goal of 904,200 specimens imaged**. The original 22 CAP TCN institutions have imaged 909,055 specimens to date. Figure 2 shows the current state of CAP imaging as of April 2022. Collections that have not yet met their imaging goals are continuing to image specimens, as well as several collections that have already surpassed their goals.

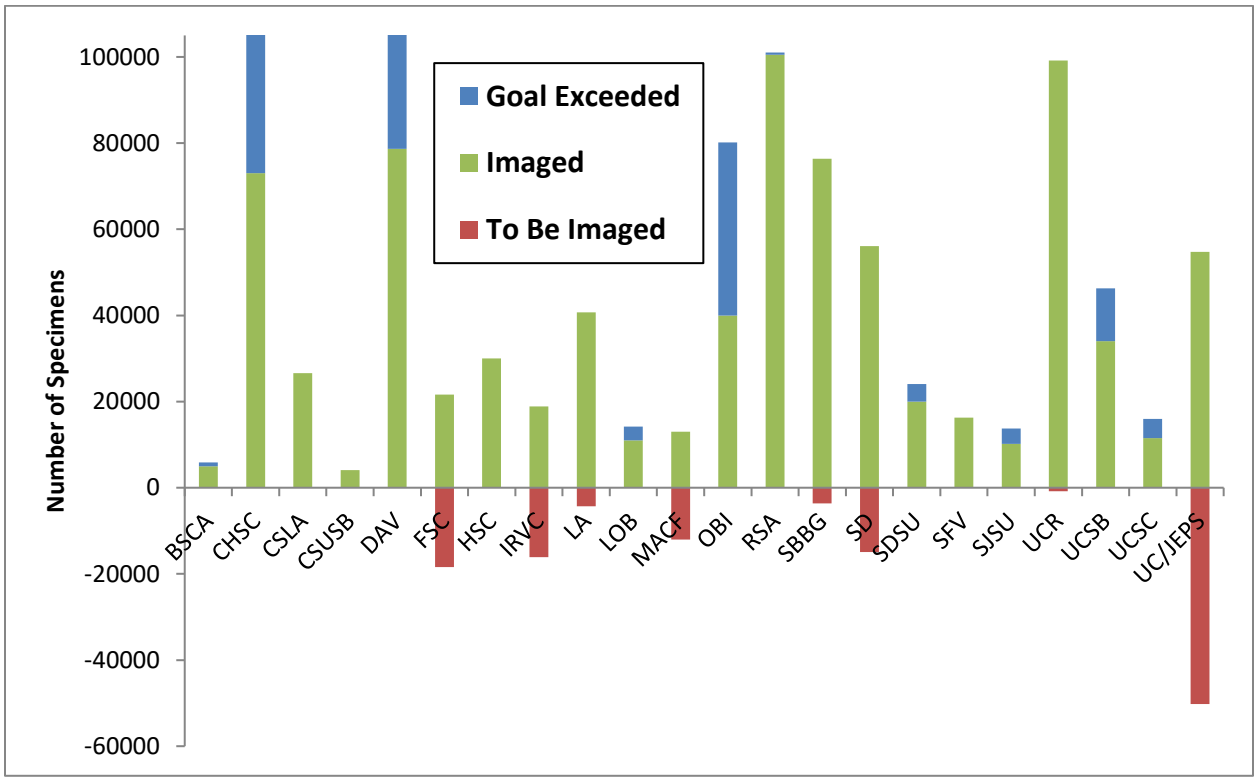


Figure 2. Herbarium specimen imaging progress. Blue portions represent the number of specimens that have been imaged, while green portions represent the number of specimens that have been imaged beyond the expected target specimens. Red bars below the zero line indicate the number of target specimens 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

The PM visited the Pacific Union Herbarium (PUA) February 8-10 to transfer the imaging equipment from CSU Stanislaus, set up the equipment, establish a digitization workflow, and train students and PI Wyrick on digitization protocols and use of CCH2. Digitization of this collection is somewhat slowed by issues with previous identifier values, which they are resolving during the digitization process. OSC and SFSU are continuing to image specimens as expected and have completed 74% and 36% of their imaging goals, respectively. CDA has been delayed by slow processing of their purchase orders and has not yet received their equipment. Figure 3 shows the current imaging progress at PEN institutions.

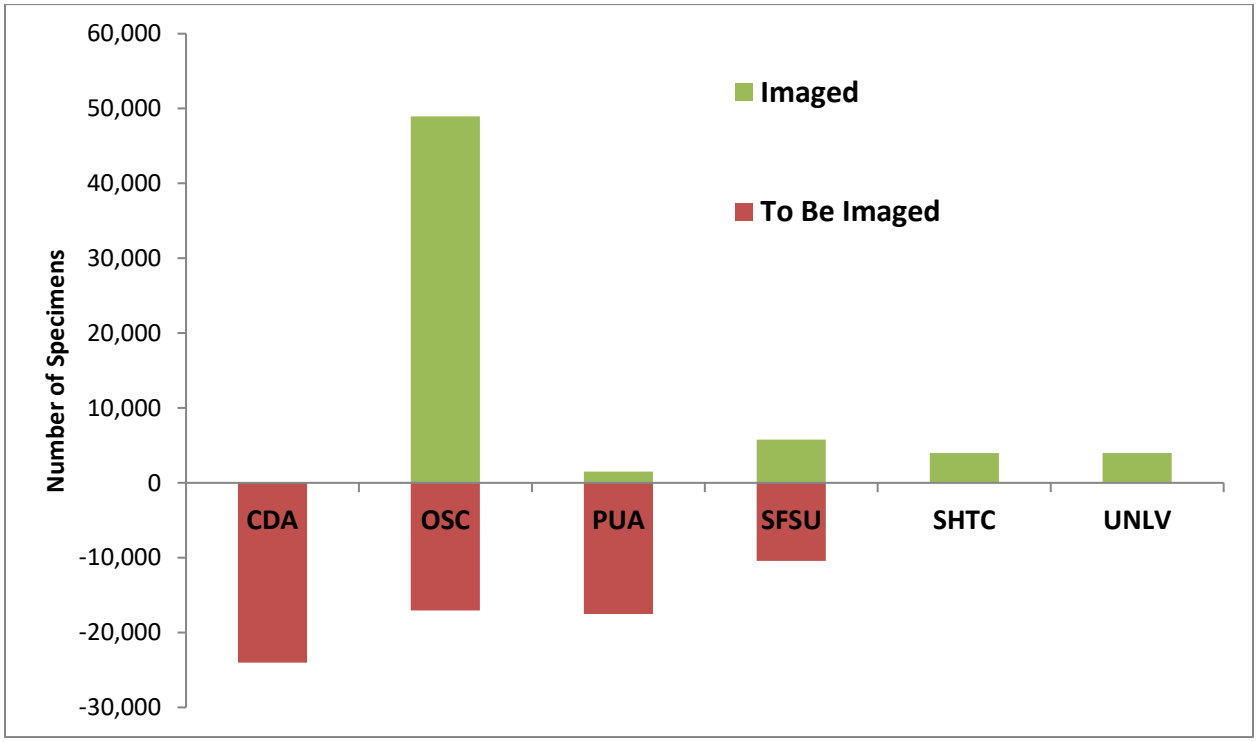


Figure 3. Herbarium specimen imaging progress for the seven PEN institutions. Green portions represent the number of specimens that have been imaged, while red bars below the zero line indicate the number of target specimens that have not yet been imaged. For SD, the total number of specimens to be imaged,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

The website created by the project (https://www.capturingcaliforniasflowers.org/) is continuing to be a resource for other collections and TCNs as they begin their own digitization processes. In particular, the CAP TCN has documented their discussions around the redaction of threatened or rare taxon data (https://www.capturingcaliforniasflowers.org/sensitive-taxa.html), which has been a topic of concern throughout the herbarium community.

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.

Ortery, the company that manufactured the lightboxes that we used for this grant, no longer produces the lightbox model that we purchased. Instead, it now has a much more expensive version that is likely outside most herbaria's budgets. Furthermore, even these lightboxes do not have camera mounting systems that sufficiently support the camera. These gaps do not directly affect us, but they may affect institutions that begin the digitization process in the future. We are currently unaware of any cost-effective lightbox suppliers.

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 meetings have served as a forum for questions and problems throughout the community, as well as a set time and place to make announcements and update the community on digitization progress. Excitingly, these meetings are starting to be used as places to begin collaborations on new grants or symposia at upcoming meetings. For example, CCH individuals have submitted an abstract for an herbarium-focused symposium at the October 2022 California Native Plant Society emeting.

We concluded the winter 2022 quarter of our online herbarium digitization course and launched the spring 2022 course (see E&O section). We had 12 students from 6 institutions in the winter quarter, and we now have 13 students from 7 institutions in the spring quarter (4 of whom are returning from the winter term).

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. The PM has collaborated with individuals from the BLM Bishop Office Herbarium (BLMBI), Death Valley National Park Herbarium (DEVA), Inyo National Forest

Herbarium (INF), Klamath National Forest Happy Camp District herbarium, Jasper Ridge Biological Preserve Herbarium (JROH), and Sierra Pacific Industries Herbarium (SPIF) to advise on digitization workflows and provide digitization training. With this aid, BLMBI and INF have completely imaged their herbarium holdings and will soon be uploading images of these 5000+ specimens into CCH2 for public viewing. DEVA plans to image their herbarium. INF will hire a digitization intern to transcribe specimen data in CCH2 from these images. DEVA is scheduled to image their specimens in May 2022 using borrowed imaging equipment, and the Klamath National Forest Happy Camp District herbarium is hoping to do the same in September 2022.

The Herbarium Digitization Online Course students participated in the Botanical Research Institute of Texas's WeDigBio event on April 8. The students and the instructor (PM) attended the virtual tour of BRIT's xylarium (collection of wood specimens).

Several vascular plant herbaria have begun to think about digitizing their bryophyte and lichen specimens. Because the CCH PM is also the portal manager for the Bryophyte and Lichen Symbiota portals, this has been easy to facilitate.

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).

Two blog posts were written and published to the CAP website: https://www.capturingcaliforniasflowers.org/blog. Blog posts are publicized via Twitter.

Notes from Nature volunteers completed one expedition this quarter, resulting in transcribed labels for 710 specimens from the UC Los Angeles Herbarium. Three Notes from Nature expeditions are ongoing, consisting of 5,718 specimens from Fresno State, Oregon State, and UC Irvine.

We concluded the winter 2022 quarter of our online herbarium digitization course, which included 12 students from 6 institutions. In this class, students learned how to transcribe herbarium specimen labels in Notes from Nature and our Symbiota portal, CCH2. Students also learned how to transcribe and convert coordinates from a variety of coordinate systems into decimal latitude and longitude, which they did for specimens that had recently been transcribed through Notes from Nature. We also taught the students how to georeference specimens in the CCH2 portal. As part of the course, students read and disseminate primary scientific literature about herbarium specimen-based research.

We launched the spring 2022 quarter of the online herbarium digitization course, which includes 13 students from 7 institutions. In this term of the course, we are focusing on georeferencing specimens using the Collaborative Georeferencing (CoGe) tool, which links to CCH2. We are focusing on Ventura county specimens to begin and will likely include more specimens as these are completed.

WEBSITE AND PORTAL USAGE

Our project website (capturingcaliforniasflowers.org) has received 1,324 visits (approximately equal to last quarter) and 1,853 pageviews (also equal to last quarter) from February 2, 2022 to April 11, 2022. The data portal (cch2.org) has supported 30,158 sessions (76% increase from last quarter), 145,872 pageviews (36% decrease from last quarter), and 15,105 users (86% increase from last quarter) over the same time period. Unfortunately, nearly 3,000 of these users and sessions appear to be automated bots originating from China.

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)

Share Progress in Digitization Efforts

ALMNH: Kevin Kocot: This quarter we have digitized 267 lots of specimens. We have been focusing on digitizing specimens in Arctos. I have two undergraduate assistants who have gotten very efficient at working in Arctos and are both bright and enthusiastic. We have struggled with specimens that are labeled in a variety of different ways and often with less data than would be ideal but have been doing our best to work with similar specimens to maximize efficiency.

AMNH: Fani Rodriguez, Chris Johnson, Lily Berniker: To date, we have added 11,659 new records and updated images, locality information or card catalog records for an additional 8,898 records that were already in the database but incomplete. A total of 18,634 card catalog records have been attached to our database catalog records. A total of 3,229 images of specimens and/or labels have been taken; 985 have been attached to new catalog records; 1,056 have been attached to existing, incomplete catalog records. 17,770 databased specimens are associated with a locality record and of these 2,812 have an initial set of geographical coordinates.

AUMNH: Nusrat Noor: 358 specimens were uploaded into Specify and an additional 463 specimens were entered into excel but are not yet ready to be uploaded.

BPBM: Holly Bolick: This quarter we did not do pre-curation, but rather direct capture from labels, and then when additional information was available in accession forms, that data was added later (second pass); initial label capture was done by volunteers and technicians and quality control was performed by more seasoned staff. We added an additional 497 new specimen records in the database (total of 1,867 lots to date), and have updated and cleaned up an additional 484 specimen records. We mobilized approximately 1,200 new specimen images that are linked to catalog number and ready for upload. We acquired 33 new specimen images, including type specimens. Our to date total for specimen images is now approximately 3,147.

CAS: Christina Piotrowski: This quarter CAS was finally able to bring on board our single full time (vs. 0.75 FTE as budgeted) DigIn Digitization Technician to hand enter data records directly from specimen jars. Since her start date in March, Hanna Baek has been trained to enter semi-skeletal specimen records as efficiently and accurately as possible. Hanna and permanent staff and volunteers captured 3,391 (chiefly Annelida) records in spreadsheets or directly in the database this quarter. 3,350 of these records are in Specify ready to be ported to iDigBio once georeferenced. We estimate Hanna's data entry rate as approximately twice as fast as traditional hand cataloging, chiefly due to our efforts to maximize efficiency.

Zooniverse, Notes from Nature Invertebrate Time Machine Project (NfN, ITM): CAS's team of 2,971 volunteer transcribers completed our 6th and final set of card catalog labels this quarter, which marks the end of this phase of the project. NfN volunteers transcribing a total of 23,610 classifications this quarter over two separate workflows (collecting event and specimen data each transcribed 3X), resulting in transcribed records for 3,935 total records in Q2. CAS staff trained and directly engaged many of our NfN volunteers via more than 353 online transcriber questions and comments in Q2.

Staff continued preliminary QA/QC/reformatting of previously transcribed data to prepare it for ingestion, checking an equivalent of approximately 500 records (estimated metric since data is cleaned by field rather than by specimen record). We are currently exploring new ways to utilize the Zooniverse platform to capture label data, while minimizing post-processing, since QA/QC of these records requires a significant amount of staff effort before it is appropriate for upload.

On site CAS volunteers scanned more than 1,329 specimen labels this quarter, with scans destined either for uploaded crowd-sourced transcription or (more likely) to be transcribed by in-house or remote Academy volunteers. Label scans will also be directly attached to specimen records.

FMNH: Rüdiger Bieler: We imaged the majority of our non-molluscan marine primary types (most of them needing special treatment with imaging under fluid) and prepared the remaining (all wet-preserved or slide-mounted) primary types for photography in the coming quarter. The new images are being attached to our EMu database

FWRI: Paul Larson: Progress has slowed this quarter a bit as staff were moved off the TCN grant and temporarily onto another funding source that needed to be used before the end of the FY. 347 new records digitized this quarter.

HBOM: Dennis Hanisak: We have continued to reorganize HBOM from its remediation and renovation and to train HBOM personnel using non-NSF targeted samples and other funding so that we can maximize our use of our NSF funds for this project.

MCZ: Adam Baldinger: This quarter 1,100 uncataloged lots, equaling 5,237 specimens, mostly echinoderms, were databased from spreadsheet data and specimens in hand. To date, 10,550 records in MCZbase have been cleaned/vetted for accuracy. Of these, 10,379 records contain georeferences.

NCSM-NMI: Megan McCuller: Digitization has been primarily through the imaging of jar labels, but we have also made a good amount of progress regarding our Specify database that allows for much easier data import. We discovered that there's one hidden checkbox that is only present during the setup of the Specify database that determines whether or not collecting events will be duplicated during import – this has been a huge barrier for us in importing spreadsheet data, but it was not at all obvious how to resolve it. Now that it has been resolved, we can finally import large datasets from acquired orphaned collections into Specify. Those data will be represented next quarter.

NHMLA: Dean Pentcheff: During this quarter, we entered into a more full-scale data entry process. By the end of this quarter, we have a total of 24 part-time staff (mostly work-study students from USC, plus Guest Relations staff from NHMLA) hired specifically for the digitization project. We continue to use most of the full-time staff's hours (one curator, one research project manager, and two collections staff) for this project. We now have eight data entry stations constructed and functioning, and occasionally add a ninth (based on a repurposed iMac). Our training and procedural documentation has improved immensely in the face of the significant staff influx. We are continuing to pursue the hiring process to

replace a departed collections staff member, a digitization specialist, and the DigIn Project Manager.

RSMAS: Nikki Traylor-Knowles: We have been plugging along with getting all of the scans into spread sheets. We have four interns that are working on this, and it is moving along slowly but surely.

SBMNH: Daniel Geiger: To date ~26,818 lots have been cataloged and these are regularly contributed to iDigBio.

SIO-BIC: Charlotte Seid: Digitized 1,712 lots, mostly from an extensive and fairly uniform set of specimens (City of San Diego Benthic Invertebrate Monitoring Program) which we are using as a test case and are prioritizing for 2022.

SIO-PIC: Linsey Sala: 2,207 specimen lots were digitized via direct label data capture and 3 new student assistants brought onboard.

UCM: Bridget Chalifour: A total of 30 specimen lots were imaged this quarter. Bridget Chalifour is continuing work on Specify, and as georeferencing efforts amp up, we will be uploading more of our marine lots to Specify. GAs for the section Erika Nielsen and Cameron Pittman have been instrumental in imaging all of our ledger material. This has been a huge feat which is literally years in the making, which will greatly speed up georeferencing work.

UF: John Slapcinsky: This quarter we uploaded 670 new fully georeferenced records into our Specify database and these new records are now uploaded to iDigBio. An additional 3,947 records are edited, georeferenced and ready for upload. Approximately 22,000 specimens were rehoused and their data is being prepared for upload. 1,204 photos have been selected and quality controlled and are ready for upload into our database and iDigBio.

VIMS: Jennifer Dreyer: 75 records have been entered into Excel this quarter and 400 records have been uploaded into Specify via the workbench. 124 specimen labels were photographed for an archive to attach to specimen records in Specify. 900 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. 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 trying to incorporate the taxonomic nomenclature changes that Nicolas Bailly processed with the WoRMS taxa matching tool – this is progressing.

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

Institution	Grant proposal commitments: DigIn lots to digitize for upload	Grant proposal commitments: DigIn images to create or mobilize for upload	Commitments completed: Specimen records uploaded to iDigBio	Commitments completed: Images uploaded to iDigBio	Records ready to upload: Specimen records fully prepared for upload to iDigBio	Georeferencing: Records prepared for georeferencing	Georeferencing: Records uploaded to CoGeo	Georeferencing: Records QCed and repatriated after georeferencing	Curation: Specimens procurated for digitization	Specimen photography: Specimen images taken	Specimen photography: Specimen images QCed and databased	Label or catalog data capture: Records imaged from ledgers, cards, or labels	Label or catalog data capture: Records OCRed or transcribed	Label or catalog data capture: Records QCed	Label or catalog data capture: Records databased	Direct capture from specimens: Records directly captured from specimen labels	Direct capture from specimens: Specimen records QCed and databased	Direct capture from specimens: (Add columns if there's something else to report)	Capture seconds-per-specimen: Seconds	Capture seconds-per-specimen: Phrase describing capture	Transcription seconds-per-specimen: Seconds	Transcription seconds-per-specimen: Phrase describing transcription	Processing seconds-per-specimen: Seconds	Processing seconds-per-specimen: Phrase describing processing	Logs captured: Field Notes and Station Files digitized	Comments: Qualifications or explications. Or just say, "Hi!".
ALMNH	5,250	-	0	0	0	0	0	0	1000	0	0	0	0	0	3823	63	0	0	0	0	0	0	0	0	0	
ANSP	22,060	1,600	0	0	0	0	0	0	0	0	0	0	0	0	0	7,207	7,207									
AUMNH	10,000	5,000	3,262	0	1,095	0	0	0	0	0	0	0	0	0	0	1,558	1,095	0	0	0	208	fixing data into com	0	0	0	The data is already transcribed from label but must be reformatted individually due to the sheer variety of incorrect formatting and because the specimens have come to us all mixed up in relation to the original transcription. Does not include additional QC and database upload
BPBM	6,238	3,900	0		1,867	0	0	0	0	77	3,070	0	0	0	0											
AMNH	56,708	7,000	0	0	0	3,661	0	0	N/A	3,229	2,139	19,187	19,187	19,187	19,187	224	224		621	imaging labels & spmns when appropriate	252*	transcribing specimen label data into database				*Reflects new and modified catalog records that are part of this project; note transcription sec-per-spmn is for paid interns. However, volunteer effort is also about 252 secs per
CAS	59,616	3,500	0	0	0	0	0	0	2,803	1,471	0	37,421	29,881	6,665	1,378	3,391	3,350	0	-200	imaging labels (volu	~375	direct label capture to worksheet				estimated that direct data entry (semi-skeletal records) approx 2X as fast as traditional data capture, however requires QC and uploading to dbase
FMNH	1,140	50	0	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0								
FWRI	33,582	150	0	0	7,699	0	0	0	800	0	0	0	0	0	0	0	0	0								
HBOM	10,000	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	Hi!
MCZ	31,564	4,631	9,815	39	735	10,379	0	0	0	1	0	0	0	0	10,550	0	0	0						420	Data entry of new	0	Hi! Mostly asteroid and echinoid data from spreadsheets
NCSM-NMI	31,283	675	0	0	12,124	0	0	0	0	0	0	1,506	0	0	0	0	0	0	-400	imaging labels	NA	NA	NA	NA	NA	
NHMLA	320,000	2,572	0	0	0	0	0	0	1,250	0	0	17,911	0	0	0	41,788	0		85.1	mixture of label pho	NA	NA	NA	NA	NA	
RSMAS	55,000	-	0	0	0	0	0	0	0	0	0	22,761														
SBNHM	100,000	4,500	24,493	4,500																						as of 4/19/2022
SIO-BIC	29,300	30,000	0	0	4,798	0	0	0	0	564	11	0	0	0	0	4,798	4,798	0	122	data entry from labe	NA	NA		16	QA/QC, cross-refere	NA	Time estimates are an underestimate because they represent work only on a fairly repetitive and uniform set of specimens, used as a test case and low-hanging fruit. Late in this quarter I wrote a script to automate the most laborious parts of QA/QC so processing time may decrease next quarter.
SIO-PIC	34,371	-	0	NA	0	0	0	0		NA	NA	NA	NA	NA	NA	2,207	0	335								
UCM	3,285	1,000	0	0	0	53	0	0	0	421	0	3,554	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	Records imaged from ledgers are probably much higher, will work to calculate and add newer numbers found only in ledger and not in database
UF	20,000	400,000	6,531	25,211	26,000	10,638	0	0	22,219	400,000	8,751	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	0	Culled and edited 64,643 images preparing them for import into our database
VIMS	6,000	125	0	0	0	900	0	0	75	124	0	0	0	900	400	75	0	0	180	imaging labels	36	uploading specimen	0	0	0	Images are of labels only and generally not specimens; the transcription time is the time it takes me to upload a batch of 100 records, map the fields and troubleshoot any errors in the upload. Just starting out this is taking me longer but hope to get this streamlined the more records I upload. Still working on figuring out error of uncertainty for georeferencing.

Access the quantitative table here.

Share Best Practices, Standards, and Lessons Learned

ALMNH: Kevin Kocot: Arctos's data quality checks remain very helpful in ensuring the completeness and accuracy of our data. This has helped catch a number of errors missed by the person entering the data and helped us identify errors in the original specimen labels.

BPBM: Holly Bolick: We found it more efficient to skip pre-curation of dry specimens and do direct data capture from labels (and can use volunteers, interns, and new staff); once this is done, it's easier and more efficient to QC and update records later by the collection manager and long time staff.

CAS: Christina Piotrowski: The Specify subgroup of the Workflows WG has continued meeting regularly to discuss specific challenges that our new Specify users are tackling. We plan to engage directly with Specify to address several shared issues. Alongside other working groups, Academy staff participate regularly in this discussion and organizes meeting notes and reporting. CAS staff serves on the DigIn Steering Committee and contributes to Specify, Expedition, Nomenclature, Georeferencing, and Digitization working groups.

MCZ: Adam Baldinger: MCZ staff continue to be involved in Steering, Expedition, Nomenclature and Georeferencing committees/workgroups. Information obtained is then shared with others in MCZ Departments, including those working on other TCN's (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: I was able to figure out why the import issue was occurring, but I was able to solve it by both reaching out to Specify and asking the DigIn Specify working group if anyone has faced the same issue. In doing so I had help to fix it.

NHMLA: Dean Pentcheff: Bringing on digitizing staff who are not already very familiar with collections data requires designing a training and work regime that comes in controllable steps. We have found that new staff must first record every label photographically and be restricted to a very small subset of data patterns for direct data entry. Each digitizer can be permitted to do data entry without label photos (if that is appropriate for the particular label format) only after the individual's performance entering data on each expedition data pattern has been observed to be correct over time. In the absence of a clearly staged approach for permitting specific types of data entry, the data quality can be very poor due to lack of context and knowledge.

SIO-BIC: Charlotte Seid: Conducted 2 FileMaker Pro training/collaboration sessions (2 hrs.) with SIO-PIC and SIO-MVC (Marine Vertebrate Collection).

SIO-PIC: Linsey Sala: Utilizing 2D Datamatrix barcode labels with assigned and translated catalog numbers, so that material can more easily be tracked for future use. Thanks NHMLA for sharing your workflow on this!

UCM: Bridget Chalifour: Bridget Chalifour, Cameron Pittman, and Erika Nielsen have 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.

VIMS: Jennifer Dreyer: I continue to lead the Nomenclature WG and a few additional collections have added their taxon lists to the data files that Nicolas Bailly and Q-Quatics will work on to resolve mistakes with species names. New topics have slowed down, but most collections are making progress in manually updating taxon names in their databases. I continue to attend All Hands meetings and participate in Specify, workflow, and georeferencing WGs

whenever possible. I actively participate with the general group via Slack to provide feedback on publicity content or to get answers on questions. I am still learning a lot from each meeting and all the working groups share their information here. You can also embed graphics if desired.

Share Identified Gaps in Digitization Areas and Technology

ALMNH: Kevin Kocot: We are not using object tracking or barcodes.

AMNH: Fani Rodriguez, Chris Johnson, Lily Berniker: We need an outlined georeferencing process.

BPBM: Holly Bolick: Our locality gazetteer is now functional and more efficient than the previous method of data entry. However, many aspects need streamlining, including entering GPS coordinates. We still do not have images linked to specimens within our database system, but this is currently being addressed.

CAS: Christina Piotrowski: CAS has technology gaps related to georeferencing, but staff have attended the Working Group meetings and trainings to keep abreast of progress.
Persistent roadblocks include the ability to pull newly georeferenced records back into Specify, as well as to share expedition data with our partner institutions (for standardization and repatriation). Our DigIn collaborator, Paul Larson, is attempting to get traction on this issue with Specify as he serves on an advisory group.
We continue somewhat rate-challenged as we ramp up our work this year while still training ourselves on the use of our new Specify database, workbench upload while tweaking the field structure.
We remain in the process of setting up a specimen imaging station, continuing to troubleshoot equipment and lighting integration for type specimen imaging, but we've made some headway this quarter with a firmware roadblock.

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

NCSM-NMI: Megan McCuller: We have faced a significant barrier in the uploading of our data to iDigBio and other online platforms/aggregators because our Database Manager, who is currently the only one with approval and access to push our data, has refused to do so. We have been working to get this resolved.

SBMNH: Daniel Geiger: Some cruise reports would be great to have for georeferencing, e.g., CDFG Cromwell/Jordan/Townsend cruises. Some permanently lost (e.g., Hawaii-FIDO cruises, thrown away by R. Young, pers. comm.)

SIO-BIC: Charlotte Seid: Wrote a FileMaker Pro script to automate locality matching for QA/QC.

SIO-PIC: Linsey Sala: Have new student workers that could benefit from Excel (basic & advanced) & OpenRefine data wrangling techniques that were discussed as part of our potential items for workshop topics to cover. We'd prefer these to be remote or recorded format to facilitate undergraduate student participation.

UCM: Bridget Chalifour: Emily Curcio has trained two fellow graduate students in dissecting scope imaging protocols.

Share Opportunities to Enhance Training Efforts

ALMNH: Kevin Kocot: Having a veteran student worker train a new student worker has been incredibly efficient as they have worked side by side and the veteran worker has been able

to pass on a lot of knowledge and prevent issues before they arise. I will strive to maintain this kind of continuity in the future.

CAS: Christina Piotrowski: Piotrowski is preparing to attend the Society for the Preservation of Natural History Collections in Edinburgh next quarter, since CAS will be hosting this international conference of museum professionals in 2023. Among numerous opportunities to share best practice discussions with other museum professionals at this meeting, she will be participating in a workshop on Nagoya Protocol standards and implementation in June 2022.

NHMLA: Dean Pentcheff: We have made our extensive training and procedural documentation available to the DigIn community.

SIO-PIC: Linsey Sala: Have new student workers that could benefit from Excel (basic & advanced) & OpenRefine data wrangling techniques that were discussed as part of our potential items for workshop topics to cover. We'd prefer these to be offered as remote or in recorded formats since our undergraduates would not be traveling with their class schedules.

UCM: Bridget Chalifour: Emily Curcio has trained two fellow graduate students in dissecting scope imaging protocols.

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

AMNH: Fani Rodriguez, Chris Johnson, Lily Berniker: Begin our collaboration with Iowa University to help curate the fiddler crab collection.

AUMNH: Nusrat Noor: Workshop to Discuss the Value and Scope of an Antarctic Biorepository.

CAS: Christina Piotrowski: As a member of the San Diego Natural History Museum Marine Invertebrate Collection Advisory Committee Piotrowski participated in a digitization planning meeting this quarter to provide advice on curation and digitization of SDNHM's long-neglected marine invertebrate collections. It is hoped that data for this collection may eventually be incorporated to iDigBio as additional museum specimen records. The DigIn effort has brought this group's attention, alongside the possibility of forming a PEN (we provided this group with our DigIn lead PI's contact info for further consultation). Other collaborations include: ESB TCN; Zooniverse/Notes from Nature; WoRMS; USFWS (identifications and vouchering confiscated wildlife specimens).

FWRI: Paul Larson: Collaboration is heavy between DigIn and ESB. Also have been communicating with other institutions in an effort to share expedition data.

MCZ: Adam Baldinger: Information continues to be shared among permanent MCZ curatorial staff working on other TCN's – ESB and PILSBR – and on an NSF-CSBR cryogenic collections grant.

NHMLA: Dean Pentcheff: We are active participants in all DigIn working groups and with ESB colleagues.

RSMAS: Nikki Traylor-Knowles: University of Delaware & ESB.

SBMNH: Daniel Geiger: Received first loan requests for material cataloged under grant: echinoid spines for group in Belgium.

SIO-BIC: Charlotte Seid: Participated in the "Workshop to Discuss the Value and Scope of an Antarctic Biorepository" (Feb 2-4, virtual) to discuss opportunities for accessioning, curation, and digitization of PI-held Antarctic specimens. Contributed to a written Summary of Workshop Outcomes and Recommendations for NSF and a commentary to be submitted to Science (the Policy Forum). Participated in a meeting of the San Diego Natural History

Museum Marine Invertebrate Advisory Committee to discuss digitization opportunities and best practices (Mar 24, virtual). Participated in the FathomNet Workshop (Mar 31-Apr 1, virtual) to discuss opportunities for linking marine images to specimen records.

UF: John Slapcinsky: On Specify working group with the ESB TCN.

Share Opportunities and Strategies for Sustainability

ALMNH: Kevin Kocot: Reduction of in-person meetings in favor of Zoom or other online platforms is one of the most impactful ways we can reduce our carbon footprint. Better advertising of available specimens can reduce the need to collect material by others, thus reducing carbon footprint and decreasing impact on native populations of organisms.

AMNH: Fani Rodriguez, Chris Johnson, Lily Berniker: Continue to attach our scanned card catalog records to digitized catalog records.

CAS: Christina Piotrowski: The Zooniverse - NfN ITM Project has resulted in more than 31,000 card label scans in total, and we are currently scanning thousands of jar labels from undigitized lots during onsite DigIn volunteer workflows. These label scans 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.

RSMAS: Nikki Traylor-Knowles: We are working with RSMAS administration to get the collection to be a part of a masters in professional science track so that we can have a sustainable model for funding.

VIMS: Jennifer Dreyer: I continue to image labels in specimen vials/jars for preservation. Eventually all specimens will get a new thermal printed label, but we want to archive as many of the older labels as we can in case of deterioration or damage.

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

ALMNH: Kevin Kocot: We participated in the Bama Bug Fest, an outreach event to educate the general public about insects. We presented a table on crustaceans with emphasis on peracarid crustaceans or 'bugs of the sea.' There were over 1,700 visitors and over 100 volunteers.

AUMNH: Nusrat Noor: Have done multiple tours and tabling events highlighting collection and invertebrate biodiversity. Taught a marine invertebrates course to 60 middle school students from underrepresented communities.

BPBM: Holly Bolick: Some specimen lots that were planned for installation did not meet the necessary criteria (time and place of collection) and were transferred to our Education Collection and will be available for outreach and education. These specimens are generally used for tours, presentations at schools, and in exhibits and educational programs at the museum and make wonderful outreach tools especially for children.

CAS: Christina Piotrowski: In addition to our frequent interactions with hundreds of volunteer transcribers working on the NfN, ITM Zooniverse project, supporting them while engaging them with our marine invertebrate specimen data, we have begun to do more in person Outreach and Engagement this quarter.

CAS hosted the full class of 4th grade girls (55 students and 9 chaperones) from The Hamlin School in San Francisco this quarter to engage with them about careers in STEM for women in museums. Select engaging CASIZ specimens were shared with the girls to capture their attention while teaching them about the importance of building and maintaining museum

research collections and their data for wildlife and habitat conservation. We also hosted a collections tour for Stanford University students, during which the importance of logging complete specimen data and vouchering of specimens during biodiversity work was emphasized.

We are currently preparing 4 Social Media posts and potential web contributions about our outreach activities to share out next quarter.

MCZ: Adam Baldinger: Nothing to report specifically for E&O, but for Publicity the MCZ submitted Invertebrate of the Week (*Ampithoe pollex*), Scientist Spotlight (Jennifer Goldstein) and Friday Fun Fact (sponges).

NCSM-NMI: Megan McCuller: Our unit had the opportunity to work with an excellent undergraduate intern who specializes in 3d modeling and game creation. With him, we are in the process of developing a game where players can digitally build a crustacean using different types of carapaces, claws, and legs. The goal is for it to be fun, while simultaneously being used to teach players about the importance of collections, biodiversity, and taxonomy.

NHMLA: Dean Pentcheff: Social media postings have been regular and substantive (summarized separately below). Based on templates devised during the prior quarter's collaboration with the USC Annenberg School of Communications, we have a regular schedule of multiple Instagram posts. These are based variously on specimens, staff profiles, and other collections-based information and are coordinated, curated, and posted by our work study student Victoria Westover. Special thanks to Jenny Dryer, Libby Ellwood, Chrissy Piotrowski, Kevin Kocot, and Megan McCuller for regularly helping with corrections and post approvals.

We (Austin Hendy, Regina Wetzer, Dean Pentcheff, Adam Wall, Libby Ellwood, and two teachers Rikki Marzan and Wayne Thompson) have begun organizing the upcoming summer teacher pilot workshop (with California State University at Dominguez Hills). We have already had three productive program design meetings (18 February–San Pedro, 24 March at CSUDH, and 28 April at NHMLA). We will begin recruiting STEM teachers within a month. The workshop will take place 21–24 June 2022 (8am-4:30pm daily at NHMLA and CSUDH) and will focus on biodiversity and climate change and the linkage between these topics as relevant to the DigIn digitization project.

Pentcheff, Wetzer and other NHMLA marine curators participated in a March Museum Fellows & Membership field trip, “Turning Tides” to the Cabrillo Beach tide pools, (see social posts) (~40 participants); these staff also provided an Earth Day video program for Nickelodeon staff; Adam Wall and Wetzer hosted 15 students from CalState University Los Angeles for a behind the scenes – “Specimen digitization to eDNA”; and we are participating in a Community Science LA River eDNA Bioblitz.

SBMNH: Daniel Geiger: No-data specimens were made available to teaching collections (UC Santa Barbara, Santa Barbara City College, Westmont College, Ventura College).

SIO-BIC: Charlotte Seid: Conducted 16 E&O presentations (11.5 hrs.) for 74 visitors (elementary school through adult learners), highlighting invertebrate biology and the value of digitized museum collections.

SIO-PIC: Linsey Sala: We are continuing to provide tours of our collections highlighting the importance of biodiversity digital data availability and have received a flood of requests for these and next quarter as more in person activities resume.

UCM: Bridget Chalifour: We are in the process of creating a shared repository for outreach activities and instructions within UCM, and would appreciate any resources other institutions could provide for a range of activities catering to a broader range of audiences.

UF: John Slapcinsky: Tweet about invertebrates on Twitter at Spineless Science @UFInvertZoology.

VIMS: Jennifer Dreyer: 6 specimens were loaned out for educational purposes in an undergraduate lecture on bioluminescence. I hosted 2 personal tours of the Collection for visiting guests. All other outreach activity has been slow to resume due to COVID.

Share Information About Your Website and/or Portal Usage

NHMLA: Victoria Westover: Social Media Summary: 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.

Share Other Activities and/or Progress

ALMNH: Kevin Kocot: I recruited a graduate student intern who will work in the collections over the summer.

AUMNH: Nusrat Noor: Purchased a new laptop which we will be putting to use and should help to speed things up since the previous computer was very old and slow.

CAS: Christina Piotrowski: CAS hosted Dr. Catherine McFadden's lab this quarter to sample thousands of CASIZ soft coral specimens for her project to upgrade taxonomic understanding of this group (alongside specimen determinations). McFadden also contributed her specimen lab images to CASIZ to eventually add to our online image files. We currently have only 2 on-site volunteer label scanners, one data entry volunteer, and one pre-curation volunteer who works ahead of label scanners to pre-curate ethanol lots. Our data entry volunteer is also helping our staff with cleanup of crowd-transcribed specimen records. We hope to bring on at least 2 more scanners next quarter, since we will be losing our fastest scanner as she departs for a PhD program.

FWRI: Paul Larson: Precurated ~800 specimens.

RSMAS: Nikki Traylor-Knowles: We are delighted to share a new promo video for the collection.

SBMNH: Daniel Geiger: Lots of type specimens of Bryozoa and Foraminifera identified and cataloged. So far over 1,100 lots.

SIO-PIC: Linsey Sala: This quarter we have completed the interviewing and hiring process of additional student workers and are in the midst of training and tracking our data capture times. We have completed pre-curation on another 335 lots.

UCM: Bridget Chalifour: We have made significant progress this quarter in cleaning and reorganizing our dry and wet collections, as well as installing Specify on all section computers so more users can learn and work in our database.

VIMS: Jennifer Dreyer: I am purchasing a document camera to help create a station for imaging labels and specimens. Although the funds being used are outside of this grant, this camera will be a great way to keep making progress on archiving specimen records.

Have you had any additional costs due to the COVID pandemic?

AMNH: Fani Rodriguez, Chris Johnson, Lily Berniker: We are still hampered by an inability to have volunteers easily onsite.

CAS: Christina Piotrowski: 1. We've incurred additional supplies expenses to support the scanning of our photo slide collection for DigIn deliverables, as our aging photo slide scanner is no longer supported by Windows and must be replaced in order to digitize these CAS resources.

2. We have purchased an additional document scanner and are looking at purchasing additional computers to support multiple scanning workstations, which we'll attempt to staff with a large group of volunteers once our museum's Volunteer Program is fully reactivated this summer and fall. We have been unable to image a sufficient number of labels this FY due to the inactivity of this program and to our permanent staff working partly remotely, resulting in insufficient volunteer support.

3. 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. The current higher load of grant supporting activities and remote work have 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: Primarily because of COVID and diversity-related work, the human resources department at NHMLA is taking 4–9 months to initiate hiring on grant-funded and grant-related jobs. Of the three hires related to this project (one NHMLA full-time staff member and two full-time grant-funded positions), none have yet resulted in a final selection and job offer. We have also not yet been able to bring on volunteers. This has led to unanticipated and very large time commitments from other NHMLA salaried staff to cover the work required to manage a part-time digitizing staff of 24. These salaried positions are not grant-funded, so the work has come at the expense of previously-committed collections and research programs.

RSMAS: Nikki Traylor-Knowles: we have just had to slow down in ways that were unanticipated.....so the progress is not where we would have liked.

VIMS: Jennifer Dreyer: No additional costs but extremely long wait times (projected backorder is almost a year) for ordering scintillation vials for collection specimens due to production shortages.

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: Nothing to report.
ANSP ESB: 4,557 records for 30,183 for mollusks taken off South Carolina have been digitized in Excel, but not yet imported to the collection database or assigned catalog numbers.
BMSM ESB: BMSM continues to digitize new acquisitions, having cataloged 241 new ESB lots during the period, for a total of 1,437 specimens. In addition, BMSM cleaned and standardized ESB locality names (mostly in Florida) for 1,230 lots. BMSM uploaded 412 new composite images and georeferenced localities encompassing 1,004 records, for a total of 198 localities georeferenced (mostly in S and SW Florida), with 98 localities georeferenced *de novo* including error radius.The total number of georeferenced ESB records so far is 15,013.
CM ESB: 1,647 records data cleaned; 454 lots georeferenced. In 1st quarter 2022, georeferenced 41 additional records.
DMNH ESB: The Museum continues to standardize locality names in preparation for uploading to InvertEBase. Over 41,900 records were enhanced as part of this effort.
FWRI ESB: 602 lots georeferenced and 875 denovo digitized specimen records

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.
HMNS ESB: 11,995 lots representing 216,655 specimens have had their GPS collecting locality properly assigned to the correct fields in our CMS.
LACM ESB: 454 lots were digitized, representing 1,200 specimens. A total of 1,079 lots have been digitized to date, making 16.16% 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: 15 lots/records were databased this quarter; to date, 10473 records in our database were cleaned/vNetted for accuracy, and of these, 10,388 with verified georeferences. 10,167 records are available on iDigBio.
NCSM ESB: 155 localities have been georeferenced and 506 records have been georeferenced.
PRI ESB PEN: 667 lots from 34 bulk samples (8309 specimens) have been digitized; All 34 samples were from 1 locality which has been georeferenced with error radius; 667 lots (8309 specimens) have been coded with live-dead information.
RSMAS ESB: We have to date digitized by getting the data into spreadsheets:15,536 lots
UF ESB: 16 lots of 62 specimens were newly digitized, georeferenced and are available in InvertEBase. an additional 12,913 lots were georeferenced with error radii and data for 1239 lots were cleaned and prepared for georeferencing. Two new UF students were hired to replace graduating students.
UMMZ ESB: 415 lots representing 3,026 specimens have been newly digitized; 265 lots uploaded to InvertEBase portal; 450 images generated, and 3 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: Continued development of geographic workflows/protocols; recruited one new volunteer (total of 4 new volunteers) to implement these workflows in preparation for digitization. Completed updating taxonomic catalog for bivalve collection using the authoritative taxonomic database MolluscaBase. Collaborate with YPM (Nelson Rios) to determine state-level open water boundaries to use as a filter to create an ESB species list for each state.
ANSP ESB: Nothing to report.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DMNH ESB: Nothing to report.
FWRI ESB: Nothing to report.
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.

LACM ESB: Nothing to report.
MCZ ESB: Permanent staff involved in the project continue to participate in Outreach, Steering, Expedition, Nomenclature and Georeferencing committees/work groups. Information is then shared with others in MCZ's Malacology and Invertebrate Zoology departments, including those working on other TCN's (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 Nothing to report.
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: Still having technical difficulties publishing dataset from Specify 7 to Symbiota/InvertEBase
CM ESB: Nothing to report.
DMNH ESB: Nothing to report.
FWRI ESB: Nothing to report
HBOM ESB: Nothing new to report.
HMNS ESB: Currently GeoLocate is not embedded in the HMNS EMu CMS. The Inventory Manager has been working with Axiell and GeoLocate functionality will be included in the next HMNS update for EMu. The museum has also signed a contract with Axiell for use of another product called CultureConnect that will allow the institution to publish images and information for the objects currently on display. Once the Inventory Manager has worked out any potential issues with integrating CultureConnect into EMu the plan will be to add GeoLocate functionality as well. While included in the previous quarterly report as of April 2022 the work with Axiell continues and should be resolved soon.
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.
DMNH 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 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: Stations for digitization of South Carolina mollusks will also be used for digitization of other invertebrates for DigIn TCN.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DMNH ESB: Continued collaboration with BCEENET.
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 TCN's: 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 for 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.
DMNH 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: Submitted our proposal to the Dean at RSMAS concerning our development of a professional master track and we are waiting on feedback. Additionally, we had a professional promo video made about the collection which turned out really wonderful. Happy to share with the group.
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. Provided specimen images and text for both February and March MotM postings.
ANSP ESB: All ANSP lots of Noetia ponderosa have been scored for live/dead. The PI has continued work with iNaturalist (see MCZ report below) and is the primary person bringing older observations into the ESB iNaturalist portal by flagged the live/dead status.
BMSM ESB: PI is head of the Outreach Committee for the ESB TCN and directly responsible for the ESB Facebook page, having posted regularly via that social media outlet; PI is a member of the ESB TCN steering committee. The PI introduced the ESB TCN project as part of a "live" lecture titled "Biodiversity and Taxonomy of Mollusks" presented at BMSM on March 17, 2022
CM ESB: Nothing to report.
DMNH ESB: Nothing to report.
FWRI ESB: Posted items to instagram as part of the outreach committee
HBOM ESB: Nothing to report.
HMNS ESB: Nothing to report.
LACM ESB: Nothing to report.
MCZ ESB: The iNaturalist public portal keeps growing and now includes 56 members, 2,699 identifiers, 71,258 observations and 860 species.
https://www.inaturalist.org/projects/eastern-seaboard-mollusks
NCSM ESB: We began a Twitter account in January. We continue to gain followers on TikTok, Instagram, and Facebook.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Nothing to report.
UF ESB: Tweeted about *Hemitoma octoradiata* in Spineless Science from @UFInvertZoo. Posted ESB observations in iNaturalist and added 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: Nothing to report.
ANSP ESB: Nothing to report.
BMSM ESB: Dataset is live and updated at portal
https://webportal.specifycloud.org/shellmuseum/ Stats and portal usage data not available.
CM ESB: Nothing to report.
DMNH ESB**:** 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**:** Nothing to report.
PRI ESB PEN: Nothing to report.
RSMAS ESB: Currently still developing the website, hope to have it launched by the end of the spring semester.
UF ESB**:** Dataset is live and updated at portal http://specifyportal.flmnh.ufl.edu/iz/
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 is well underway; interviews for final candidates have been scheduled.
ANSP ESB: The PI spent part of a sabbatical working with Rob Guralnick at the University of Florida in Gainesville, learning programming in R which will help with automation for finding basis of records in BHL for names in partner collections that are not in MolluscaBase.
BMSM ESB: Nothing to report.
CM ESB: Nothing to report.
DMNH ESB: Awaiting official paperwork from IRS re: update our EIN and name. The new name for the Delaware Museum of Nature and Science (DelMNS) has happened internally and on our website: www.delmns.org.
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 January 1 – March 31, 2022.

Workflows, Equipment, and Personnel

Most GLOBAL institutions continued steady GLOBAL progress during 2022-Q1.

ALA's imaging, barcoding, and transcription of lichen and bryophytes is ongoing. They are still being affected by COVID, but are slowly gaining momentum. No specimens or labels were digitized in 2022-Q1 due to scheduling, but they hope to get more done in the next quarter.

ASU's routine workflow is now established, so imaging, barcoding, and transcription of lichen and bryophytes is ongoing. They had been previously much delayed by COVID, but productivity is now improving.

[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

No BRY specimens or labels were digitized in the first quarter of 2022. However, students are lined up to re-start digitization May through September.

CINC & MU's imaging, barcoding, and transcription of CINC bryophytes is going well. Transcription of MU bryophytes is slowing down as they are down to difficult hand-written labels and labels in Cyrillic script.

COLO started the semester remote and the Museum was closed to the public most of January and February, with staff asked to work remote where possible. While still not where they want to be production-wise, March of 2022 was the most productive imaging month for the project even without imaging during spring break.

F continued imaging of lichens and bryophytes. They onboarded new interns to their team which will increase output for imaging and databasing.

FLAS's imaging is going strong, and they are excited to see the actual organism in photos. They are constructing an additional light-box from coroplast and LED's. Christian Wanamaker joined the FLAS team as their Project Manager to oversee the digitization work.

LSU's specimen imaging of bryophytes by a volunteer is in progress.

MICH recruited and trained one volunteer to contribute to bryophyte label transcription.

MSC is nearly complete with their digitization work. Their bryophytes are fully transcribed and some very complicated batches of lichens are almost completely imaged. These have spreadsheets, which will complete transcription when the imaging is done.

NY barcoding had slowed down as they worked through some lichen exsiccatae but they started barcoding bryophytes and that will continue in earnest through the rest of this year.

Preparations for a collection move at OSC has taken all of their curatorial time. The move is scheduled for May, and they hope to be unpacked and operational by July. They will make GLOBAL digitization their top goal once they are operational again this summer.

PH had only one work study student imaging about once a week, which caused a decrease in progress.

TENN briefly used old halogen lights for one of our imaging stations after the original LED lights they purchased stopped working for our needs. The halogen lights were too hot and

uncomfortable for the students and resulted in a different photo than our first imaging station, even after post-processing. After reaching out to the group for suggestions, they purchased two new LED panels, recommended by Eric Tepe (CINC). TENN hired and trained four undergrads for a “Herbarium Boot camp” over the Winter Mini-Term in January to work on GLOBAL imaging, databasing, and transcription. The herbarium has had 11 undergrads and 1 graduate research assistant (GRA) this semester who are almost all solely working on GLOBAL. 2022-Q1 was the most productive quarter at TENN by far.

After a long winter break at UC, campus was remote for the first two weeks of the semester. That did slow down their digitizing pipeline, but now the students are allowed to return to campus, so things should ramp back up. Lichen digitization and imaging is ongoing. They are nearing the end of the lichen collection, and within the next two quarters we will be moving on to the bryophytes.

WIS continued to image lichen specimens. Student hourly rate is increasing this last month.

Digitization

Eighteen institutions (ASU, 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 59,793 specimens barcoded (40,236 bryophytes and 19,557 lichens), 75,398 labels imaged (37,664 bryophytes and 37,734 lichens), 69,012 specimens imaged (33,467 bryophytes and 35,545 lichens), 37,620 specimen records uploaded to the portal (26,450 bryophytes and 11,170 lichens), 44,691 skeletal records created (27,036 bryophytes and 17,655 lichens), 32,663 labels fully transcribed (24,410 bryophytes and 8,253 lichens), and 31,549 specimens georeferenced (18,595 bryophytes and 12,954 lichens) (See Table 1 & Figure 1). These quarterly totals are the highest yet for label and specimen imaging, as well as transcription and georeferencing (See Figure 2).

Table 1: Digitization progress by GLOBAL collaborators in 2022-Q1, separated by Bryophyte (B) and Lichen (L) specimens.

	# Barcodes Added		# Labels Imaged		# Specimens Imaged		# Uploaded to Portal		# Skeletal Records Created		# Fully Transcribed		# Georeferenced	
	B	L	B	L	B	L	B	L	B	L	B	L	B	L
ALA														
ASU	220	239	220	239	220	239			220	239	220	239	220	239
BRY														
CINC & MU	2,299	34	2,914	34	2,914	34	3,550	34	2,914	34	4,362	6		
COLO		4,525		4,525				4,525		4,525		1,612		
DUKE	1,782		2,096		885		2,981		1,782		150		10	
F	4,419	1,588	4,419	1,588	4,419	1,588	4,419	1,535	3,632	65	2,119			40
FLAS	5,670		1,165		1,165		1,165		18					
ILL & ILLS	3,765		3,765		3,765									
LSU	3	140	3	140	1,474		3	140	3	140	3	140	58	225
MICH	5,026	1,932	5,036	1,932	579	277	2,443		5,026	1,932	2,443		309	1
MIN		7,026		7,026		7,026					4,475			
MO	4,295		5,169		5,169				801		765		433	
MSC		3,582		3,582		3,582		680		3,582	1,099	3,582		3,582
NY	1,858	294	962	15,499	962	15,499			1,894	3,969	1,774	2,613	1,068	5,087
OSC														
PH		47		47		47		47		47		47		
TENN	8,839		9,855		9,855		9,829		8,805		6,899	14	1,812	6
UC		150		3,122		3,122				3,122				
WIS						4,131		4,209					14,685	3,774
YU	2,060		2,060		2,060		2,060		1,941		101			
Totals	**40,236**	**19,557**	**37,664**	**37,734**	**33,467**	**35,545**	**26,450**	**11,170**	**27,036**	**17,655**	**24,410**	**8,253**	**18,595**	**12,954**
B+L Totals		**59,793**		**75,398**		**69,012**		**37,620**		**44,691**		**32,663**		**31,549**

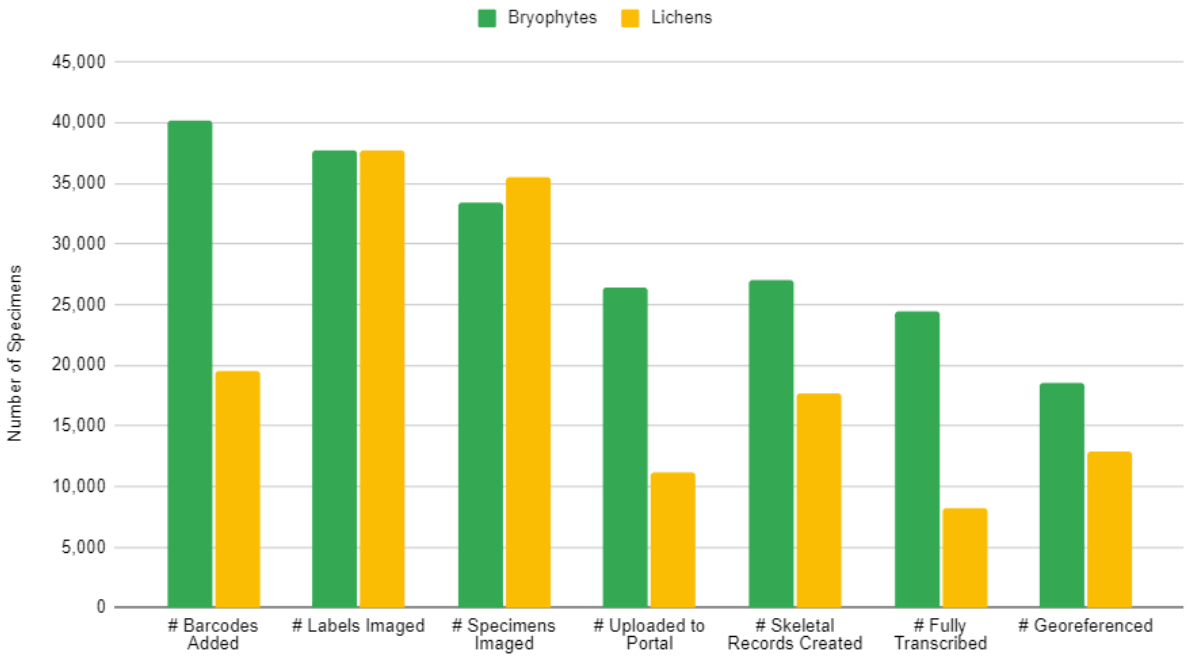


Figure 1: Digitization progress for the GLOBAL collaboration in 2022-Q1, separated by Bryophyte and Lichen specimens.

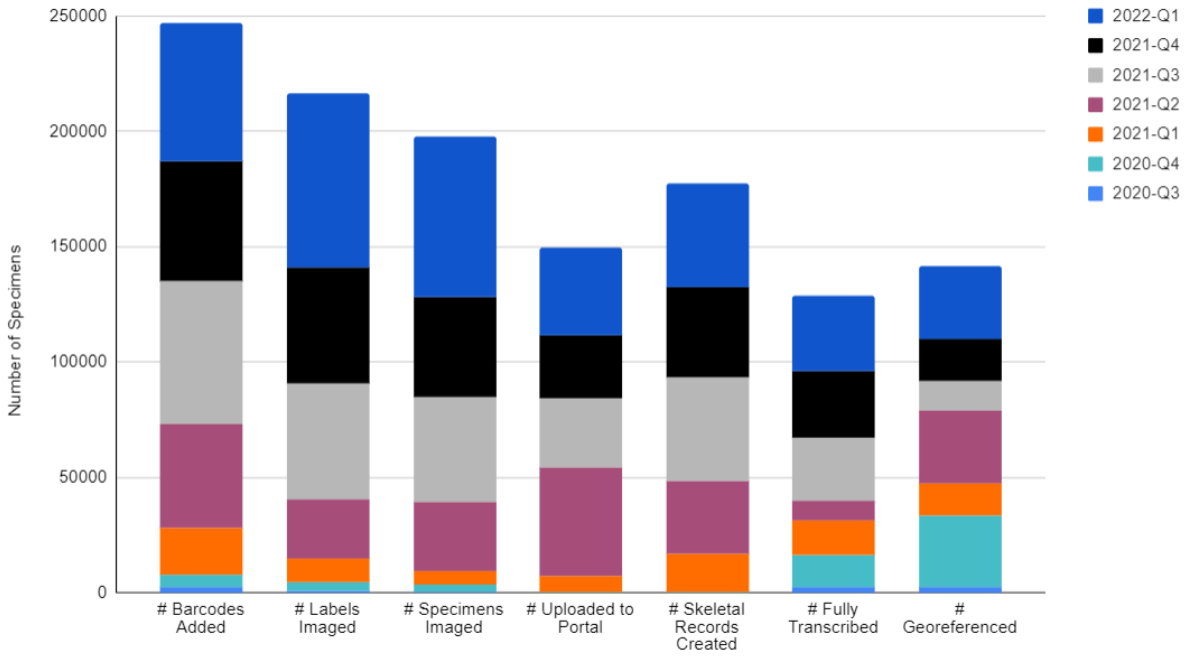


Figure 2: Cumulative digitization progress for the GLOBAL collaboration by quarter.

Share Best Practices, Standards, and Lessons Learned

Flexible Workflows

The GLOBAL teams continued to make use of flexible digitization workflows in 2022-Q1, including some use of virtual transcription work and prioritizing label imaging, while most collaborators were able to begin or continue on-site work.

Collaboration

Team members continued to make use of Basecamp, Zoom, and email to communicate and collaborate during 2022-Q1. New collaborators and students were given access to Basecamp group resources. The Outreach & Education Group met twice in preparation for the April WeDigBio event and to discuss the status of O&E activities. The Specimen Imaging Working group met in February. ASU PI Bungartz demoed the newly available program BCRWatcher, and the group discussed lighting and light-boxes with a new team member from FLAS. The Executive Committee (F, NY, TENN, UC) met in January with the IT Team to help visualize the GLOBAL interface, a web platform that will bring together but not replace the current Lichen and Bryophyte Portals, among others.

A Management Committee Meeting was held in February open to all GLOBAL team members to review quarterly grant progress. The GLOBAL Project Manager (TENN) began spring check-in meetings with collaborators, Zooming with MO, COLO, CINC & MU, DUKE, ILL & ILLS, YU, FLAS, LSU, BRY, F, MIN, WIS, ALA, MSC, MICH, ASU in March to discuss progress, concerns, and plans.

WIS continued its collaborative georeferencing with those institutions that have given permission and have transcribed label data available. In 2022-Q1 they worked with localities in Austria, France, Germany, Guam, Canary Islands, Palau, Norway, UK, Philippines, Malaysia, Thailand, China, Brazil, Switzerland. Germany and Austria are problematic as they often are older specimens and contain localities that are now part of Czech Rep, Slovakia, etc. They need to determine the best way to handle these records once they are in the CoGe framework.

Data Quality Control

MSC learned how to track transcription through the “Review/verify occurrence edits” function in Symbiota, which is very useful.

A review was undertaken of TENN Bryophyte and Lichen Portal records to clean up record statuses to ensure they move properly through the transcription and georeferencing workflows.

Share Identified Gaps in Digitization Areas and Technology

Image Uploading

ASU IT continued to facilitate the uploading of images into the Lichen and Bryophyte Portals. They are developing a new tool to allow users to batch ingest images directly through the portal rather than uploading them into Dropbox, where they are then transferred to portal servers by the data manager.

Barcode Renaming

ASU's progress in digitization was originally delayed because programmers at ASU were developing a program to capture image metadata as part of the routine imaging. The program BCRWatcher is now fully functional and has extensively been tested, so that routine imaging has picked up pace.

GLOBAL Interface

The discussion that began in 2021-Q4 to determine the best way forward for a combined Lichen and Bryophyte data portal interface continued in 2022-Q1. The Executive Committee (EC) met in January to review the grant proposal and discuss a vision for the GLOBAL interface. The results of this meeting were shared with the IT Team. A second meeting was held with the EC where the IT Team presented different practical options for the interface. We believe that the Symbiota API, which is under development, may best serve the purpose to query and integrate data sets across different portals, and began querying our collaborators for user scenarios to help direct the functionality of the interface.

Snapshot Dataflow

As not all of our collaborators are working Live in the portals, there are some ongoing challenges. Because MSC maintains a Specify database as well as the Lichen Portal, they need to create a workflow for separately uploading records into each. UC had to complete manual entry of lichen names not in their internal database system.

Transcription Challenges - Handwriting

Transcription of MU bryophytes slowed down as they are down to difficult hand-written labels and labels in Cyrillic script. This 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. A January meeting with F's Machine Learning Engineer Beth McDonald illustrated some possible future avenues. She reviewed her active projects using AI and Machine Learning to help decipher handwriting.

Share Opportunities to Enhance Training Efforts

The ASU team continued to develop documentation and training resources to be accessed on the Symbiota Docs website (https://biokic.github.io/symbiota-docs/) and the YouTube channel (https://www.youtube.com/channel/UC7glMVLRnTA6ES3VTsci7iQ).

The program BCRWatcher for routinely capturing image metadata as part of the digitization workflow is now fully functional, was announced on basecamp and has been made available via https://help.lichenportal.org/index.php/en/bcrwatcher/.

CINC & MU will be losing several of their undergrad GLOBAL workers at the end of the semester. One of their best will be staying on, fortunately, and they are considering moving her into a leadership/training role for new undergrad hires.

FLAS has 3 undergraduate students gaining experience with the specimen digitization process.

At ILL & ILLS, 2 undergraduate students have been trained in lichen and bryophyte packet refurbishing.

NY Lead Digitizer and Intern attended the Tuckerman Foray and were able to collect and learn lichen IDs.

The GLOBAL Project Manager (TENN) and Georeferencing Manager (WIS) continued compiling transcription and georeferencing resources during 2022-Q1 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.

The GLOBAL Project Manager (TENN) hired and trained four new undergrads over a three week Winter Mini-term to work on the GLOBAL project and they all stayed on at varying levels during

the spring semester. TENN Collections Manager Oliver also trained two new herbarium interns for the spring semester. Experienced herbarium techs assisted with some of these training efforts.

WIS has students working together on georeferencing and sharing best practices and tips for moving more quickly through localities. One of their students has offered to help train incoming student hourlies, as she is graduating this semester.

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

As Domain 6 of iDigBio, the ASU team works closely with the other iDigBio domains. The Latin American version of the Lichen Portal, Consorcio de Herbarios de Líquenes en América Latina (https://lichenportal.org/chlal/), continues to be supported. As a result of this outreach towards Latin America, several new collections from the region are now available through the Lichen Consortium (e.g., the lichen collections from the Ecuadorian Base Nacional de Datos de Biodiversidad, https://bndb.sisbioecuador.bio/bndb/).

CINC (also processing MU and CMNH specimens) is part of the All-Asia TCN as well, and students working in the herbarium (on separate imaging stations) share tips and tricks.

COLO is also a member of the SoRo TCN and the All-Asia TCN, and continues to share info and technology between projects to help optimize workflows.

Collaboration is ongoing at MICH between PCC and GLOBAL TCNs, which share many resources at MICH including facilities, digitization and management staff, training, some equipment, and workflow. Though the grant objectives and specimens being imaged are separate, much of the institutional infrastructure is shared between the projects.

GLOBAL Project Manager (TENN) and TENN GRA attended a session of the BRIT Armchair Botanist to help plan and prepare for their own transcription event.

TENN PI Budke was contacted by both Clemson University (CLEMS) and the Bishop Museum (BISH) about joining our group as PEN's. While the North American collection at CLEMS was not in scope, discussions began with the team at the Bishop Museum. Resources were shared and a virtual meeting was held in March to discuss plans for a PEN submission. GLOBAL collaborators Eric Tepe (CINC) and Alan Franck (FLAS) offered advice from their successful prior PEN

experiences. The Bishop Museum, along with the University of Hawaii (HAW) and the National Tropical Botanical Garden (PTBG), hope to submit a proposal in April.

TENN PI Budke and the GLOBAL Project Manager were connected with Andrew Hipp from the Morton Arboretum by Jennie Kluse (LSU). They met virtually to discuss georeferencing and project management advice for the proposed Tree TCN.

Lauren Cohen from iDigBio was given access to the GLOBAL Basecamp group and attended one of our working group meetings.

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

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.

ASU transferred all images that were previously housed on the storage.idigbio server to ASU servers. After de-duplication, these images will replace the existing image links so that image hosting does not rely on iDigBio's IT infrastructure in the future. Stephen Sharnoff has now generously accepted to make his entire slide collection of outstanding lichen macro-photos available directly through the Lichen Consortium; images will be linked directly to their corresponding voucher specimens [at CNAL and SBBG (collections transferred from UCR)]. They already received a first batch of 7,541 images; images previously not scanned are currently being digitized. Linking these images to their specimens and serving them through the portal will assure that these image links no longer break, when the taxonomy changes or specimen IDs change.

FLAS hopes to unite their collections into one home source and IPT to various Symbiota.

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 is coordinating a workshop on the Latin American Lichen Consortium (https://lichenportal.org/chlal/) planned for July 30-31 at the XV meeting of the Grupo Latinoamericano de Liquenólogos (GLAL) in Argentina.

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

DUKE gave a tour of their lab and herbarium for an adult volunteer.

The Gantz Family Collections Center at F hosted a short but sweet event for Collections Club on Friday, January 21st for plant enthusiasts. The event continued its virtual format which brought in volunteers across the United States and Canada. 26 community scientists collectively contributed to curating 1,029 bryophyte records. Volunteers worked on transcribing specimen labels of bryophytes and lichens that were collected outside of North America.

LSU held 4 tours of the herbarium with elementary children from LSU Laboratory School demonstrating bryophytes vs. vascular plants (~400 students and 16 teachers total).

NY staff worked on imaging specimens and writing short biographical pieces on several women collectors for Women's History Month, these were published on The Hand Lens. They also participated in several Women's History Month events at NYBG, a dinner banquet and a

breakfast, where they showcased specimens from this TCN (and other herbarium specimens) collected by various women.

TENN began hosting a weekly online transcription event in February to engage volunteers to help with transcribing GLOBAL specimens from multiple partners. During 2022-Q-1, 26 participants were trained on transcribing skeletal data in the Bryophyte and Lichen crowdsourcing modules and they added skeletal data to 939 records. Many of the events featured presentations including a GLOBAL overview, TENN Graduate RA Julia Butler's Masters project on Fissidens, TENN PI Budke's work with *Palamocladium leskeoides*, and TENN graduate student Eric Shershen's PHD moss project. TENN Collection Manager Oliver gave a virtual tour of herbarium specimens from TENN and a demo of specimen imaging. Georeferencing Manager Smith (WIS) gave a demo of georeferencing. Recordings of most presentations have been made available on the project website.

TENN shared Georeferencing resources with Dr. Charles Kwit, a professor in Department of Forestry, Wildlife and Fisheries at the University of Tennessee, for use in a class project.

TENN ordered GLOBAL logo stickers to distribute to students, volunteers, and at outreach events.

The GLOBAL Project Manager (TENN) attended a number of EODI Trainings during 2022-Q1 including, "Barriers to Inclusion: Service Dog Handlers in Science Laboratories," "Advancing Equity-Minded Structures of Support", and "Just Sustainabilities in Policy, Planning, and Practice."

WeDigBio

Five GLOBAL collaborators (DUKE, COLO, CINC & MU, F, TENN) agreed to participate in the April 2022 WeDigBio. They held two WeDigBio Planning Meetings in March to discuss scheduling, roles, presentations, and advertising. The team from F will again help host and manage the registration for the event, with assistance from the GLOBAL team. It was decided to hold a GLOBAL-specific day on Thursday, while including GLOBAL records throughout the four day event.

Share Information About Your Website and/or Portal Usage

The GLOBAL project website, https://globaltcn.utk.edu, was utilized by 386 users during 2022-Q1, including 33 from Europe, 27 from Asia, 14 from Oceania, and 7 from Africa (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 3,700 users visited the Bryophyte Portal and over 18,800 users visited the Lichen Portal during 2022-Q1 (see Figures 4 & 5).

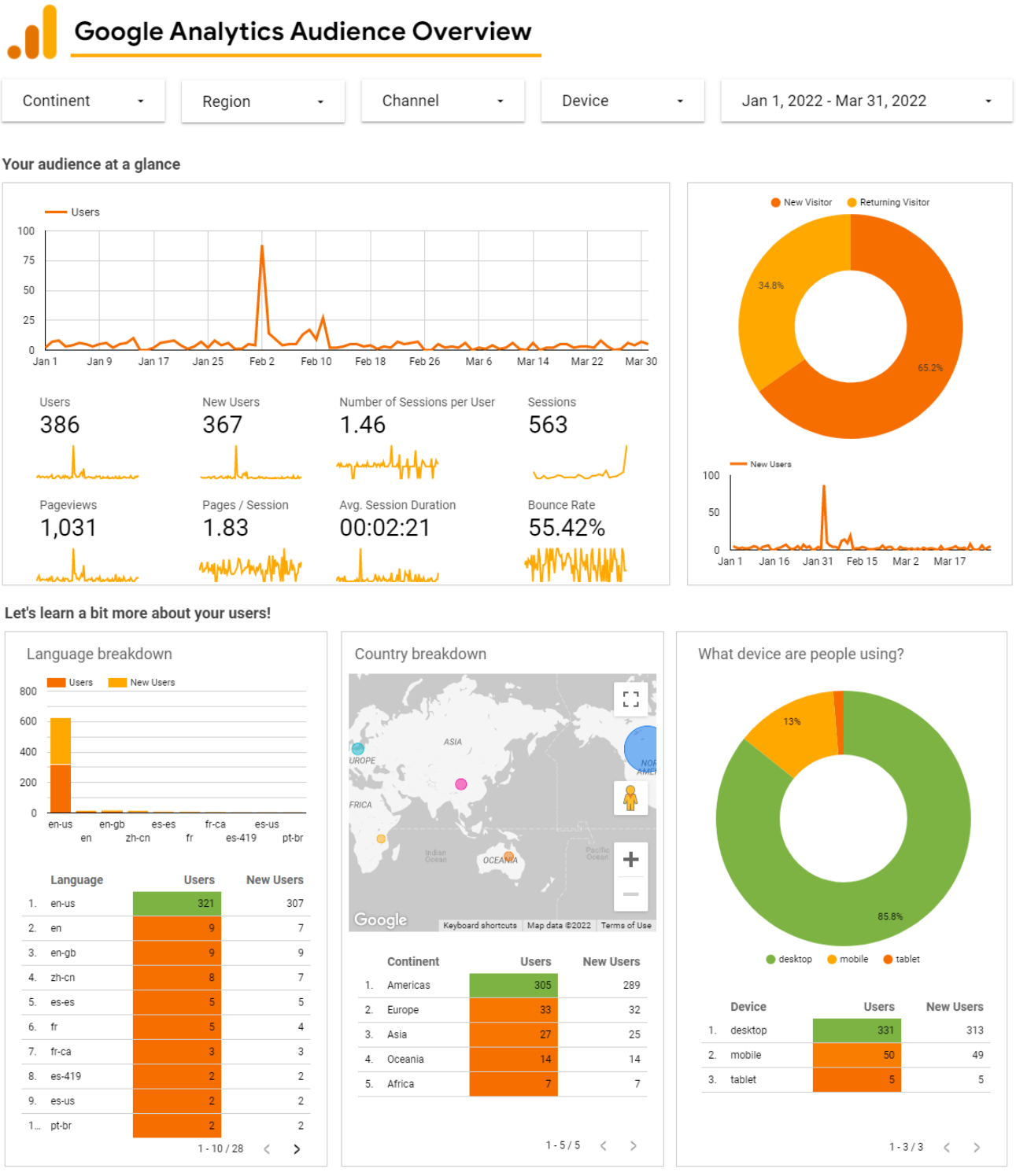


Figure 3: Use metrics for the GLOBAL project website (https://globaltcn.utk.edu) from January 1 – March 31, 2022.

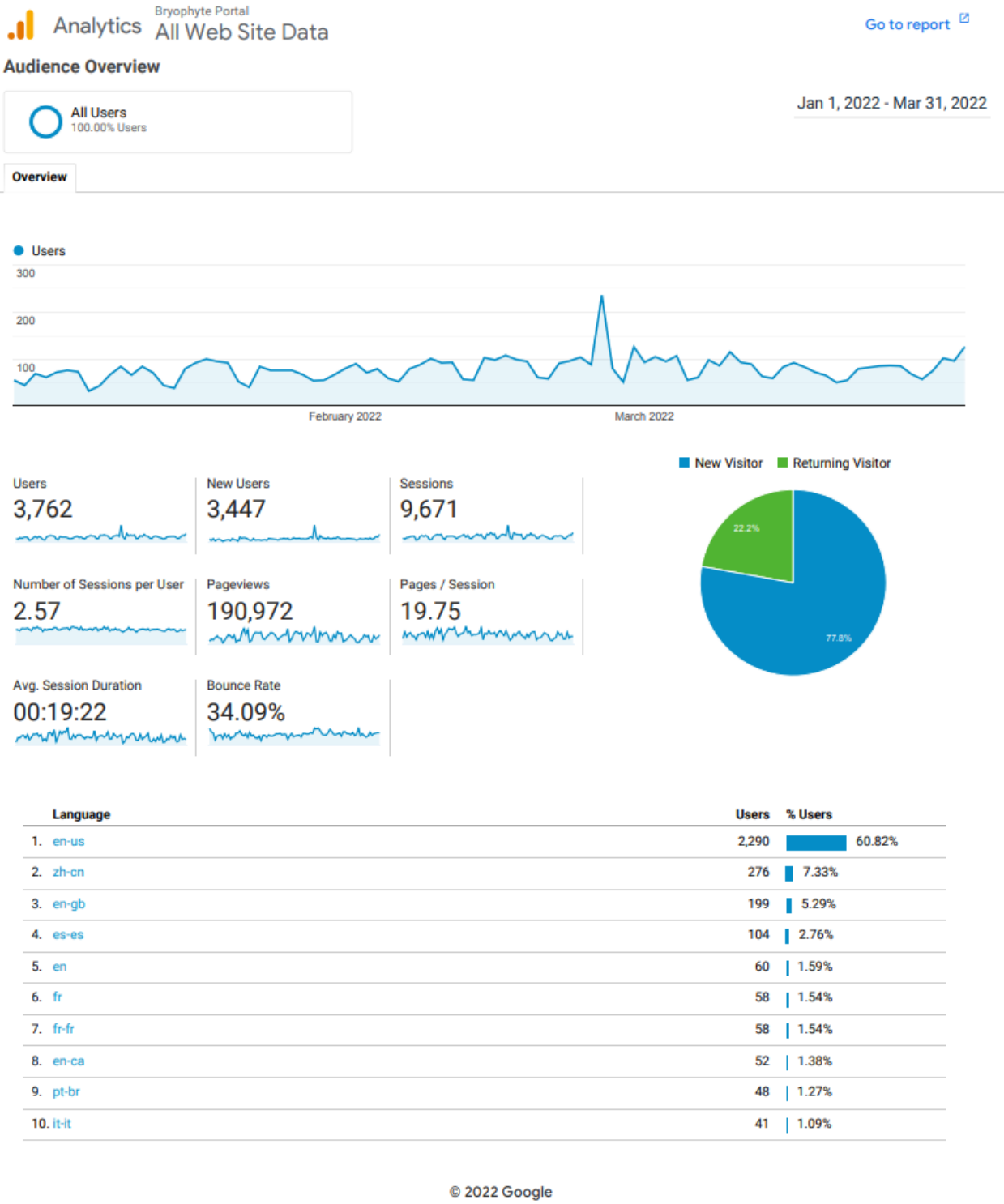


Figure 4: Use metrics for the Bryophyte Portal (https://bryophyteportal.org/portal/) from January 1 – March 31, 2022.

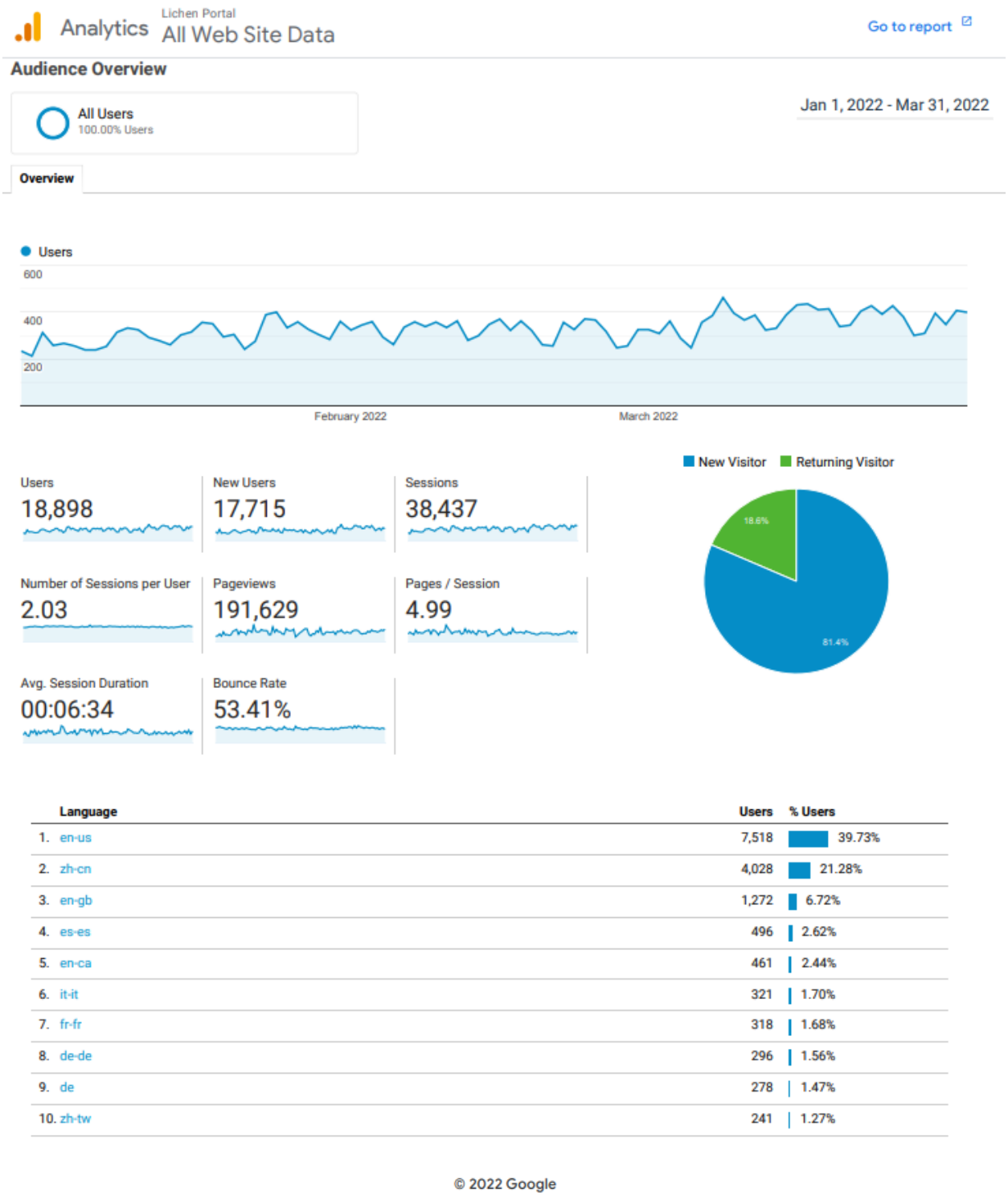


Figure 5: Use metrics for the Lichen Portal (https://lichenportal.org/cnalh/) from January 1 – March 31, 2022.

Share Other Activities and/or Progress

Image Tagging

For the Lichen Consortium, ASU PI Bungartz continued to work on the glossary, the lichen character database, and a controlled vocabulary for routine image tagging. ASU is also developing Mytabolites, a program for the analysis of lichen secondary metabolites via thin-layer chromatography (TLC). The prototype of this program (ver. 0.9.8.3) now includes the updated data from Jack Elix's fifth edition of the Catalog of Lichen Secondary Metabolites. It connects to the Lichen Consortium online and can be used to match TLC data against lichen taxa from which these substances have been reported.

Curation

Over 2800 bryophyte packets at ILLS were updated to archival paper (funded through institutional funds).

MSC created a semester project for one of their undergraduate students to work through some very complicated lichen specimens. They had multiple collection numbers in each packet, but only the first one was listed on the front of the packet, so they had to create and track numerous drop tags, as well as create additional annotations with descriptions for all the secondary collection numbers.

Specimen Exchange

COLO made use of Basecamp to share duplicate lichen and bryophyte specimens from their long-time, former curator, William A. Weber with several of our collaborating herbaria around the country.

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 (Project Manager)

Share Progress in Digitization Efforts

For extant specimen progress during this reporting period, Pteridophyte Collections Consortium members created skeletal records for **11,619** specimens, fully transcribed **11,111** specimens, imaged **38,850** specimens, and geo-referenced **2,145** specimen records. The total pteridophyte extant specimen progress including work done prior to the start of the grant is **645,490 (39% of goal)** skeletal records created, **1,237,135 (74% of goal)** extant specimens imaged, **1,114,825 (69% of goal)** extant specimens fully transcribed, and **298,492 (18% of goal)** extant specimens geo-referenced.

In the Pteridoportal (http://pteridoportal.org), we currently have **1,742,796** extant specimen records, **1,466,973** (84%) of which are imaged and **458,239** (26%) of which are georeferenced.

For fossil specimen progress during this reporting period, Pteridophyte Collections Consortium members imaged **215** specimens. The total pteridophyte fossil specimen progress including work done prior to the start of the grant is **38,599** (44% of goal) specimens databased, **36,090** (41% of goal) specimens imaged, and **19,023** (21% of goal) specimen records geo-referenced.

In the Pteridoportal (http://pteridoportal.org), we currently have **13,099** fossil specimen records, **10,560 (**81%) of which are imaged and **6,135** (47%) of which are georeferenced.

Covid remains an issue at many institutions. Progress has been limited by access to collections, staff and student illness, and students readjusting to school/life balance as campuses reopen.

Unfortunately vandalism caused a flood in UCMP's imaging space which limited progress this quarter. Their collections were unharmed, however imaging was not possible during damage remediation which created extra work for staff..

CHRB's fern collection has been completely barcoded, skeletaled, and imaged with the images processed and upload onto the Pteridoportal.11,781/16,914 records have been transcribed into Stage 1 which is approximately 70% complete.

Share Best Practices, Standards, and Lessons Learned

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

Share Identified Gaps in Digitization Areas and Technology

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

Share Opportunities to Enhance Training Efforts

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

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

Ongoing collaboration between PCC and Lichen/Bryo TCNs, which share many resources at MICH including facilities, digitization and management staff, training, equipment, and workflow. Though the grant objectives and specimens being imaged are separate, much of the institutional infrastructure is shared between the projects.

Share Opportunities and Strategies for Sustainability

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

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

In February, Project PI Carl Rothfels hosted an online mini-workshop for the Jepson Herbarium: Fiddleheads: Fern life cycles and identification. The workshop was recorded and the videos

from the workshop are available here:
https://www.youtube.com/playlist?list=PLULUH7ENikDrPvKHlHfSEvFZAuFrC2Q2g

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

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

Person Completing the Report

J Ryan Allen Project Manager

Share Progress in Digitization Efforts

Collectively for the current quarter roughly February 2022-April 2022 we have entered 10,396 new records into databases, barcoded 34,656 new specimens, imaged 35,690 new specimens and georeferenced 34,958 new records.

Our overall project totals are: 476,130 new database records, 1,010,839 newly barcoded specimens, 1,036,819 new images and 467,634 new georeferences.
The project after ~56 months (out of 48) has completed.
Data Entry 86.3%
Barcodes 116.3%
Images 121.1%
Georeferencing 75.9%

The SoRo TCN requested a no-cost extension to finish the project and the project has been extended to 8/2022 and may ask for one more NCE.

Share Best Practices, Standards, and Lessons Learned

RSA: We have been exporting records from the database and georeferencing in batch in excel – we found that this was far faster and more efficient way for us to georeference records, and to quality control georeferenced records relatively easily. We have targeted records that share the same locality (>5 records) as priority to georeference first.

Share Identified Gaps in Digitization Areas and Technology

CSCN images are now being uploaded to the Symbiota servers. Images are being transferred to COLO for compression prior to uploads (16,899 specimen images uploaded). The last collection needed online images (GREE) is on deck for the same process.
SJNM has finished updating records with barcodes and the remaining images will be linked during the next quarter.
RSA: One of the most challenging aspects of this project has been imaging just the SoRo states. SoRo states are mixed in folders with the rest of the North American specimens (excluding California) so we have actually imaged twice as much for this project, but only have 53,996 specimens imaged to show for it.

Share Opportunities to Enhance Training Efforts

RSA: I have found it very helpful to "assign" my staff to come up with three ideas in which we can make our digitizing efforts more efficient and effective. We discussed their ideas as a group and have been trying out one of the ideas – all staff concentrating on the families of a few key states to database in order to streamline the georeferencing. This approach seems to be working, we have seen a small jump in our georeferencing numbers.

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

COLO: is also on the GLOBAL TCN and All-Asia TCN, we have been sharing resources and tips from the SoRo TCN to help the project.
NYBG is the lead on the Endless Forms TCN and part of the All-Asia TCN
RSA: is also on the Endless Forms (NYBG as lead), CAP TCN and All-Asia TCN.
HUH, NYBG, RSA, BRU and COLO are all members of the All-Asia TCN and we hope to apply lessons learned in this project to the new TCN.

Share Opportunities and Strategies for Sustainability

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

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

FLD: Participated in the Fort Lewis College "Science Open House" in which the major STEM departments are open for tours with demos by faculty. We were open and some community members did learn of the collection. We just don't get as many visitors as chemistry – they blow things up.
RSA: The herbarium is returning to its tour program and have given several tours this last quarter, including tours for a botany class at Mount San Antonio Community College, curatorial staff from the Alf Museum of Paleontology, and several new Garden staff and volunteers. Among the areas that we highlight are our active digitization projects, including the SoRo project.
COLO: We recorded a virtual herbarium tour for the WeDigBio spring 2022 event highlighting the collection and digitization efforts. For WeDigBio, we posted vascular plants from Nevada to help building data availability from the states bounding the SoRo region and a set of Lichens for the GLOBAL TCN.

Share Information About Your Website and/or Portal Usage

Google Analytics
Last Quarter (February 1st-April 30th 2022) had 8,533 users over 9,151 sessions and 25,819 pageviews

Last Quarter (November 1st 2021-January 31st 2022) had 10,706 users over 10,933 sessions and 21,872 pageviews
We suspect that most of the data use is through the primary SEINet portal.

Share Other Activities and/or Progress

RSA: In the last quarter we have made significant progress on our barcoding and imaging efforts, due in large part to taking on a new intern for the project. Monitoring the progress, we seem to be making slow and steady progress and it seems to have helped to assign each staff member a family and a state to database. We are directing more of our attention to georeferencing, putting key staff who are very good and efficient at georeferencing. We reviewed our budget recently in preparation of our draft budget for FY2023 and we estimate that we have funding for the project up until September 2023. We hope that we can make our numbers as specified in the proposal.

COLO: We are preparing for one last sweep of georeferencing to catch specimens that are targeted to be georeferenced at COLO, but were not ready during the first pass. We also sent

out a survey to get a sense for remaining goals and priorities for all collections as we get to the end of the project. Our goal is to devote some of our remaining resources on high impact "common good" projects across the consortium.
COLO: We have been working with the Symbiota Support Hub and we are planning a portal and project wide campaign to help improve data quality across the portal. We will have weekly meetings during May to accomplish these goals.
COLO: As we finish project level digitization we are planning out a timeline to make improvements to the soroherbaria website. The site is now running the current version of Symbiota and we are planning to upgrade the front end of the site during the summer and fall.

Analytics SoRo SEINet
All Web Site Data

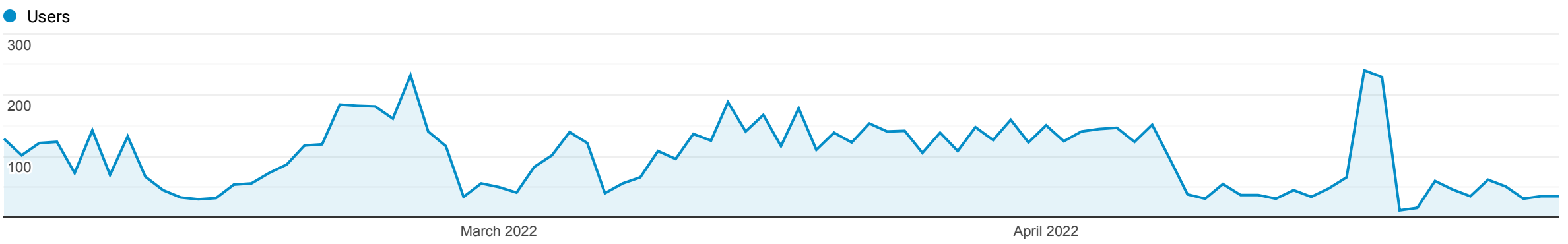
Go to report

Audience Overview

All Users
100.00% Users

Feb 1, 2022 - Apr 30, 2022

Overview



Users	New Users	Sessions	Number of Sessions per User
8,533	8,526	9,151	1.07

Pageviews	Pages / Session	Avg. Session Duration	Bounce Rate
25,819	2.82	00:02:31	91.89%

	Language	Users	% Users
1.	en	7,669	89.54%
2.	en-us	684	7.99%
3.	zh-cn	79	0.92%
4.	es-es	21	0.25%
5.	es-419	15	0.18%
6.	en-gb	14	0.16%
7.	ru-ru	9	0.11%
8.	en-ca	7	0.08%
9.	es-mx	7	0.08%
10.	tr-tr	6	0.07%

TCN Quarterly Progress Report

TORCH TCN — Quarterly Report

Reporting Period: February 1st, 2022 - April 30th, 2022

Except for NY: reporting through March 5th, 2022 (last day of funding)

Assembled by BRIT on May 3rd, 2022, for May 4th IAC meeting

TCN Name

American Crossroads: Digitizing the Vascular Flora of the South-Central United States
(Short name: 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
MO – Missouri Botanical Garden
NOSU – Northeastern State University
NY – New York Botanical Garden
OKL – University of Oklahoma
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 – University of Texas at Austin
TTC – Texas Tech University
UTEP – University of Texas at El Paso

Share Progress in Digitization Efforts

Progress in Digitization Efforts:

- Number of skeletal records created:

BAYLU = 0

BRIT = 0

HUH = 13

KANU = 0

MO = 0

NOSU = 0

NY = 1,198 (project total: 35,568)

OKL = 0

OKLA = 4,126 (13,418 total)

SHST = 9,530

TAES = 10,000

TAMUCC = 0

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin	0
Angelo State University	0
Fort Worth Nature Center	0
Howard Payne University	0
Johnson Wildflower Center	0
Our Lady of the Lake University	0
Saint Edward's University	0
Sul Ross State University	1,395
Texas Lutheran University	0
Texas State University	0
UT RGV Brownsville	0
UT RGV Edinburg	0

TEX-LL Sub-Total 1,395

TTC = 390

UTEP = 0 [has completed its contribution to the TORCH TCN Project]

Total skeletal records created this quarter: 26,652

- Number of fully-transcribed records created:

BAYLU = 13,958

BRIT = 11,391 (9,391 staff and volunteer transcriptions + 2,000 community science Notes from Nature-generated transcriptions)

HUH = 754 (47,766 cumulative)

KANU = 15 (total fully transcribed from OK and TX = 27,565)

MO = 0

NOSU = 0

NY = 1,894 (project total: 64,701)

OKL = 1,171

OKLA = 2,557 (66,200 cumulative, including import from Oklahoma Vascular Plants Database / OBIS)

SHST = N/A (25,000 cumulative, staff and volunteer transcriptions)

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin 1,905

Angelo State University	63
Fort Worth Nature Center	200
Howard Payne University	3,899
Johnson Wildflower Center	634
Our Lady of the Lake University	0
Saint Edward's University	3,454
Sul Ross State University	410
Texas Lutheran University	9
Texas State University	0
UT RGV Brownsville	1,191
UT RGV Edinburg	0

TEX-LL Sub-Total 11,765

TTC = 1,336

UTEP = 0 [has completed its contribution to the TORCH TCN Project]

Total fully-transcribed records created this quarter: 44,841

- Number of specimens imaged:

BAYLU = 50,658

BRIT = 1,442

HUH = 758

KANU = 42 (total imaged specimens from OK and TX = 24,400

MO = 0

NOSU = 0

NY = 2,730 (project total: 53,600)

OKL = 461

OKLA = 263 (75,764 cumulative)

SHST = 3,020

TAES = 10,000

TAMUCC = 94

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin	16,296
Angelo State University	48
Fort Worth Nature Center	0
Howard Payne University	150
Johnson Wildflower Center	0
Our Lady of the Lake University	0
Saint Edward's University	0
Sul Ross State University	1,395
Texas Lutheran University	2,519
Texas State University	0
UT RGV Brownsville	1,191
UT RGV Edinburg	5,850

TEX-LL Sub-Total 27,449

TTC = 1,726

UTEP = 0 [has completed its contribution to the TORCH TCN Project]

Total number of specimens imaged this quarter: 98,643

- Number of specimens georeferenced:

BAYLU = 925

BRIT = 0

HUH = 5,357 (29,715 cumulative)

KANU = 26 (total georeferenced specimens from OK and TX = 27,350)

MO = 0

NOSU = 0

NY = 4,920 (project total: 78,718)

OKL = 869

OKLA = 30 (11,374 cumulative)

SHST = 0

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin	1,082
Angelo State University	63
Fort Worth Nature Center	0
Howard Payne University	9
Johnson Wildflower Center	488
Our Lady of the Lake University	0
Saint Edward's University	6
Sul Ross State University	0
Texas Lutheran University	0
Texas State University	0
UT RGV Brownsville	1
UT RGV Edinburg	0

TEX-LL Sub-Total = 1,649

TTC = 0

UTEP = 0 [has completed its contribution to the TORCH TCN Project]

Total number of specimens georeferenced this quarter: 13,776

- Other digitization or pre-digitization efforts:

BAYLU: Nothing to report.

BRIT: Data-cleaning of records generated from Notes from Nature, including coordinates, being placed in proper fields, 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. Utilizing the crowd sourcing module in Symbiota, providing training and ongoing support.

Launched two Notes from Nature expeditions concentrating on Texas specimens.

We have prioritized the complete transcription and record cleaning for the 19 Texas counties surrounding the BRIT herbarium and our provider herbaria, with the intent to prioritize their georeferencing. This consists of 40,193 records from BRIT and BRIT-provider herbaria. Next we will move to the Trans-Pecos region for county prioritization.

HUH: Nothing to report.

KANU: Nothing to report**.**

MO: Nothing to report.

NOSU: Nothing to report.

NY: OCR has been performed on all specimen labels to aid in transcription.

OKL: Nothing to report**.**

OKLA: New Oklahoma and Texas specimens accessioned.

SHST: Nothing to report.

TAES: Nothing to report.

TAMUCC: Nothing to report.

TEX-LL: We are continuing to track our digitization efforts for UT Rio Grande Valley – Brownsville (RUNYON) separately for purposes of this grant despite its merger into TEX-LL.

TTC: We continue to create labels for our unprocessed Guadalupe Mountains National Park collection, using the 50-year-old journals of T.L. Burgess and D.K. Northington.

UTEP: Nothing to report. We have completed our contribution to the TORCH TCN Project.

- Comments about the digitization process:

BAYLU: Slow and steady.

BRIT: None.

HUH: None.

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

MO: We have unfortunately still not been able to start on the TORCH specimens (a variety of staffing difficulties, technical issues with Tropicos, and COVID restrictions). We will be doing a big push this summer for this project, though, in conjunction with efforts to image specimens from AR and TN to cut down on the amount of specimen sorting. So we should have some decent numbers for next update.

NOSU: We got caught between grant periods and I was having trouble getting students paid to work on this and when they aren't getting paid, they aren't going to work on it. However, we have finished imaging and I have a student that will be working on the transcriptions soon.

NY: Due to state and city restrictions, we are limited to only a small number of onsite staff each day, and each staff member can only work onsite three days per week.

NY Table summarizing total count of NY records contributed to TORCH (includes those fully or partially digitized before the beginning of TORCH funding):

	Imaged	Transcribed	Transcribed coords / Georeferenced
Texas	73,804	**74,002**	73,319
Oklahoma	10,488	**10,498**	10,464
Arkansas	18,391	18,411	18,261
Total	**102,683**	**102,911**	**102,044**

Deliverables from the original proposal budget justification:

Deliverables, according to the TORCH Budget Justification:
"For this project, NYBG 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 there are the final statistics for the NY contribution to the TORCH project.

OKL: Nothing to report.

OKLA: Nothing to report.

SHST: Nothing to report.

TAES: Nothing to report.

TAMUCC: Nothing to report.

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) got off to a slow start and has not made as much progress as we had hoped, mainly because of 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.

TTC: We have now crossed 60% of our specimens imaged (13,779) and have added 3,149 specimens not previously recorded when the project began.

UTEP: We have completed our contribution to the TORCH TCN Project, but still have some images waiting on TACC servers to be linked to the TORCH Symbiota Portal.

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

BAYLU = 0

BRIT = Searched all collections on 25 Apr 2022, with "Kingdom = Plantae," and collected in TX or OK):

BRIT-SMU-VDB-NLU:	175,924
TAC:	7,064
NTSC:	0
ACU:	0
HSU:	0

Sub-Total for BRIT Lead = 182,988

HUH = 49,369

KANU = A new instance of our database is uploaded to GBIF and iDigBio at the beginning of each month. This continues to be done for all transcribed records. **[for this count, assumed 27,565, from KANU's "Fully Transcribed Records" above]**

MO = N/A

NOSU = 0

NY = **[for this count, assumed ~ 84,500**; See table and comments under "Comments about digitization progress" section, above, for TX and OK specimens**]**

OKL = 0

OKLA = 0

SHST = 0 [Searched all collections on April 11th, 2022. All data is in DiscoverLife through John Pickering, and assumed that iDigBio would pick-up the records through their regular data-swapping.]

TAES = 0

TAMUCC = 0

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin	241,452
Angelo State University	0
Fort Worth Nature Center	0
Howard Payne University	26,804
Johnson Wildflower Center	0
Our Lady of the Lake University	0
Saint Edward's University	0
Sul Ross State University	0
Texas Lutheran University	7,578
Texas State University	0
UT RGV Brownsville	0
UT RGV Edinburg	0

TEX-LL Sub-Total 275,834

TTC = 22,479

UTEP = 27,573 **[assumed same as TORCH Portal number, searched Apr. 29th, 2022, collected in either TX or OK]**

Total number of records available in iDigBio portal (cumulative): 670,308*

*****[Note: This number is lower than that in the previous Quarterly Report (722,161) due to discrepancies in the way totals were reported from one report to the next. In the previous report, some institutions may have included taxa outside the scope of the TCN (such as bryophytes), or records available in the portal but from outside this TCN's region of interest (only Texas and Oklahoma)]

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

BAYLU = 50,658

BRIT = Searched TORCH Portal on 25 Apr 2022 for geographic distributions within each collection's profile, without taxonomic constraints, collected in TX or OK):

BRIT-SMU-VDB-NLU:	210,285
TAC:	7,064
NTSC:	11,322
ACU:	3,746
HSU:	3,965

Sub-Total for BRIT Lead = 236,382

HUH = 45,912

KANU = All KANU records uploaded to GBIF and iDigBio should be accessible via the TORCH portal. **[for this count, assumed 27,565, same as above]**

MO = N/A

NOSU = 981 (stub records waiting to be transcribed)

NY = **[for this count, assumed ~ 84,500, same as above]**

OKL = 137,026

OKLA = 70,229

SHST = 0

TAES = 238,854

TAMUCC = 0

TEX-LL (including Data-Provider Institutions) =

University of Texas at Austin	241,452
Angelo State University	58,157
Fort Worth Nature Center	1,918
Howard Payne University	26,806
Johnson Wildflower Center	3,271
Our Lady of the Lake University	0
Saint Edward's University	8,308
Sul Ross State University	30,538
Texas Lutheran University	7,587
Texas State University	0
UT RGV Brownsville	2,109
UT RGV Edinburg	0

TEX-LL Sub-Total = 380,146

TTC = 22,896

UTEP = 27,573

Total number of records available in TORCH Symbiota Portal (cumulative): 1,322,722*

***[Note: This number is lower than that in the previous Quarterly Report (1,338,840) due to discrepancies in the way totals were reported from one report to the next. In the previous report, some institutions may have included taxa outside the scope of the TCN (such as bryophytes), or records available in the portal but from outside this TCN's region of interest (only Texas and Oklahoma)]

Share Best Practices, Standards, and Lessons Learned

BAYLU: Teach transcribers about the help functions within Symbiota. Use the instructions as the sole basis for information additions.

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 to report.

Share Identified Gaps in Digitization Areas and Technology

KANU: For TORCH specimens that we overlooked during initial digitization, we have been using HerbASAP software for post-processing of images. That seems to be working pretty well and should save a tremendous amount of time for that part of the digitization process once fully implemented. We are still ironing out a few technical issues with the software.

MO: We have unfortunately still not been able to start on the TORCH specimens (a variety of staffing difficulties, technical issues with Tropicos, and COVID restrictions). We willbe doing a big push this summer for this project, though, in conjunction with efforts to image specimens from AR and TN to cut down on the amount of specimen sorting. So we should have some decent numbers for next update.

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. The TORCH TCN Data manager position is vacant as of November 2021, following the 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 will slow down our ability to move images for storage at TACC and thus delay uploading of images to the TORCH portal.

All other institutions: Nothing to report.

Share Opportunities to Enhance Training Efforts

BAYLU: Trained 5 student workers in early March – Symbiota transcription practices.

BRIT: We continue to host weekly zoom conversations with the Armchair Botanist program to engage Notes from Nature volunteers transcribing project specimens.

TORCH Staff have participated in Symbiota Support Hub meetings, and as well as targeted consortia-level data cleaning sessions offered by iDigBio (SERNEC).

NY: Digitization staff have taken advantage of a wide range of webinars and online conferences sponsored by New York Botaical Garden, iDigBio, Royal Botanical Gardens, Kew, etc. TORCH digitizer McKenna Coyle has now secured a full-time

position managing the database of the cryo collections at the American Museum of Natural History; her experience working on the TORCH grant was instrumental in helping her to obtain this position.

OKLA: P.I. attended monthly Symbiota support group meetings.

SHST:

Continue to train new members under Zena Smith, Trained by Roger Sanders at BRIT, pressing specimens.

Learned about Fungi from David Lewis

Offered additional weekly trainings on barcoding, imaging, and digitizing

Organizing more volunteers

TTC: The course subaward PI Johnson taught in Fall 2021 (Field Botany and Natural History Collections) was extremely successful in recruiting digitization assistants for the herbarium – six new assistants joined the Herbarium this quarter. As a result we have increased our capacity for imaging, transcribing, and georeferencing specimens.

All other institutions: Nothing to report.

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

The TORCH TCN Project held three virtual Executive Committee meetings during this reporting period (specifically, on March 1st, March 9th, and April 12th, 2022).

Project Manager Diego Barroso held 4 meetings with Bruce Hoagland and Todd Fagin, of OVPD/OBIS, to discuss data ingestion procedures (ingesting OVPD data into the TORCH Symbiota Portal). Also, Diego Barroso met with OKL and OKLA PIs to discuss procedures to improve data quality of the initial OVPD import into the TORCH Portal.

BRIT: Have held meetings to collaborate with the TORCH Steering Committee to organize the 2022 TORCH Annual Meeting, to be held in August 2022.

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

SHST: Exchanged specimen with University of Montreal Herbarium (MT) and botanical

research garden

TAMUCC: Texas A&M University (TAES)

TTC: A graduate student (Sherese Price) and PI Matt Johnson traveled to Oklahoma State University. We visited the Herbarium and Sherese sampled specimens for DNA extraction for her Master's project and Johnson gave a research presentation to the Department of Plant Ecology and Evolution.

All other institutions: Nothing to report.

Share Opportunities and Strategies for Sustainability

TAMUCC: Recycling discarded specimen folders or potentially reusing them if in good condition.

All other reporting institutions: Nothing new to report

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

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

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

TTC: PI Matt Johnson gave a research presentation to the Department of Plant Ecology and Evolution at Oklahoma State University.

All other reporting institutions: Nothing new to report

Other Education and Outreach activities:

BRIT: Hosted three virtual events as part of WeDigBio 2022 events (7-10 April 2022), providing a lecture/presentation and then guided transcription in the TORCH project in Notes from Nature. Lectures/presentations featured collecting expeditions in Colombia, a behind-the-science look at the BRIT Xylarium, and a highlight of the Specimens and

Expertise from the TORCH project (staff and volunteers). Total attendance: 50 people across 3 events.

TEX-LL: One class tour and one public tour, both including information on TORCH and digitization. In-person tours have generally been slow in recovering from disruptions caused during the pandemic.

TTC: TTC participated in a Ranch Day event at the National Ranching Heritage Center in Lubbock Texas, on April 2, 2022. This event was attended by over 4000 visitors, and is primarily an event for kids to learn about ranching heritage, ranching practice, and ranching science through a variety of activities. The TTC herbarium had a booth with example specimens that would be important for ranching, including native grasses that cattle would eat, poisonous and invasive plants. Kids were introduced to the importance of collections and the history behind labels. We also prepared about 400 pressed plants for kids to make their own “herbarium specimen” by gluing them to construction paper and writing a specimen label.

UTEP: UTEP created an exhibit on the life of Elsie Slater, a self-taught biologist who is recognized as the first El Pasoan to build a collection of pressed plants of the region's flora. This “Where We Will Grow” exhibit was shown at UTEP’s Centennial Museum from September 9th, 2021, through January 15th, 2022.

This is a link to photos from the exhibit:
https://www.utep.edu/centennial-museum/museum/past-exhibits/where-we-will-grow.html

and here is a link to the digital self-guided tour:
https://express.adobe.com/page/thsai4mzh5MQz/

We had QR code sign stops scattered through the gardens at places where there were species that matched the Elsie Slater collections. High resolution photos were used to connect present-day garden specimens with historical ones from the El Paso, New Mexico, and Mexico region.

We also used the georeferenced products from the TCN to create a map of Elsie’s collections in El Paso (see attachment; filename: UTEP-SlaterMap.pdf), and this map was one of the pieces showcased in the exhibit, along with QR codes that linked to locality pages with the high resolution images of specimens collected by Elsie.

Also, below is the link to the Slater Exhibit project on Arctos. In addition to art student projects, three of the students that worked on the TCN helped curate and produce the exhibit:

https://arctos.database.museum/project/10003615

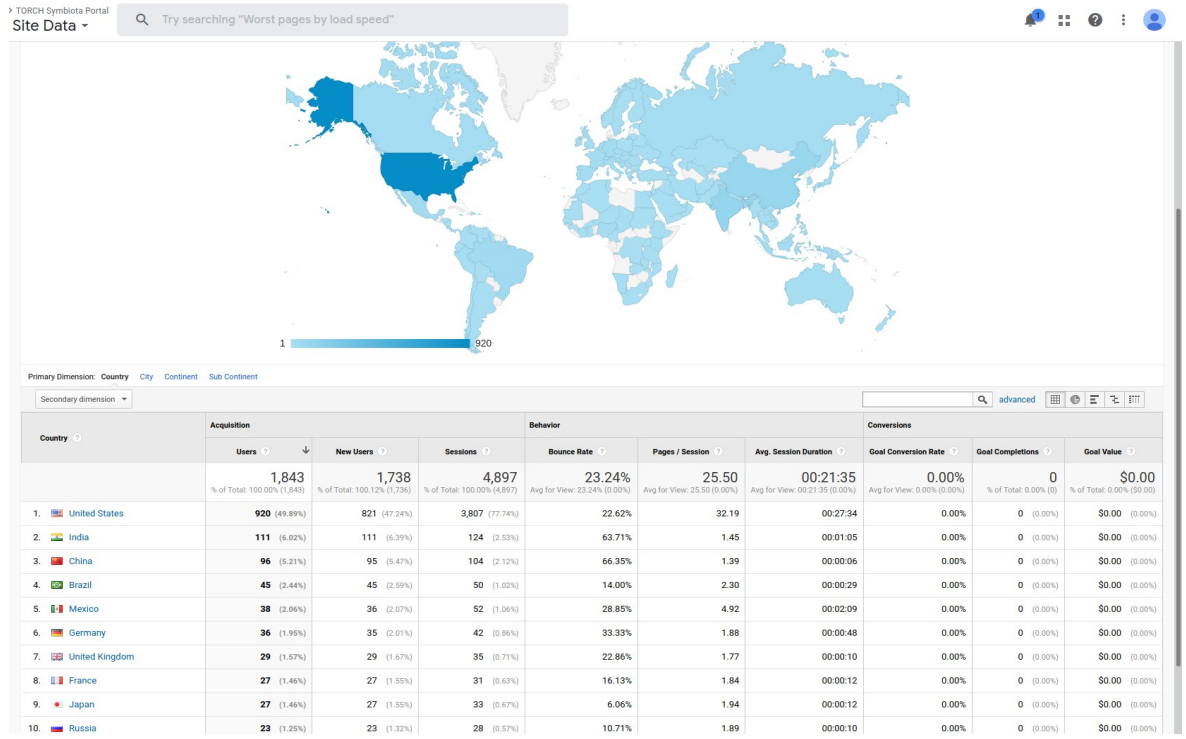
Many of the images from the TCN were used by the art class in Spring 2020 to create the pieces as part of the exhibit, since they couldn't visit the collections in person.

Most of the pieces have the exact specimens that are linked to the records, so now the pieces will show up on the record page, in addition to the project page:

https://arctos.database.museum/guid/UTEP:Herb:6622

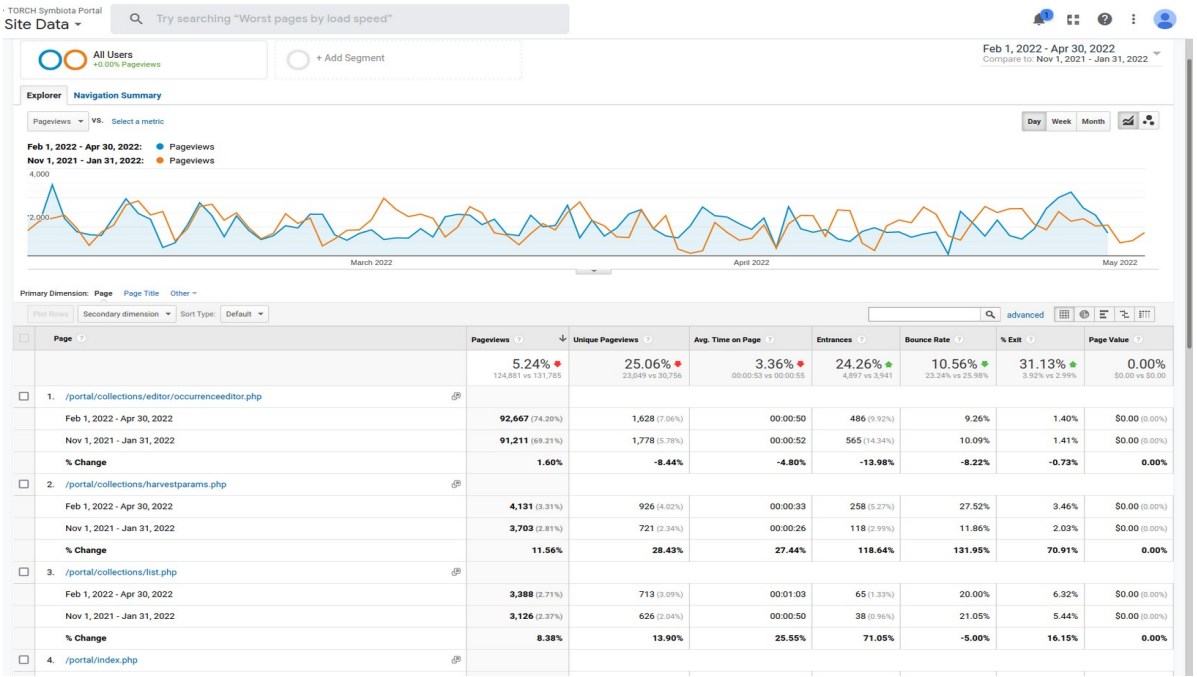
Share Information About Your Website and/or Portal Usage

Users by country, Feb. 1st , 2022 – Apr. 30th , 2022



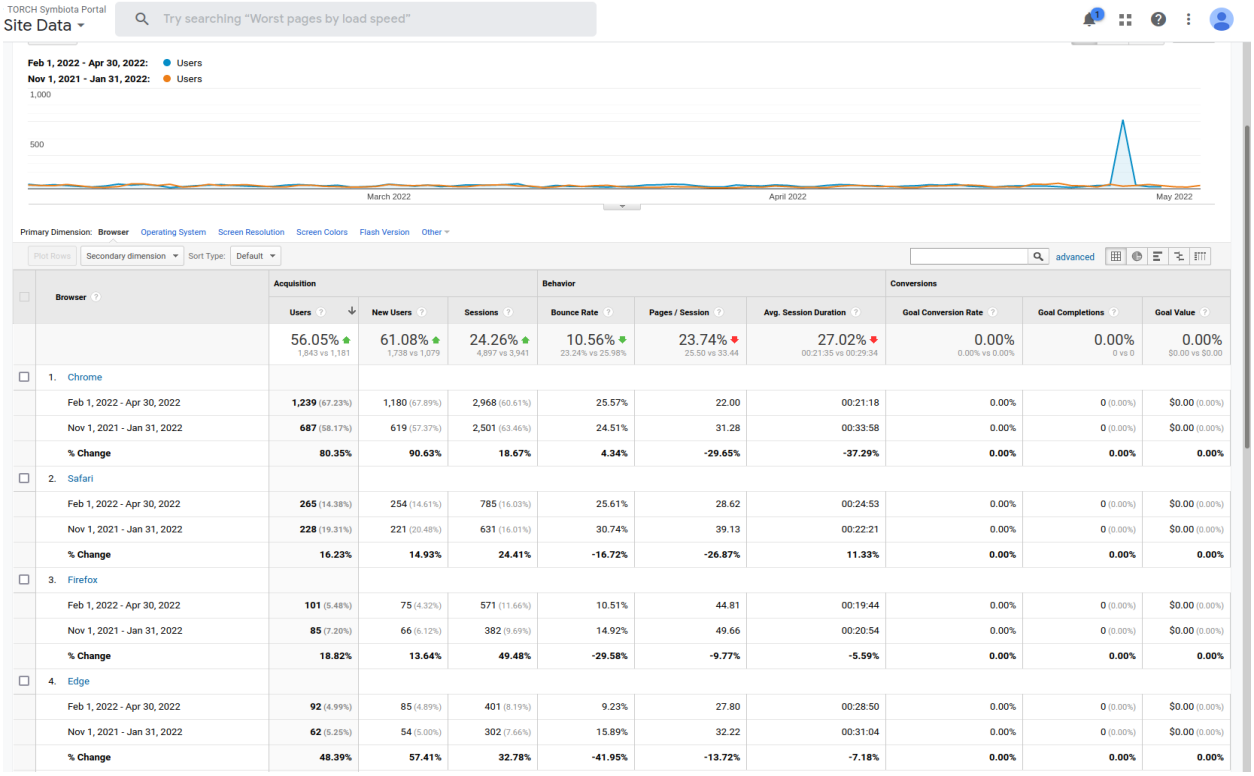
Country	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
	1,843 % of Total: 100.00% (1,843)	1,738 % of Total: 100.12% (1,736)	4,897 % of Total: 100.00% (4,897)	23.24% Avg for View: 23.24% (0.00%)	25.50 Avg for View: 25.50 (0.00%)	00:21:35 Avg for View: 00:21:35 (0.00%)	0.00% Avg for View: 0.00% (0.00%)	0 % of Total: 0.00% (0)	$0.00 % of Total: 0.00% ($0.00)
1. United States	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%)
2. India	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%)
3. China	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%)
4. Brazil	45 (2.44%)	45 (2.59%)	50 (1.02%)	14.00%	2.30	00:00:29	0.00%	0 (0.00%)	$0.00 (0.00%)
5. Mexico	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%)
6. Germany	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%)
7. United Kingdom	29 (1.57%)	29 (1.67%)	35 (0.71%)	22.86%	1.77	00:00:10	0.00%	0 (0.00%)	$0.00 (0.00%)
8. France	27 (1.46%)	27 (1.55%)	31 (0.63%)	16.13%	1.84	00:00:12	0.00%	0 (0.00%)	$0.00 (0.00%)
9. Japan	27 (1.46%)	27 (1.55%)	33 (0.67%)	6.06%	1.94	00:00:12	0.00%	0 (0.00%)	$0.00 (0.00%)
10. Russia	23 (1.25%)	23 (1.32%)	28 (0.57%)	10.71%	1.89	00:00:10	0.00%	0 (0.00%)	$0.00 (0.00%)

Pageviews and Avg. Time on Page. Comparison with previous Quarter.



Page	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
	5.24% 124,881 vs 131,785	25.06% 23,049 vs 30,756	3.36% 00:00:53 vs 00:00:55	24.26% 4,897 vs 3,941	10.56% 23.24% vs 25.98%	31.13% 3.92% vs 2.99%	0.00% $0.00 vs $0.00
1. /portal/collections/editor/occurrenceeditor.php							
Feb 1, 2022 - Apr 30, 2022	92,667 (74.20%)	1,628 (7.06%)	00:00:50	486 (9.92%)	9.26%	1.40%	$0.00 (0.00%)
Nov 1, 2021 - Jan 31, 2022	91,211 (69.21%)	1,778 (5.78%)	00:00:52	565 (14.34%)	10.09%	1.41%	$0.00 (0.00%)
% Change	1.60%	-8.44%	-4.80%	-13.98%	-8.22%	-0.73%	0.00%
2. /portal/collections/harvestparams.php							
Feb 1, 2022 - Apr 30, 2022	4,131 (3.31%)	926 (4.02%)	00:00:33	258 (5.27%)	27.52%	3.46%	$0.00 (0.00%)
Nov 1, 2021 - Jan 31, 2022	3,703 (2.81%)	721 (2.34%)	00:00:26	118 (2.99%)	11.86%	2.03%	$0.00 (0.00%)
% Change	11.56%	28.43%	27.44%	118.64%	131.95%	70.91%	0.00%
3. /portal/collections/list.php							
Feb 1, 2022 - Apr 30, 2022	3,388 (2.71%)	713 (3.09%)	00:01:03	65 (1.33%)	20.00%	6.32%	$0.00 (0.00%)
Nov 1, 2021 - Jan 31, 2022	3,126 (2.37%)	626 (2.04%)	00:00:50	38 (0.96%)	21.05%	5.44%	$0.00 (0.00%)
% Change	8.38%	13.90%	25.55%	71.05%	-5.00%	16.15%	0.00%
4. /portal/index.php							

Users by Browser. Comparison with previous quarter (note WeDigBio effect!)



TORCH Symbiota Portal
Site Data
Try searching "Worst pages by load speed"

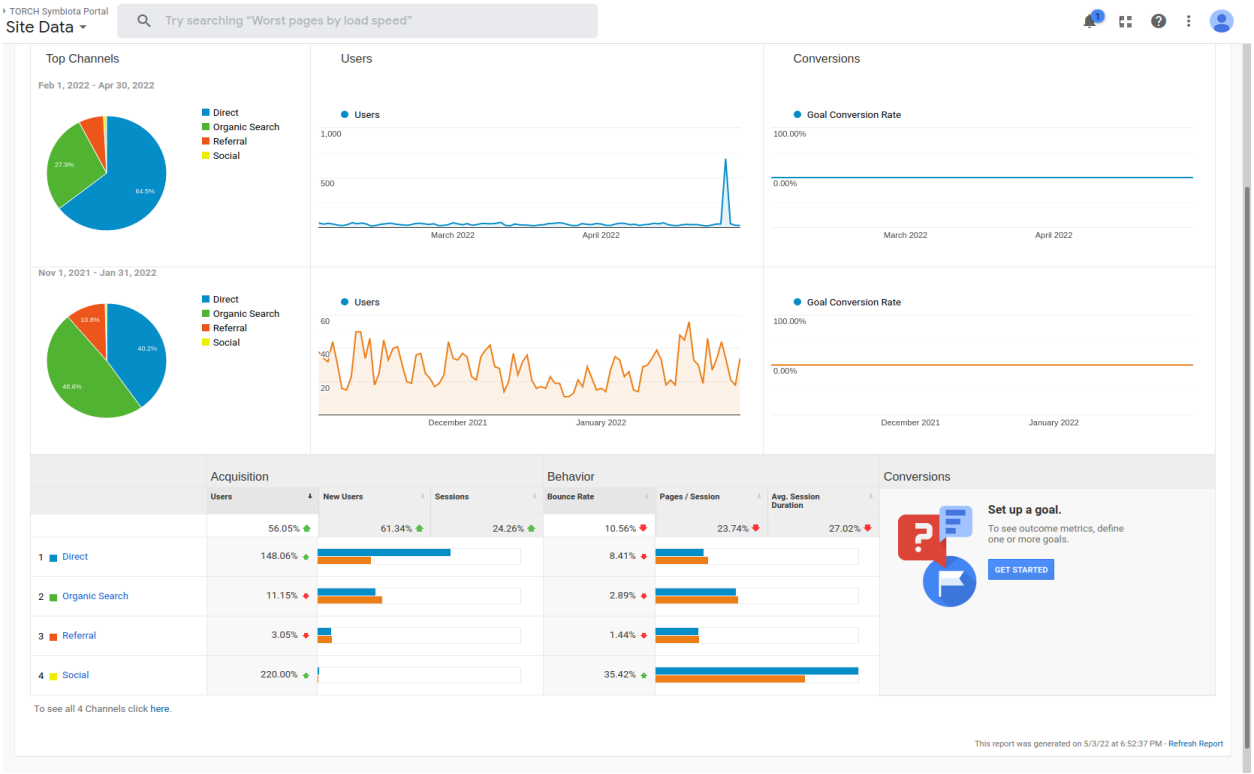
Feb 1, 2022 - Apr 30, 2022: Users
Nov 1, 2021 - Jan 31, 2022: Users

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

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

Browser	Acquisition			Behavior			Conversions		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
	56.05% 1,843 vs 1,181	61.08% 1,738 vs 1,079	24.26% 4,897 vs 3,941	10.56% 23.24% vs 25.98%	23.74% 25.50 vs 33.44	27.02% 00:21:35 vs 00:29:34	0.00% 0.00% vs 0.00%	0.00% 0 vs 0	0.00% $0.00 vs $0.00
1. Chrome									
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%)
Nov 1, 2021 - Jan 31, 2022	687 (58.17%)	619 (57.37%)	2,501 (63.46%)	24.51%	31.28	00:33:58	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	80.35%	90.63%	18.67%	4.34%	-29.65%	-37.29%	0.00%	0.00%	0.00%
2. Safari									
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%)
Nov 1, 2021 - Jan 31, 2022	228 (19.31%)	221 (20.48%)	631 (16.01%)	30.74%	39.13	00:22:21	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	16.23%	14.93%	24.41%	-16.72%	-26.87%	11.33%	0.00%	0.00%	0.00%
3. Firefox									
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%)
Nov 1, 2021 - Jan 31, 2022	85 (7.20%)	66 (6.12%)	382 (9.69%)	14.92%	49.66	00:20:54	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	18.82%	13.64%	49.48%	-29.58%	-9.77%	-5.59%	0.00%	0.00%	0.00%
4. Edge									
Feb 1, 2022 - Apr 30, 2022	92 (4.99%)	85 (4.89%)	401 (8.19%)	9.23%	27.80	00:28:50	0.00%	0 (0.00%)	$0.00 (0.00%)
Nov 1, 2021 - Jan 31, 2022	62 (5.25%)	54 (5.00%)	302 (7.66%)	15.89%	32.22	00:31:04	0.00%	0 (0.00%)	$0.00 (0.00%)
% Change	48.39%	57.41%	32.78%	-41.95%	-13.72%	-7.18%	0.00%	0.00%	0.00%

User Acquisition. Comparison with previous quarter (note WeDigBio effect!)



TORCH Symbiota Portal
Site Data
Try searching "Worst pages by load speed"

Top Channels

Feb 1, 2022 - Apr 30, 2022

Users

Conversions

Nov 1, 2021 - Jan 31, 2022

	Acquisition			Behavior			Conversions
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	
	56.05%	61.34%	24.26%	10.56%	23.74%	27.02%	
1 Direct	148.06%			8.41%			
2 Organic Search	11.15%			2.89%			
3 Referral	3.05%			1.44%			
4 Social	220.00%			35.42%			

Set up a goal.
To see outcome metrics, define one or more goals.
GET STARTED

To see all 4 Channels click here.

This report was generated on 5/3/22 at 6:52:37 PM - Refresh Report

Share Other Activities and/or Progress

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

UTEP: In addition to art student projects, three of the students that worked on the TORCH TCN helped curate and produce the Slater exhibit. Here is the link to the Slater Exhibit project on Arctos:

https://arctos.database.museum/project/10003615

See also the attached map (filename: UTEP-SlaterMap.pdf).

All other institutions: Nothing new to report.

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

BAYLU:
Albert Zertuche
Prof. Walter Holmes
Alejandro Ayala
Faith Bremer
Andy Conley
David Kwak
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, Collections Manager/Institutional Rep; trehman@brit.org
Jason Best, Director of Biodiversity 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

NOSU: We have finished imaging and I have a student that will be working on the transcriptions soon.

NY: McKenna Coyle, Lead Digitizer (now at the American Museum of Natural History)

OKLA: Four undergraduate workers continued transcribing.

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
Micheala Allen(Volunteer) Mra046@shsu.edu
Deja Williams (volunteer)Ddw052@shsu.edu
Rachel Alvarado(volunteer) Raa040@shsu.edu
Daniela Waiters (Volunteer) Dmw064@shsu.edu
Jayden Robinson (volunteer) Jdr085@shsu.edu
Chigbo Opara (volunteer) Cxo043@shsu.edu

TAMUCC:
Dr. Barnabas Daru
Jordan Rodriguez
Anna Swanson (new)

TTC:
New Undergraduate Digitizers: Kelly Mata, Samantha Thornton, Courtney Miller, Alexisari Martinez, William Onyedionu, Mara Hosaka

Continuing Undergraduate Digitizers: Norma Ruvalcaba

Undergraduate Coordinator: Chase Bergeron

Other Progress not listed above (anything else to share):
The TORCH TCN finalized the cohort of 20 interns for the upcoming 2022 TORCH Summer Internship program, with four interns at each of the five lead institutions. The internship will run from June 6th through August 12th.

TORCH TCN Technological Innovator Jason Best began discussions with Joseph Young, of Kuvio Creative, to start work on designing and implementing the TORCH Digitization Hub. The Hub will be a web-based application which will simplify the upload process for all participants and will provide quality control and file management features which will remove many existing workflow bottlenecks. Details of the contract and scope of work have been finalized, and Kuvio has been hired to begin work on the project in May.

Jason Best also began work performing OCR on images from the OKLA herbarium, in order to link them to the proper records from the Oklahoma Vascular Plant Database, using the accession number stamped on the herbarium specimen sheets.

BRIT:
Recruited for a new Digitization Technician to devote 20hr/week to TORCH digitization efforts. The selected individual will begin working on May 2, 2022.

Reviewed applications and selected 4 student interns for appointment at BRIT during summer 2022. Continued planning for summer internship program.

NY: We are done with our work on the TORCH TCN project.

OKL: We worked on preparing for the TORCH internship this summer.

OKLA:
Subaward work at University of Kansas is complete, as of end of October 2021.
Subaward work at New York Botanical Garden is complete as of end of March 2022.

All other institutions: Nothing new to report.

<u>Questions/comments</u>:

TTC: A big quarter for us!

All other institutions: None.

Anthony's Pass

on way to Tin Mines

Near Canutillo

Mundys Spring

Franklin Mountains

Mount Franklin

McKelligon Canyon

Near ASARCO

Newman Road

Elsie's House

Lower Valley

Upper Area

Juarez, along Rio Grande

Rio Grande Valley

Hueco Tanks State Park and Historic Site

Hueco Mountains

Helm's Ranch

Hueco Pass

along Carlsbad Highway (U.S. Highway 62/180)

0 1.5 3 6 9 12 Miles

N

Undergraduates working remotely with the UTEP Biodiversity Collections used data from preserved plant specimens to create this map of where Elsie went and collected. Now that more historical plant collections are mapped, scientists can see a better snapshot of the local plant diversity in the early 1900s and track changes in that diversity through time. Scan the QR codes around the map with your smartphone to peek at the species that Elsie documented around El Paso.

Do you recognize some of these places on the map? Retrace Elsie's steps on your next hike and start your own plant collections with iNaturalist on your smartphone!

iNaturalist

Scan me!

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 (February through April 2022) falls within Year 3 of the TPT project. The last overarching annual report was submitted to NSF on July 30, 2021. 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. We have also made the most of this unusual time to be very active and creative with outreach, networking, citizen science, and public engagement activities.

Of special note: **Yale Peabody Museum (YPM) has **completed & exceeded their digitization goals**! **

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
ANS	5,842	359	6,463	1,226
BPBM	20,872	4,900	19,103	9,800
BYU	2,597		2,597	
CAS	19,923	1,852	472	
CU	9,995			1,758
FMNH	6,428	809	45,096	80
HWML	19,943		3,666	
INHS	21,559	348	10,813	5,296

Institution	Transcribed records	High resolution & pinned images	Scanned slides	Scanned vials
MPM	2,609		1,228	1,500
MSB	1,617	618	1,500	2,140
MSU	11,902		1,100	
OSU	2,254		2,254	
PERC	8,905	8,905		
PSU	20,126		2,139	1,411
TAMU	67,445		6,773	13,595
UH	5,018		3,402	
UM	111,745	259	42,283	
UMSP	56,252		94,495	
UNH	10,500	2,125	10,500	1,763
UU	13,000		15,000	
UWSP	7,494		8,347	
WIRC	23,668	26,219	5,772	2,327
YPM	17,607	325	3,409	2,581
Totals	**470,682**	**49,380**	**286,412**	**41,977**
Total records	**848,451**			

So far, TPT has completed 36 Notes from Nature expeditions and transcribed 142,071 slide images with the help of volunteers. We currently have two active expeditions from UU, *Jumping into the Field Museum Flea Collection 5.0* and *Flea Circus III*.

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. Most 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.

FieldGuide. The Phthiraptera (lice) taxonomy and images have been imported into Field Guide and testing of a new AI neural network model workflow has begun! Results of the model testing for the Phthiraptera datas are expected soon.

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. The TPT symbiota portal has launched (https://s2.parasitetracker.org/). We are still working on uploading the taxonomic backbones for the parasites and associated hosts so that we can attach specimen records. We expect this will be completed soon. Otherwise the website is fully functional. 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

While TPT network members continue to progress toward their digitization goals, COVID-19 and the new variants that keep emerging have notably impacted our original digitization timelines. The network continues to struggle with staffing issues, as many institutions had limited, or highly restricted collection access, and on top of dealing with frequent changes in institutional policies to try and keep everyone safe during the pandemic. The combination of access restrictions, fluctuating policies, and smaller student and faculty populations allowed on many campuses, have made it challenging to find reliable staff, student, and volunteer help for the TPT project. With fewer people working in person at many institutions, finding appropriate IT help when needed has additionally contributed to some productivity delays.

The pandemic has also impacted many planned outreach and educational activities, but the TPT network has been very creative in overcoming these challenges. Not only have we made the best of a situation we have little control over by continuing to make collections and parasite science available and accessible, but in many ways we have used this pandemic to create resources and activities that are even more versatile, robust, and meaningful, than we ever may have thought to do without the pandemic pushing us to expand our capabilities.

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

(BPBM) A new collection manager was hired at BPBM. While PI Neal Evenhuis has been doing a wonderful job keeping the project running despite humongous challenges, the BPBM collection has been without their full complement of staff (i.e., collection manager) since the passing of Dr. Jim Boone in mid 2021. This will greatly assist the project moving forward at BPBM and help motivise and lift everyone's spirits.

(CAS) PI Grinter has developed a new slide scanning workflow that coopts an unused botany Scanner and greatly expedites the scanning process. This includes new mini matrix codes for the slide catalog numbers. This will greatly expedite digitization at CAS.

(FMNH) is working closely with FMNH to iron out some issues and improve workflows now that people can get back in the collection. FMNH has brought on a number of new people to work

on TPT, including: 2 fulltime employees, and 1 part time photographer, and 9 volunteers. We are also sharing task management and analysis protocols used at MPM, which should greatly help FMNH improve and track productivity.

(INHS) Four new students have been hired at INHS to work on TPT. There have also been some issues with the IPT server, but INHS is working with GBIF's IT staff to get the issues resolved.

(OSU) MPM is working with OSU to improve the slide processing portion of the digitization workflow. Another student will need to be hired, as the current one recently graduated and left the project.

(PSU) PI Porturas has hired three new students to work on TPT and an additional student has recently returned to work after being on medical leave.

(TAMU) The team at TAMU has nearly completed processing their "hidden" ectoparasite data and has started writing up procedural documentation, which will be helpful for more efficiently processing ectoparasite contents in the future.

(UNH) One undergraduate was trained in CLMS 3D imaging. PI Miko has also developed a Google map leaflet plugin based area query for web interfacing in Drupal. This will be used for the "What bites you on your hike in NH?" web resource.

(UU) PIs are continuing to make progress on an updated host-parasite checklist for the order Phthiraptera and have hired a new person to work on building the list. More students are still needed for digitization efforts though. Thanks to the TPT project, several thousand specimens belonging to the Bishop Museum were found in the UU collection and will be returned shortly.

(UWSP) Two new undergraduates and one new high school student were hired for the spring semester and an additional summer technician is in the process of being hired to help with SCAN data quality control and georeferencing. PI Orlofske received training on a new campus cloud backup system to store digitized images and is proactively working on developing a workflow for backing up scans, images and associated data to the new system. PI Orlofske has also provided a demonstration training session on SCAN for other UWSP curators and two research students exploring options for their collection and digitizing projects.

(UM) A new collection manager, Taro Eldrege, was hired in April. PI OConnor will continue to manage the project at UM, but Eldrege will be helping oversee student technicians working on all digitization projects in the museum. Plans are being made to hire new technicians and MPM is working closely with UM on bringing Taro up to speed.

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 recently submitted **NSF TCN iDigBees** proposal sharing workflows as well as digitization and project management insights and expertise. In addition, members of TPT are lending expertise to the **USDA funded National Bee Monitoring RCN**. 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 are working with and helping organize and plan the NSF funded Entomological Collections Management Workshop for 2022. This is the first year the workshop will be adopting a hybrid implementation, due not just to COVID concerns, but also in order to make the course more accessible to a broader and more diverse student population. This workshop is the only one of its kind for the entomological community and is extremely important in training the next generation of collections managers - many of whom will be implementing digitization protocols at their institutions. With TPT's assistance, this year's curriculum will incorporate more modern collection management techniques with an emphasis on 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) is collaborating with Hassan Dawah of the National Museum of Wales and providing 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 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 is playing an important role in the upcoming 2022 Entomological Collections Management Workshop. In addition to TPT members presenting at the workshop, PI Zaspel (MPM) has been 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 the perfect 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 newly submitted iDigBees TCN proposal 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 or inter-institutional communication and collaboration between experienced TCN participants and newer ones to facilitate sustainability, productivity, and reduce stress for everyone involved.

This quarter, the TPT group has been working closely with GloBI creator Jorrit Poelen, to produce a much needed “how-to” page (https://www.globalbioticinteractions.org/how-to) on GloBI. GloBI continues to be an amazing resource for the scientific community, but it can often be a bit challenging to navigate and find a particular resource needed. The new ‘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.

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

This quarter, the Frost Entomological Museum (PSU) has given tours to approximately 50 people (public requests & classroom visits), all of which have been led past staff actively digitizing the parasite collection. This allowed for the opportunity to share with non-scientists how and why collections digitize specimens and what can be learned from the historical data unlocked.

PI Miko (UNH) created a new interactive educational exhibit about Bird Lice. 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 collection crawl event for the public. More than 300 people visited the museum collection to learn about the museum and the work TPT has been doing as well as participate in fun family activities.

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.

Share Information About Your Website and/or Portal Usage

To date, the TPT Notes from Nature project has completed **36 expeditions, 142,073 transcriptions** for 43,542 unique specimens, and provided learning experiences for **2,098 citizen Scientists** and **volunteers**. TPT Notes from Nature statistics: https://www.zooniverse.org/projects/md68135/notes-from-nature-terrestrial-parasite-tracker.

The latest GloBI report included all TPT collections and collaborators indexed as of October 15, 2021. The total number of interactions included in this reporting period is **427,775** records (500,000 interactions is the overall goal for TPT). The full TPT biotic interaction dataset published on Zendo has been **viewed 789 times** and been **downloaded 294 times:** https://zenodo.org/record/5572874#.Yeck61jMKGR.

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 2 faculty and 3 undergraduate students wrote an abstract that was accepted to the American Society of Parasitology meeting to be presented in July (UWSP).

- A team of 5 undergraduates wrote an abstract for a presentation for the UWSP campus symposium to be presented in May (UWSP).

Publications in Prep

Papers that are currently in progress and being developed:

- Enhancing visibility and sustainability of taxonomic resources. Led by Kat Sullivan (MPM).
- Biotic host associations confidence paper. Led by PI Julie Allen (UNR).
- Computer learning to examine differences between GloBI and literature association data. Led by PI Seltmann (UCSB).
- Checklist of Illinois Ixodida. led by INHS masters student.