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

November 2021

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

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☒ DigIn	☒ MiCC	☒ TORCH
☐ Endless Forms	☐ oVert	☒ TPT
☒ ESB	☒ PCC	

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

~~Cretaceous World~~	~~LBCC~~	~~SERNEC~~
~~EPICC~~	~~MaCC~~	~~TTD~~
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TCN Quarterly Progress Report

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

TCN Name

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

Person Completing the Report

Katja C. Seltmann, Pam Horsley & Crystal Maier. This is the cumulative report for the Big-Bee project. Individual institution reports can be found at: https://drive.google.com/drive/folders/1XKkI0GdsY0CrE03QMl2LRwijftsN4ldX?usp=sharing

Share Progress in Digitization Efforts

- The start date for the Big-Bee project was 15 Sept 2021.
- Institutions are just getting started and the project is getting organized.
- Prioritization of higher taxa established to leverage the network effects of having multiple institutions digitizing the same taxa. Andrenidae will be the first family to digitize.
- UNR, FSCA subcontracts have been set up with UCSB. LACM waiting for subcontract to be finalized. Consultant (Jorrit Poelen) contract with UCSB is set up.
- UMMZI changed PIs and are hiring a new collection manager.
- UCSB, LACM, SDMC, SEMC, UCMC, MCZC are in the process of hiring digitization staff and students.
    - SEMC is hiring Hispanic Graduate Student, Andres Motta Herrera, to start on January 2022
- FSCA, EMEC, UNHC have finished hiring staff or students.
- MCZC focused the first quarter on pre-curation of specimens in the collection. MCZC Co-PI Maier began standardization of data entry for species association data in MCZbase.
- MCZC Co-PI Maier and SDMC PI Horsley set standards for all-network metrics reporting and project management for Big Bee.

- Gathered baseline bee digitization data and created templates, file naming conventions, google calendar with reporting dates, and Slack channel for periodic metrics reporting. Reporting spreadsheet can be found at https://docs.google.com/spreadsheets/d/1twhePUfhI0tZ28LcwAocJLXrlAYzZ4apJYc5_UKm8X4/edit?usp=sharing

- Standardized imaging trays were cut and shipped from Essig to Big-Bee digitizing partners. Each institution assembled their own imaging boxes and are testing the imaging setup. A standardized ruler was evaluated for accuracy and included on the imaging boxes (Figure 2). The imaging boxes and ruler are used for imaging labels and dorsal views of specimens.
- UNHC trained two students in male genitalia dissections and high resolution imaging using a compound microscope system. Institutions and bee labs with potential candidate specimens were contacted for further dissections.
- UNR, UCSB and the entire network started developing Notes from Nature measurement tool for measuring bee body size. Notes from Nature will be used for both transcribing label data and measuring the length of the space between the bee tegula. Each measurement also has to be calibrated with a ruler included in the image (see Figure 1, below).

Figure 1: Although very early in the project we have significant results including the Notes from Nature (NfN) measurement tool under development (Fig. 4). With this tool, NfN users will calibrate a ruler using the included scale bar before measuring the body size of a bee.

- Big-Bee collections are now integrated into Global Biotic Interactions including an integration page https://www.globalbioticinteractions.org/bigbee/
- Big-Bee Symbiota Database has been set up and the first collection, ASUHIC has been added. https://library.big-bee.net/portal
- EMEC created standardized imaging workboxes for Big-Bee TCN partners, along with a video on work box assembly (https://youtu.be/JtElelNcw2Y).

- Specimen digitization has just begun but a few collections are already making great progress.
    - FSCA databased 200 specimen records and produced 85 extended-focus images
    - ASUHIC has digitized 4,683 specimens

Share Best Practices, Standards, and Lessons Learned

- Macropod imaging system includes parts (lens, laptops) that are on backorder because of shipping chain supply issues. All institutions receiving a Macropod have started the process with their institutions. Systems are expected by January 1, 2021.
- We are moving forward with the label and dorsal specimen imaging (Figure 2) first as this does not require the Macropod imaging kit.

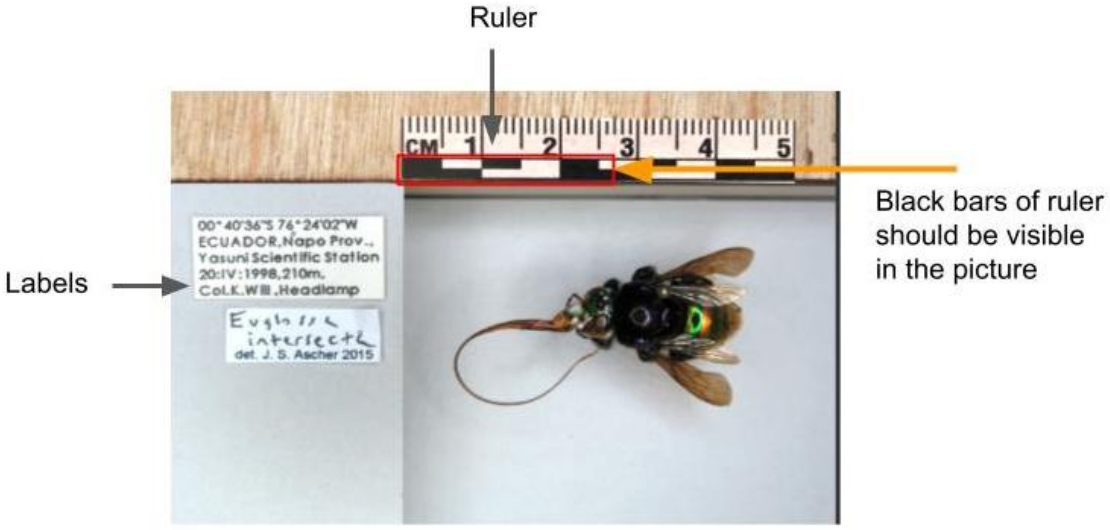

Figure 2: Label with Dorsal Specimen Images standards are under development

Share Identified Gaps in Digitization Areas and Technology

Nothing to report at this time.

Share Opportunities to Enhance Training Efforts

- We are having weekly Zoom project meetings on Wednesday @1:00PT to discuss digitization workflows and help collections get up and running. Meetings are recorded and posted for participants who could not attend.
- Using Big-Bee Slack channel and shared Google Drive for communication. We presently have 100% participation from partner institutions on Slack.

- Created a project GitHub (https://github.com/Big-Bee-Network).
- Sharing videos about digitization set-up to help collections new to digitization.
- LACM, UCSB, ASUHIC, SDMC, UNHC attended September 2021 ADBC Virtual Summit.
- LACM, MCZC, UNHC, CAS, SDMC attended Entomological Collections Network Meeting
- UCSB, ASUHIC attended TDWG meeting 2021, October 18-22

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

- (October 2021): A Big-Bee PEN grant with PI Dr. Keng-Lou James Hung, Assistant Professor, University of Oklahoma. This is the first ADBC proposal written by Dr. Hung.
- (November 2021): UCSB PI Seltmann was invited by Steve Bascoff (Data Science and Data Curation Specialist, Jean & Alexander Heard Libraries, Vanderbilt University) from the Audubon Core Maintenance Group to include Big-Bee as a use case for standardized image views.
- MCZC talked with two institutions, Montana State University (Michael Ivie) and Purdue University (Ian Kaplan/Aaron Smith) were interested in learning more about the project and potentially contributing bee data to the network.
- CAS fielded an email from The Hebrew University of Jerusalem (Guy Bloch, PhD), who inquired about collaborating with Big-Bee and accessing trait data, connecting them with Katja Seltmann.
- CAS connected Kit Pendergast (University of Western Australia) with the Big-Bee website and team, she is conducting research on bee traits and is looking for data.

Share Opportunities and Strategies for Sustainability

Nothing yet to share.

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

- (October 2021): UCSB was approved to be a Bee Campus USA (https://beecityusa.org). This program supports local pollinator conservation and education. It is student run and a UCSB Undergraduate student was hired to coordinate planting of pollinator gardens and outreach locally.
- (October 2021): Article about the Big-Bee project was published in the San Francisco Chronicle (https://www.sfchronicle.com/climate/article/To-help-fight-loss-of-bees-California-Academy-of-16570034.php#photo-21637687)
- (October 2021) UCSB Current Article https://www.news.ucsb.edu/2021/020448/creating-buzz

- EMEC hosted a tour of a UC Berkeley undergraduate class, “ESPM105 - Natural History Museums & Biodiversity Science” (35 students), focusing on specimen digitization and using the Notes From Nature citizen science transcription portal. Students are each required to spend at least 30 minutes transcribing labels on Notes From Nature.
- MCZC hosted tours and outreach for five Harvard College Entomology and General Biology classes in order to garner interest and recruit student interns for projects (2 candidates identified).
- SDMC gave a tour to Biologists from Cabrillo National Monument and discussed the Big-Bee Project with them and possible collaboration.
- UNHC conducted a tour and outreach for introduction to biology (BIOL 412), Forest Entomology (NR 506) classes in order to recruit student interns for projects (Bode is from the forest entomology class).
- UNHC created a public display in Spaulding Life Science Center with 3 exhibits are ongoing presently including an exhibit about insect morphological diversity using CLSM that includes CLSM images of bee male genitalia.
- Coordinated with CAS press office (Skylar Knight, Communications Associate) for a Big-Bee press release, slated to come out in collaboration with UCSB press office.

Share Information About Your Website and/or Portal Usage

- Began the Big-Bee website (http://big-bee.net)
- https://www.globalbioticinteractions.org/bigbee
- The Big-Bee portal, or Bee Library (https://library.big-bee.net/portal) is under development.

Share Other Activities and/or Progress

(September 2021): Presented at the iDigBio Summit meeting.

Big-Bee iDigBio Wiki page has been updated:
https://www.idigbio.org/wiki/index.php/TCN:_Extending_Anthophila_research_through_image_and_trait_digitization_(Big-Bee)

(October 2021): Presented at the TDWG meeting with published abstract
Seltmann KC, Allen J, Brown BV, Carper A, Engel MS, Franz N, Gilbert E, Grinter C, Gonzalez VH, Horsley P, Lee S, Maier C, Miko I, Morris P, Oboyski P, Pierce NE, Poelen J, Scott VL, Smith M, Talamas EJ, Tsutsui ND, Tucker E (2021) Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization. Biodiversity Information Science and Standards 5: e74037. https://doi.org/10.3897/biss.5.74037

The full proposal can be found online at: Seltmann, K. C. (2021). Extending Anthophila research through image and trait digitization (Big-Bee) proposal. UC Santa Barbara: Cheadle Center for Biodiversity and Ecological Restoration. Retrieved from https://escholarship.org/uc/item/2vm761mv

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 (0.1) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5557670. Data publication that includes full UCSB Invertebrate Zoology Collection image corpus.

Seltmann, K., Allen, J., Brown, B. V, Carper, A., Engel, M. S, Franz, N., et al. (2021). Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization. Biodiversity Information Science and Standards, 5(e74037). Retrieved from https://escholarship.org/uc/item/0937b5gp. Poster from TDWG 2021 Conference.

Oboyski, et al., 2021. “Advances in capturing and parsing label data from images using OCR and machine learning techniques”. Entomology Collections Network Annual Conference.

SEMC will present the Big-Bee initiative at the XII Mesoamerican Native Bee Meeting (Nov 4-6, 2021) http://www.cinat.una.ac.cr/cman2021/. This meeting attracts numerous researchers from Latin America and the Caribbean. The presentation will be in Spanish.

CALIFORNIA PHENOLOGY TCN – QUARTERLY REPORT – NOVEMBER 2021

Assembled by Katie Pearson, 1 November 2021

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.

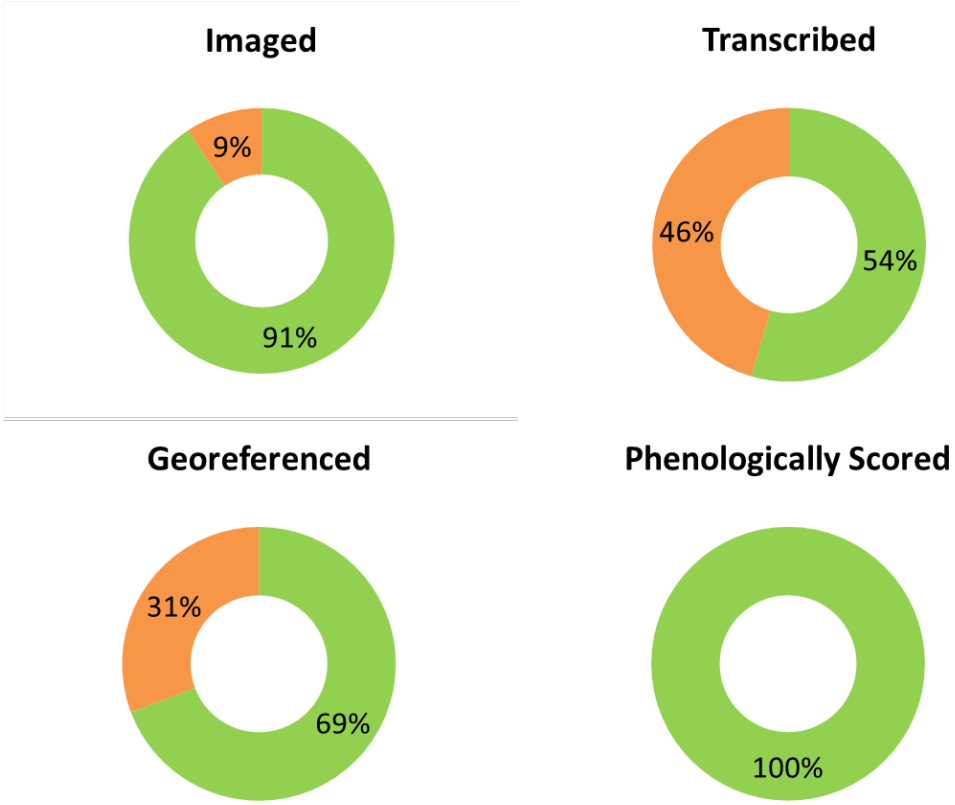

Figure 1. Progress in each of our four major digitization goals. Totals represent the original goals of the CAP grant: 902,400 specimens imaged and phenologically scored, and 300,000 transcribed and georeferenced. Additional specimens to be digitized by the PEN grant are tabulated in the PEN section 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 163,000 specimen records have been transcribed across the CAP Network since the beginning of the project. This is approximately 54% of our goal.

Transcription has largely been accomplished by institutional volunteers and technicians in CCH2 and online volunteers in Notes from Nature.

GEOREFERENCING

We have georeferenced over 207,000 specimen records, which is 69% 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 cross-institution herbarium digitization course led by Cal Poly. The CAP 100 Club currently has 28 active members. We have also continued to use the code we developed to convert township, range, section data into decimal coordinates to apply georeferences to specimens from other states, as they are transcribed.

IMAGING

Twelve of our 22 herbaria (55%) have accomplished their imaging goals (Figure 2). All herbaria have resumed imaging following COVID-19-related shutdowns. Figure 2 shows the current state of CAP imaging as of July 2021.

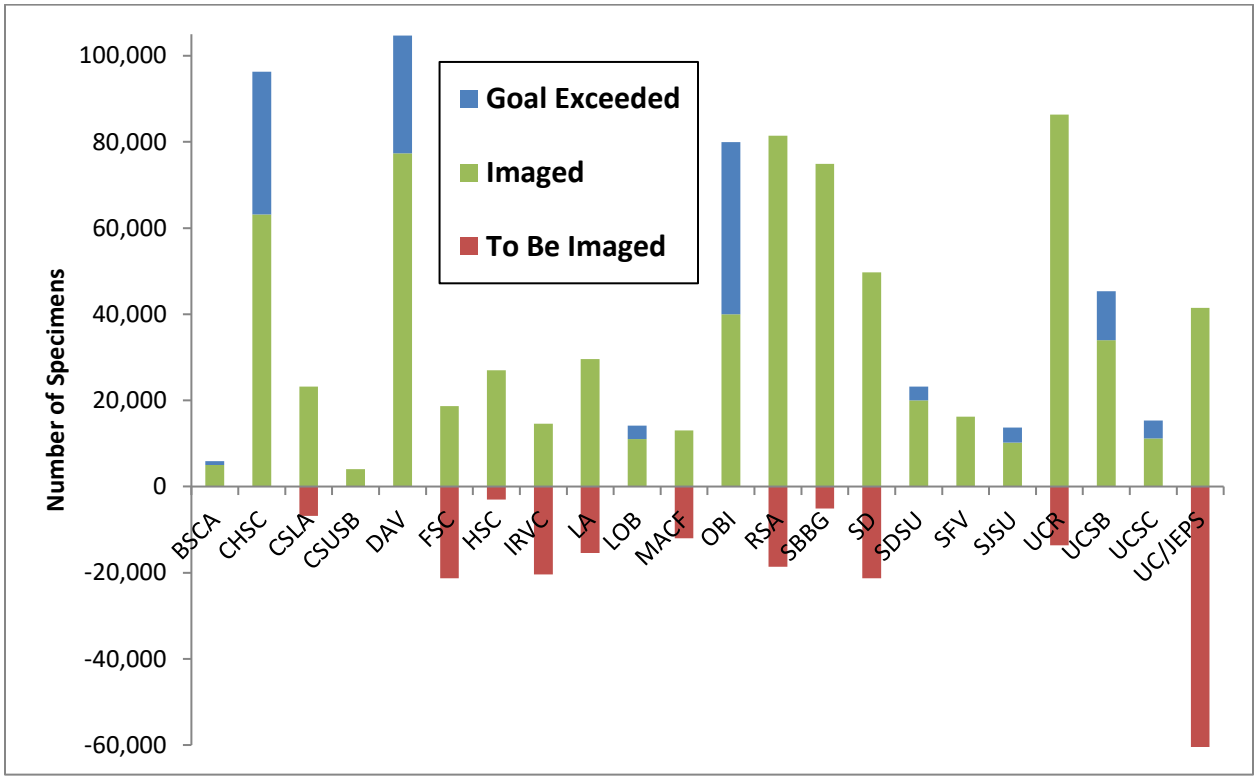

Figure 2. Herbarium specimen imaging progress. Blue portions represent the number of specimens that have been imaged, while green portions represent the number of specimens that have been imaged beyond the expected target specimens. Red bars below the zero line indicate the number of target specimens that have not yet been imaged.

PEN PROGRESS

OSC, SFSU, and SHTC are continuing to image specimens as expected and have completed 76%, 11%, and 1% of their imaging goals, respectively. CDA is continuing to work on acquiring imaging equipment. Figure 3 shows the current imaging progress at PEN institutions.

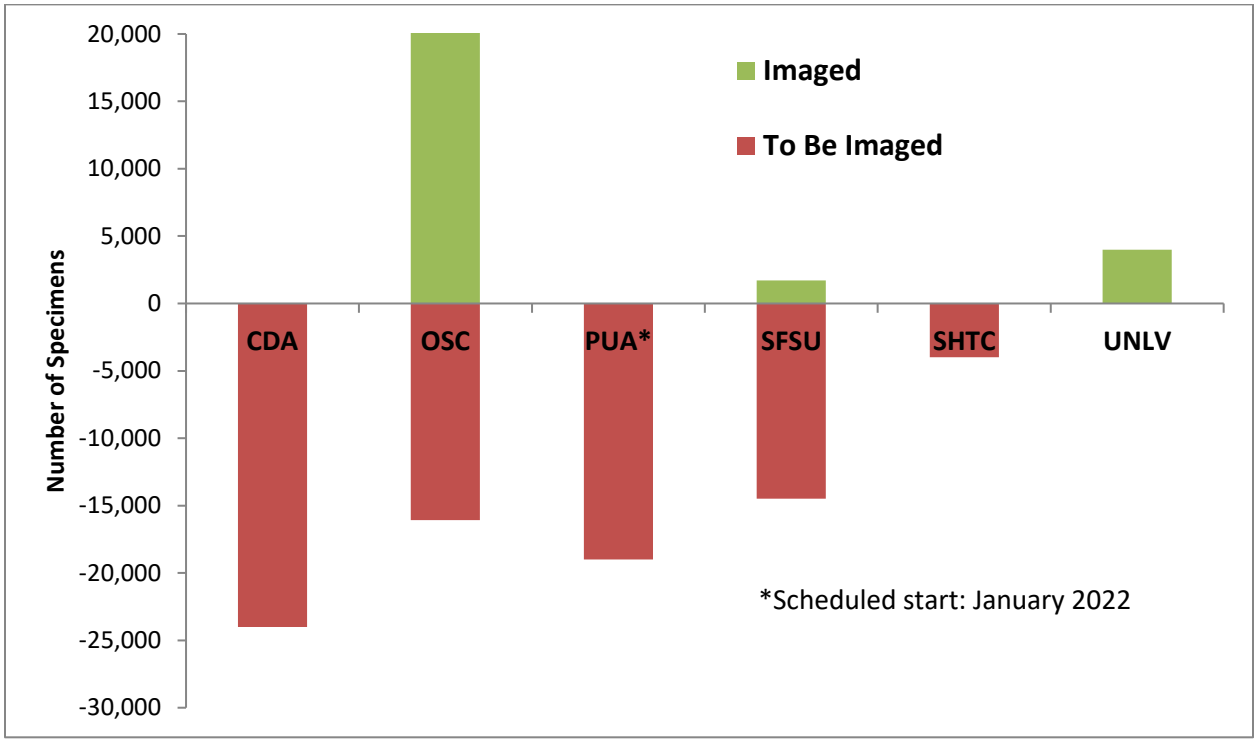

Figure 3. Herbarium specimen imaging progress for the seven PEN institutions. Green portions represent the number of specimens that have been imaged, while red bars below the zero line indicate the number of target specimens that have not yet been imaged. For SD, the total number of specimens to be imaged,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

We drafted a charter for our proposed TDWG Task Group to develop data standards for plant phenology, and we were approved as an official TG on October 19. We introduced our TG in a presentation at the TDWG 2021 conference to recruit new members and participation in our first TG meeting, scheduled for November 3.

IDENTIFY GAPS IN DIGITIZATION AREAS AND TECHNOLOGY

We are continuing to discuss long-term sustainability and cost of storing image data, which is a major need for some institutions that have lost their previously unlimited cloud storage solution (Box).

SHARE AND IDENTIFY OPPORTUNITIES TO ENHANCE TRAINING EFFORTS

In early October, the PM visited UC Irvine, CSU Fullerton, and UC Los Angeles to conduct in-person trainings and help coordinate the activity of new students. CSU Fullerton and UC Los Angeles experienced significant shutdowns due to COVID-19, and as a result, when they could finally resume imaging, all experienced students had moved on, and new students had to be trained. At CSU Fullerton, the PM helped to troubleshoot the imaging equipment, which was not functioning as expected after it had been moved to the new temporary workspace. Then, in addition to training to new interns, we coordinated an all-day "Image-a-Thon" in which groups of two to three students visited the herbarium every hour, received a tour and introduction to the herbarium, received basic training in how to image specimens, and imaged for the remainder of the hour. In this way, over 30 students received an in-person introduction to the collection and learned digitization skills. At UCLA, interested students were invited to participate in a group workday, in which we barcoded and imaged specimens as a group and discussed herbarium research and the collection process. Over 12 students participated during the day, and we barcoded over 1000 specimens in the process.

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 launched a webinar series for the Consortium of California Herbaria community called "Data Portal Lunch Breaks". 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.

We have also initiated monthly meetings of the Consortium of California Herbaria, in the place of monthly meetings with individual PIs (though individual meetings are still scheduled on an as-needed basis). The CCH meetings engage a broader audience (all CCH members, rather than just CAP Network participants) and provide updates on community developments, give announcements, and facilitate discussions on important matters to the CCH community, such as sustainable image storage.

We began the fall 2021 quarter of our online herbarium digitization course, which currently engages 33 students from 5 institutions. In this class, students learn about herbarium and digitization topics and are trained in online digitization tasks, starting with Notes from Nature transcription and transitioning into transcription directly in our Symbiota portal (more info in E&O section below).

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

We have expanded our recruitment for members of our TDWG Task Group to develop data standards for plant phenology, as recommended by TDWG leadership. To date, we have recruited representatives from Argentina (GBIF Latin America), France (CIRAD), Sweden (University of Oslo), Germany (University of Munich), and Australia (ClimateWatch).

The Consortium of California Herbaria is continuing to work with Calflora to enable users to download data including CCH data directly from Calflora.

PM Pearson continues to advise the new GLOBAL Lichens and Bryophytes TCN on matters of reporting, georeferencing, coordinating WeDigBio events, and other needs.

We integrated California vascular plant data from the University of Nevada, Reno and from the Smithsonian Institution National Museum of Natural History into the CCH2 portal to provide a more comprehensive database of California specimens.

We met with leadership of the California Digital Library to discuss potential archival image storage for California institutions,

SHARE AND IDENTIFY OPPORTUNITIES AND STRATEGIES FOR SUSTAINABILITY:

In the spring 2021 quarter of the online herbarium digitization course (see E&O activities, below), one of our collaborators (Robin Bencie, Humboldt State) sat in weekly to learn how to run the course in the future, when the CAP TCN no longer has a project manager. In the current fall quarter, another collaborator (Alison Colwell, UC Davis) is sitting in for the same purpose. The intent is to have various collaborators across the Consortium of California Herbaria run the course for a quarter at a time to continuously engage students in herbarium work and make continued progress on digitization tasks.

We are strategically expanding our community outreach to engage potentially new portal users. We presented posters at the Ecological Society of America meeting on August 5, the Biodiversity Digitization 2021 conference on September 22, and the Southern California Botanists Symposium on October 16. We presented a lightning talk at the California Invasive Plant Council 30-Year Anniversary Symposium on October 27. In addition, we collaborated with the Symbiota Support Hub to lead a workshop at the Ecological Society of America meeting on August 6 titled “Connecting Ecology and Natural History Specimen Data: Using Tools in Public, Symbiota Data Portals”. We taught 10 ecologists how to access and use Symbiota portals, including CCH2, to access and work with biodiversity specimen data.

We drafted a charter for our proposed TDWG Task Group to develop data standards for plant phenology, and we were approved as an official TG on October 19. We introduced our TG in a presentation at the TDWG 2021 conference to recruit new members and participation in our first TG meeting, scheduled for November 3. Development of phenological data standards with this TG will be an important milestone for ensuring the data captured as part of our project is findable, accessible, interoperable, and reusable into the future.

We met with leadership of the California Digital Library to discuss potential archival image storage for California institutions. The price and support for this image storage solution is tremendously improved from other solutions, so this collaboration looks promising for our institutions that are currently struggling with sustainable storage.

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).

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

Five Notes from Nature expeditions are ongoing, consisting of 9,655 specimens from Cal Poly, Cal State LA, UC Los Angeles, Fresno State University, and Oregon State University. Volunteer activity was greatly boosted by participation in WeDigBio 2021 events (Figure 4). The CAP Network coordinated five WeDigBio events: one hybrid (in-person + virtual) event at CSU Fresno (11 participants), one asynchronous event with a plant taxonomy class at CSU Fresno, one hybrid event at Oregon State University (35 participants), one virtual event with CSU Long Beach (40 participants), and a virtual, cross-network event led by Cal Poly (157 participants). At a total of 243 synchronous participants, this year had the highest participation on record for the CAP TCN.

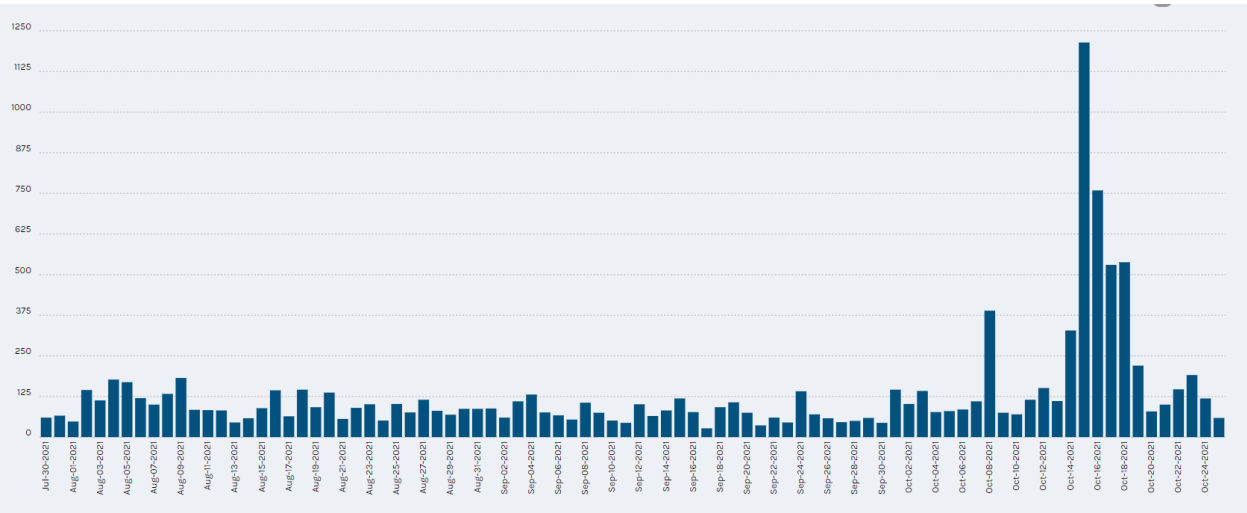

Figure 4. Notes from Nature transcription activity (in number of transcriptions) during the previous quarter. The huge peak of activity from October 14th-October 17th corresponds to the weekend of WeDigBio.

In the first week of October, we began the fall quarter of our online herbarium digitization course. We recruited broadly across the network, resulting in 33 students from 5 institutions. The course was so popular at institutions that are primarily online (e.g., SFSU), that we had to turn away students due to capacity limitations. This class meets synchronously, once weekly for 2 hours. Students learn about herbarium and digitization topics and are trained in online digitization tasks, starting with Notes from Nature transcription and transitioning into transcription directly in our Symbiota portal. The course is run by the PM and the Cal Poly Hoover Herbarium coordinator (a recent Cal Poly graduate).

On September 17, PI Susan Mazer at UC Santa Barbara led an all-day phenology workshop using the workshop-version materials developed by the Cal Poly and UCSB over the summer. In this event, 20 participants learned to analyze data from CCH2 to examine phenological trends of California plant

species. Mazer reported high engagement, positive feedback, and minimal technical difficulties from the workshop.

As described above, we presented posters at the Ecological Society of America meeting on August 5, the Biodiversity Digitization 2021 conference on September 22, and the Southern California Botanists Symposium on October 16. We presented a lightning talk at the California Invasive Plant Council 30-Year Anniversary Symposium on October 27. In addition, we collaborated with the Symbiota Support Hub to lead a workshop with 10 participants at the Ecological Society of America meeting on August 6.

WEBSITE AND PORTAL USAGE

Our project website (capturingcaliforniasflowers.org) has received 1,296 visits (0.7% decrease from previous quarter) and 1,922 page views (2% increase from previous quarter) from August 2 to October 25, 2021. The data portal (cch2.org) has supported 11,338 sessions, 171,723 pageviews, and 4,264 users over the same time period.

TCN Quarterly Progress Report

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TCN Name

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

Person Completing the Report

Regina Wetzer (Lead PI)

Progress in Digitization Efforts

ALMNH: Kevin Kocot: This quarter, I have been working with two undergraduate student employees and two graduate student interns in the ALMNH: Invertebrate collection to streamline our digitization process while also conducting some much-needed care for the collection (e.g., topping off jars of ethanol-preserved specimens). We have been highly productive in terms of our digitization efforts and have uploaded data for 1,564 specimens lots (with roughly 3,500 specimens) collected during the NBP 20-10 “Icy Inverts" Antarctic research cruise to Arctos (see https://arctos.database.museum/project/10003591). We have spent considerable effort in deciphering many ‘mystery labels’ on specimens in our collection that were collected by the late Thomas Hopkins. We have made some progress there and have just begun working to digitize these historical specimens (63 lots of specimens so far this quarter).

AMNH: Chris Johnson: Between 8/1/2021 and 10/14/2021 – Remote Work: We have 1) completed the upload of the remaining card catalog images (1,040) to the multimedia module of our database for the Crustacea & Porifera collection subsets; 2) created 4,375 skeletal catalog records that correspond to the card catalog images, including catalog records for multiple specimens per card catalog, if no catalog record existed. Skeletal records consisted of a catalog number, collection subset designation, presumed preservation method, number of specimens and number of lots, project information (code, title, summary, contact info & creative commons license attribution, and general collection storage location); and 3) attached card catalog images to their respective catalog records. Altogether for this reporting period, taxon names, determinations, collecting events, notes, developmental stages, accession information were populated (transcribed), updated or corrected if existing information was incorrect for 3,329 records.

Volunteers have transcribed card catalog data into excel for 142 Chordata records. Onsite Work: We have started work with the target collections onsite. Images (927) have been taken of specimens (599) and their labels for the catalogued and uncatalogued Brachiopoda, dry Crustacea and the dry type collection of all target Marine Invertebrates. All photos of the existing catalogued specimens have been uploaded and attached to existing catalog records and any new information transcribed into the database. Images (248) of uncatalogued material have been uploaded and transcribed. Other: During this period as part of cataloging/databasing: 355 new locality records were created, with ~133 records georeferenced; 429 locality records were updated. 111 legacy Accession Records for digitized specimens were added to the database. 86 new Person (Party) records were created and 43 Person records were updated.

ANSP: Paul Callomon: Direct specimen digitization is currently not taking place as DigIn work is concentrating on unpacking and pre-sorting benthic survey collections. We are looking at ways to accurately convert stations that consist only of a LORAN line and depth to precise latitude/longitude.

AUMNH: Nusrat Noor: 3,262 new specimen lots have been uploaded to iDigBio and an additional 737 specimen lots have been fully prepared for upload to iDigBio.

BPBM: Holly Bolick: Our new technician was finally able to start working on the project this quarter and has been making significant progress. This quarter, we added 246 new specimen records into the database and have updated and QC'd an additional 1,120 records. We linked an additional 695 invertebrate specimen images to catalog numbers. Additionally we have begun scanning our invertebrate 35mm slide collection and now have 120 completed. We added an additional 5 specimen images for newly cataloged records.

CAS: Christina Piotrowski: *Zooniverse, Notes from Nature Invertebrate Time Machine Project* (NfN, ITM): Collection staff have now built a team of more than 2,500 volunteer transcribers, an estimated 900 of whom transcribed records during this quarter. CAS staff trained and directly engaged these volunteers during more than 275 transcriber questions and comments this quarter. Zooniverse Recent progress: this quarter ITM volunteers transcribed data for more than 5,500 catalog cards, each transcribed independently by 3 volunteers over 33,000 classifications (including 3 X duplicate transcriptions in two separate workflows). We continued preliminary QA/QC/reformatting of previously transcribed data to prepare it for ingestion, checking an equivalent of approximately 1,000 records (data is QA/QC'd by field rather than by record).

During in-person workflow trials, volunteers and CAS staff scanned more than 250 specimen labels and entered required data fields into either an Excel spreadsheet, a Specify workbench, or directly into Specify to compare across various workflow efficiencies. Early this fiscal year we ceased entering skeletal data at the same time labels were scanned, as we learned that coupling these tasks reduced both efficiency and accuracy. CAS staff scanned content for only one CAS Station File, instead prioritizing workflow tasks during onsite visits.

FWRI: Paul Larson: 3,084 new specimen lot records were digitized and uploaded into the local database during the reporting period.

HBOM: Dennis Hanisak: We have set up our imaging station, have developed initial protocols for the work, and are training HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project.

MCZ: Adam Baldinger: So far this quarter (8 October 2021), 348 uncataloged lots–mostly echinoderms–were databased from spreadsheet data. To date, 8,527 records in MCZbase were cleaned/vetted for accuracy. Of these, 8,430 contain verified georeferences.

NCSM-NMI: Megan McCuller: With the hire of a FT collections technician, we have started to make more progress in our digitization efforts and have digitized approximately 358 specimen lots. We have purchased a document camera and laptop and have begun developing workflows for imaging internal labels. Digitization of internal jar labels is now one of our high priority goals. In terms of database management, we are creating a working to-do list of items that need to be cleaned (such as duplicate agents and field numbers) and made consistent. Data from the recently acquired NOAA NBI collection is nearly ready to be imported into Specify, which will add approximately 8,500 collection objects to our database.

NHMLA: Dean Pentcheff: We built four mobile digitizing workstations (touch-screen tablet, document camera, lightbox, curatorial equipment). We have written a custom FileMaker database system for label data acquisition from the workstations. Initial data records (estimated to be 5,000 by 30 October) are being used to tune the system for quicker data entry, based on recurring data patterns. We have conducted the job search for the project-wide Digitization Project Manager position and expect to hire our top candidate next quarter.

RSMAS: Nikki Traylor-Knowles: We have been focused on getting cards and notebooks into spreadsheets. We are also starting to work on the development of our website for the collection. This will be where we can link the digitized collection once we figure out what platform to keep it on.

SBNHM: Daniel Geiger: We have digitized & georeferenced 3,977 lots between 8/1/2021 and 10/6/2021. The Specify attachment server is working internally now.

SIO-BIC: Charlotte Seid: Created 877 digital records and 264 locality records (of which 253 are georeferenced).

SIO-PIC: Linsey Sala: We have completed data capture for 2,827 slides that still need to be assigned localities.

UCM: Leanne Elder: 391 specimen lots have been catalogued this quarter in excel and our paper ledger. Leanne Elder is continuing work on Specify, including discussion with two other collections at UCM in Specify, and when to update to the newest version. Also closely following ongoing talks about taxonomy trees from WoRMS. GA for the section (Erika Nelson) attended the georeferencing workshop, with the plan to begin georeference in the Spring.

UF: Gustav Paulay: We have digitized 6,764 lots, exceeding the first year target of 5,000. We have uploaded 27,203 and prepped 20K photos, thus at 47% of the first year target.

VIMS: Jennifer Dreyer: 1,000 records have been entered into Excel this quarter. Specify forms for data entry were finalized. I am currently working with Specify and WoRMS to import the most current invertebrate taxon tree so I can start importing data via the workbench. When specimen jars are pulled from the Collection (for a variety of reasons) the labels are being photographed for an archive to attach to specimen records in Specify. This applied to 15 records this quarter.

NOTE that a selection of quantitative progress measures has also been reported: The quantitative table can be accessed here:
2021 Q4 Production counts

Best Practices and Standards (including Lessons Learned)

ALMNH: Kevin Kocot: Our recent efforts to digitize the NBP 20-10 Antarctic material has been a major learning experience for me. I have learned how to best organize data as it is being collected in the field into a spreadsheet that can be easily converted into an Arctos bulkloader file to efficiently upload both specimen and part data. Entering data in a format that makes it easy both to enter it in the field and to upload to Arctos is important and will be something that I pay careful attention to before my next field trip.

AMNH: Chris Johnson: Creating skeletal records in batch & populating as many fields as possible with shared data from card catalog images or specimen+label images and attaching images to catalog records. Transcriptions of missing data can then be done remotely by one or more people from attached images. If possible, organize specimens within species by locality so locality fields for catalog records can be populated in batch. Parsing work in the workflow seems to have worked well for us. CJ uploads images, creates catalog records & attaches images in batch; LB researches missing accession information and station data & creates digital accession records; LG images specimens & labels; MD (& volunteers) transcribes from cards & updates outdate taxonomy; ER provides expertise on localities & station data.

ANSP: Paul Callomon: We are reviewing standards for storing large numbers of very small specimens, including introducing multi-lot containers.

AUMNH: Nusrat Noor: We've recently got our student worker helping to digitize through a shared excel sheet where she and I can add comments and questions, making it easier to work while being socially distanced, and I am also able to go through and fix issues/give clarifications as they are happening much more efficiently rather than waiting until after.

BPBM: Holly Bolick: Our current practices are working well with the staff we have.

CAS: Christina Piotrowski: Workflows meetings: We discussed progress and workflow innovations during informal meetings with the team from NHMLA as we developed

parallel workflows. We also initiated a new iteration of the Workflows Working Group to tackle specific workflow protocol details, rather than bigger picture issues, for those institutions still building and testing smart protocols. The Specify subgroup of the Workflows WG has also been meeting regularly to discuss specific challenges that our new Specify users are tackling.
On site: CAS refined and further tested workflows to scan and transcribe label data from specimen jars. We increased the efficiency rate slightly this quarter by decoupling scanning from data entry. We've kept records of completion rates for documentation of efficiencies and rate comparisons for each of our workflow iterations. We also set up a second station for added efficiency, but unfortunately lost our volunteers for the month of September, substituting experienced staff completion rates during this time. We've also recently brought one of our volunteers on site for the simple pre-curation task of adding new catalog numbers and topping off fluid levels ahead of data entry.

HBOM: Dennis Hanisak: We have set up several immersion tanks for imaging the wet samples to produce better images.

MCZ: Adam Baldinger: MCZ project staff continue to be involved in Steering, Expedition and Georeferencing committees/workgroups. Information obtained is then shared with others in MCZ's Invertebrate Zoology and Malacology 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: Coming up with workflows that can be done consistently between myself and our collections technician and the use of shared Google drive sheets and documents so that we can keep track of work. This has been done with the help of resources shared by other DigIn institutions. However, we are still learning how to be efficient with time.

NHMLA: Dean Pentcheff: Building systems to optimize the speed and quality of collection label data is a complex iterative process that will differ based on the specific characteristics of each collection, including label type and consistency, physical arrangement, and staff availability. There will not be a single workstation design or workflow that will be optimal across all institutions.

RSMAS: Nikki Traylor-Knowles: So far I think the biggest thing we are learning is to double check anything that we input and to make sure to save our sheets on cloud storage.

SBNHM: Daniel Geiger: Existing protocols work.

UCM: Leanne Elder: Leanne Elder is on Workflows, geo referencing and Specify committees. EDF imaging workflow has been finalized and images are being saved on the museum server.

UF: Gustav Paulay: Existing protocols work well.

VIMS: Jennifer Dreyer: Have adopted workflow standards from other DigIn institutions and will make changes to our workflows as needed to accommodate any situations that are specific to our specimens. Need to implement georeferencing workflows

(as discussed in detail in the georeferencing workshop) since many of our data have lat/long but no associated uncertainty.

Identify Gaps in Digitization Areas and Technology

ALMNH: Kevin Kocot: I have the same complaints about Arctos that I did before. It is complicated, a little clunky, and some important data (such as preservation type) are not prominently visible during searches.

AMNH: Chris Johnson: Major gap is the georeferencing component of our locality data, but this will be resolved when Project Manager is hired to manage the ebb & flow of locality data & return of geographical coordinates.

ANSP: Paul Callomon: The Academy is still debating which way to go in terms of a centralized database. Until that question is resolved, development of department-specific setups proceeds at widely differing paces.

AUMNH: Nusrat Noor: Cleaning up the data is still a very tedious job. The biggest is with taxonomic names and while the match taxa tool on WoRMs is very helpful, I've found it isn't always correct or doesn't catch everything and so I often come across issues when trying to upload in Workbench and it subsequently trying to edit our tree in ways we don't want/need taking up a lot of time if the issue isn't caught before then.

BPBM: Holly Bolick: Cleaning up and updating taxonomic names in our database has created some delays and hiccups and in some cases creates additional work down the line. Also our locality gazetteer is not functional for the IZ database and therefore every locality must be entered manually as a text string (very time consuming); this issue is currently being addressed by our data manager.

CAS: Christina Piotrowski: CAS has technology gaps related to georeferencing but staff have attended the Working Group meetings and Rios' recent training session. One persistent roadblock is the ability to pull newly georeferenced records back into Specify. Similar challenges will be met as we share expedition data with our partner institutions to standardize and repatriate it. We will also be somewhat rate-challenged as we ramp up our work this new project year by final tweaking of data fields and protocols as we train ourselves on the use of our new Specify database. We are in the process of setting up a specimen imaging station, currently troubleshooting equipment and lighting schemes for type specimen imaging. We have little experience in specimen imaging, or setting up the necessary equipment rigs.

FWRI: Paul Larson: Nothing to report.

HBOM: Dennis Hanisak: To increase our capacity we will be setting up a second imaging station and adding more personnel (part-time assistant, volunteers).

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

NCSM-NMI: Megan McCuller: Cleaning data in Specify is a very time-consuming process when it is unable to be done through the workbench in bulk, for instance the removal of duplicate agents. We consistently face issues with getting our data

uploaded due to a database manager that is sometimes difficult to work with and has many other duties.

NHMLA: Dean Pentcheff: Staffing gaps at some institutions are making it very challenging for them to build optimized data collection procedures. We are optimistic that the oncoming Project Manager will be able to help propagate workflow development from the better-provisioned institutions to other institutions in the group.

RSMAS: Nikki Traylor-Knowles: We are still unsure of what platform to use once we have all of our data into spreadsheets.

SBNHM: Daniel Geiger: Specify database is very poor at data clean up. Batch editing functions are seriously deficient (e.g., batch editing only works with a single user logged in!), no geography merge functions, taxonomy merge agonizingly slow (5 minutes per merge). iDigBio uploads have not been working since May due to iDigBio problems.

SIO-PIC: Linsey Sala: We are in the process of purchasing laptops and monitors to set up and accommodate two new student assistants that will be hired (Q4) and trained (Q5) dedicated primarily to our digitization efforts. These two new undergraduates will fill the roles of two existing undergraduates that will graduate.

UCM: Leanne Elder: Currently trying to sort out archival storage for images through the University, seems to be some hurdles in getting the existing option setup (which is called the PetaLibrary at CU Boulder).

VIMS: Jennifer Dreyer: Still working with Specify and WoRMS on implementing the best invertebrate taxon tree for the Specify database.

Share and Identify Opportunities to Enhance Training Efforts

ALMNH: Kevin Kocot: I have relied on the many training videos available through Arctos to get my student workers and interns trained in using Arctos. To supplement these, I prepared 'mock-up' specimen data entry forms for Arctos that are pre-filled and annotated to explain the meaning of each field in detail and what to do in cases when important information is unavailable or ambiguous. These have been incredibly helpful as they are quickly referenced by my students (unlike a video which they would have to go back and watch).

CAS: Christina Piotrowski: CAS participated in several workshops and webinars this quarter, including the iDigBio Biodiversity Digitization Meeting and TCN Mini Summit, New TCN Orientation, Specify training webinars, and an NSF Funding Opportunities webinar. During our Specify Working Group meetings we held informal discussions and “advice sessions”, some of which recently resulted in the mobilization of our Nomenclature working group. CAS presents meeting notes from these meetings to the full project team monthly.

MCZ: Adam Baldinger: Various staff members participated in a georeferencing workshop.

NCSM-NMI: Megan McCuller: Participated in the georeferencing workshop and in working group meetings when possible. New collections technician is being continuously trained in how to use Specify 6 for digitization.

NHMLA: Dean Pentcheff: We have just begun the process of bringing digitizing staff onboard who have no prior collections or biodiversity training (Guest Relations staff from NHMLA are now working on DigIn digitization part-time). Our prior experience training work-study undergraduates for curatorial tasks has applied well for this new workforce. However, the knowledge needed to properly classify specimen label data is a new training opportunity. Working with this initial cohort of new staff is allowing us to build training materials that cover topics such as the context of biological collections (e.g. what is a cruise?), common and uncommon label data patterns (e.g. what does "Sta." mean? What does "12-xi-1953" mean?), and interpretation of taxonomic names.

SIO-PIC: Linsey Sala: The development of FilemakerPro users group would be useful to share knowledge and lessons learned.

VIMS: Jennifer Dreyer: Participated in the DigIn georeferencing workshop and continues to participate in the Specify, workflow, and georeferencing working groups. I have started to organize the nomenclature working group so we can begin working on some issues including: taxonomic synonomies, how to selectively import taxon trees from WoRMS, and general taxonomy issues within WoRMS and Specify to name a few.

Collaborations with other TCNs, Institutions, and Organizations

ALMNH: Kevin Kocot: I have numerous collaborators in the US and international collaborators in several countries that are conducting collections-based research. I am planning a course with Gustav Paulay and Jon Norenburg at Friday Harbor Labs for summer 2022 on Integrative Biodiversity and Taxonomy of Invertebrates and a meiofauna diversity and taxonomy workshop with Ashleigh Smythe at the Smithsonian Marine Station in Fort Pierce, FL later in summer 2022.

CAS: Christina Piotrowski: ESB TCN; Zooniverse/Notes from Nature; WoRMS.

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

NHMLA: Dean Pentcheff: We continue to collaborate closely with ESB, sharing Slack communications and overlapping project management. We have initiated a new collaboration with the "BugFlow" project (hosted by the Entomology Collections Network), which has built an infrastructure for developing and posting digitization workflows. Our plan is to leverage the work they have already put into the posting and management infrastructure (at GitHub) and augment their workflows with additional workflows appropriate for marine wet collections.

RSMAS: Nikki Traylor-Knowles: Eastern Seaboard Mollusks, Dr. Shea.

UCM: Leanne Elder: Leanne Elder attended a meeting with BugFlows group and will look over their workflows on github. Discussed where workflows should overlap for DigIn and BugFlow.
UF: Gustav Paulay: Collaborating with TCNs ESB and Pilsbry, as well as WoRMS and Specify communities.

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. Additionally, I have made it a point to emphasize in my presentations to the general public, Skype-a-Scientist presentations, and in my courses to emphasize that our field collecting efforts are performed at a scale that does the least amount of environmental harm as possible but also acknowledge that our research activities have an impact on while populations of these species. I feel that performing ship-based research, which has a shocking carbon footprint, should be leveraged as much as possible to retain specimens of as many diverse organisms preserved as many different ways as possible to reduce the necessity of future researchers repeating field collections in the same place simply because a representative sample of the fauna was not taken.
CAS: Christina Piotrowski: The Zooniverse - NfN ITM Project results in card label scans, and we will also scan jar labels during our onsite workflows. These scans will be invaluable for future reference/online accessibility as a specimen data QA resource. Likewise, scanned CAS station list files and field notes creates the potential for historical marine data resource uploads and sharing for reference by future workers.
NHMLA: Dean Pentcheff: The new collaboration with BugFlow will allow the workflows we develop to be part of a persisting and generalized repository of digitization workflows, extending beyond the TCN lifespan. We are continuing work on the depository of expeditionary station data, integrating that into the "Biodiversity Enhanced Location Services" (BELS) persistent infrastructure for a global gazetteer.
RSMAS: Nikki Traylor-Knowles: Our biggest opportunity is the website currently, but we need to start working on fundraising for our collection. It is under threat.

Education and Outreach (E&O) Activities

ALMNH: Kevin Kocot: We have been disseminating results of our research through virtual visits to schools through personal connections and Skype-a-Scientist. I am working to design a museum exhibit on our research that will be installed at the Alabama Museum of Natural History next year.
ANSP: Paul Callomon: Conducted field trips for undergraduate students looking at littoral and shallow tidal invertebrate faunas in southern New Jersey.

BPBM: Holly Bolick: We were asked to create content for Google Arts and Culture website and we made a Biodiversity page and referenced the DigIn project and provided link to project website.https://artsandculture.google.com/story/vwUR1HMDLqUL7g?hl=en

CAS: Christina Piotrowski: NfN ITM Project: mobilized approximately 900 volunteer transcribers to crowdsource collections data this quarter (more than 2,500 transcribers from Oct 2020-Oct 2021). This quarter we received 275 questions and comments from our ITM transcribers and CAS staff responded to questions about label data that inspired transcribers' curiosity. We provided content describing the value of historical marine collections data and engagement by describing captivating collections and collector "stories" in the collaborative Zooniverse Talk tool. Transcribers have researched and discussed historically significant collections, researched geography and taxonomy of diverse specimen records, and have encountered and digitized records of several extinct species.

We've had a few students working on the project this quarter, as well as several docents who work on our museum's main floor engaging with the public, and this project enhances their connections with the museum collections in their own building, thereby indirectly impacting museum visitors. This quarter our project was featured on the DigIn Outreach webpage.

We recruited a new on site graduate student volunteer this quarter to assist us with label scanning, to test our new workstation, and to troubleshoot our recently modified scanning workflow. We also brought one of our senior volunteers onsite to help with pre-curation and catalog number assignment.

NHMLA: Dean Pentcheff: The University of Southern California (USC) Annenberg Agency operates each semester as a professional communication consultancy. The agency is structured as a directed-research course and designed to give graduate students hands-on skills in communication and public relations strategies that they can apply serving various USC community organizations and programs, as well as local nonprofits. This Fall semester Regina Wetzer, Jenessa Wall, and our USC work study student Victoria Westover are working with a student team supervised by a faculty mentor (Team Lead: Alfonso Hegde, USC Grad Student, MS in Digital Social Media; Xinyao Li, Senior, USC Communication/Digital Social Media; Mason Wise, Senior, USC Communication; Jack Warnecke, Senior, USC Public Relations & Advertising; Shuyue Luo, Grad Student, USC Communication Data Science), in developing social media templates and designs, branding, and a social media calendar for this grant (DigIn). We will roll out our first communications before the semester ends. The goal is that we can easily and efficiently continue our social media presence throughout the project without making it a burden on any single DigIn participant or institution. It's going to be fun!

RSMAS: Nikki Traylor-Knowles: We have hired two Professional Masters' students as the interns for the data input.

SIO-BIC: Charlotte Seid: Conducted 6 E&O presentations (4 hrs) for 85 middle school through graduate school students, highlighting invertebrate biology and the value of digitized museum collections.
SIO-PIC: Linsey Sala: Conducted 5 E&O outreach presentations to undergraduate and graduate level student groups, highlighting the holdings and uses of PIC and the value of well-documented natural history collections.
UF: Gustav Paulay: Started tele-seminar series on marine biodiversity in Philippines; consulting with developing a sea cucumber museum there.

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

CAS: Christina Piotrowski: Current data/database: After completing our database migration from an aging CMS to a new customized Specify database, we are continuing to work towards data cleaning and standardization, including Geography and Tree and Locality final cleaning/standardization which will benefit DigIn project data sharing.
CAS participated on the steering committee and hiring committee for our Project Manager, who should be brought onboard shortly by NHMLA.
MCZ: Adam Baldinger: Part-time Curatorial Assistant Jennifer Goldstein was hired with a start date of July 26, 2021.
RSMAS: Nikki Traylor-Knowles: The other progress is just the development of our website so that our collection can be more outward facing and can help with our fundraising initiatives.
SIO-BIC: Charlotte Seid: Hired and trained two graduate students to conduct digitization activities.
SIO-PIC: Linsey Sala: When possible we have continued pre-curation efforts and determined sample set readiness for rapid data capture. Trained two existing undergraduates on slide/sample data capture.
UF: Gustav Paulay: Began reviewing agent data and nomenclature to identify best approaches for normalization.
VIMS: Jennifer Dreyer: Have been working with a researcher at VIMS to archive his extensive mollusc research collection and enter it into the VIMS Invertebrate Collection database. This mollusc collection was not initially part of the total specimen count for what is being funded for digitization in the DigIn grant. This will add approximately 5,000 new specimen records. The data is entirely cataloged and their lab is working on getting the records in the correct format for uploading into Specify so there is minimal effort needed on my part, and it will not take time away from the DigIn funded goals for VIMS, but it will substantially add to the overall holding of the Collection.

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

AMNH: Chris Johnson: Minor costs to ship monitors to our volunteers who are assisting with transcriptions.

ANSP: Paul Callomon: The department is shielded from direct costs, but COVID-related restrictions on space and gatherings continue to affect productivity.

CAS: Christina Piotrowski: 1. We've incurred additional supplies expenses to support remote scanning of cards and documents. For efficiency, we'll require more than one scanning workstation, which we will attempt to staff with volunteers, once our museum's Volunteer Services program is reactivated, as we have been unable to image a sufficient number of labels this FY due to staff working remotely.
2. Staff remain unable to work on site full time, and in some cases at all, so we still cannot physically prepare for workflow ramping up/hiring/training project staff. 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 into 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 for).

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: Supply chain issues with getting digitizing supplies, equipment, and curatorial supplies (e.g., magnetic shelf tape, etc.). Still have not been able to bring back volunteers.

SBNHM: Daniel Geiger: No. There are supply chain issues. Glassware/lid orders take months instead of days, University Products is not even taking in orders for archival boxes for the next 6–12 months.

VIMS: Jennifer Dreyer: Yes, specimen vials and jars have been increasingly harder to find and are more expensive.

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Key to Abbreviations

NHMLA	Natural History Museum of Los Angeles County (lead), Los Angeles, CA (R.Wetzer)
ANSP	Academy of Natural Sciences, Philadelphia, PA (P. Callomon)
AMNH	American Museum of Natural History, New York, NY (C.Johnson)
AUMNH	Auburn University, Auburn, AL – no submission
ASU	Arizona State University, Tempe, AZ [subaward]
BPBM	Bishop Museum, Honolulu, HI – no submission
CAS	California Academy of Sciences, San Francisco, CA (C.Piotrowski)

VIMS	College of William & Mary—Virginia Institute of Marine Science, Gloucester Point, VA (J.Dreyer)
FMNH	Field Museum of Natural History, Chicago, IL [subward]
HBOM	Florida Atlantic University, Fort Pierce, FL (D. Hanisak)
FWRI	Fish and Wildlife Research Institute, St. Petersburg, FL (P.Larson)
MCZ	Harvard University, Cambridge, MA (A.Baldinger)
NCSM-NMI	North Carolina Museum of Natural Sciences, Raleigh, NC (M.McCuller)
Q-Quatics	Q-Quatics, Laguna, Philippines [subaward]
SBNHM	Santa Barbara Museum of Natural History, Santa Barbara, CA (D.Geiger)
SIO-BIC	Scripps Institution of Oceanography, University of California San Diego, CA (C.Seid)
SIO-PIC	Scripps Institution of Oceanography, University of California San Diego, CA (L.Sala)
ALMNH	University of Alabama Tuscaloosa, AL (K.Kocot)
UCM	University of Colorado, Boulder, CO (L.Elder)
UF	University of Florida, Gainesville, FL (J.Slapcinsky)
RSMAS	University of Miami, Rosenstiel School of Marine & Atmospheric Science, Miami, FL (N.Traylor-Knowles)
YPM	Yale University Peabody Museum of Natural History, Boston, MA [subaward] (N.Rios)

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 & Robin DeLaPeña, FMNH, Project Coordinator

Share Progress in Digitization Efforts

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

COVID-19 restrictions continued to impact staff access to the collections and widespread hiring freezes for new staff caused unavoidable delays. However, where possible under the circumstances, work is underway. Members of the collaborative found creative ways to prepare for, and begin, digitization.

FMNH ESB**:** Worked on spreadsheets with Florida Keys data, preparing for major uploads. Work on FMNH-specific expedition data is underway. Digitization Project Coordinator (Robin DeLaPena) was hired.
FMNH ESB subaward **HMNS:** HMNS continues to work through its marine gastropod collection and has cleaned records in EMu for 755 lots representing 11,417 specimens. Focus in this quarter was on the families *Caecidae, Littorinidae, Planaxidae, Tornidae,* and *Vitrinellidae.* Due to many members of these families being extremely small the ability to confirm if the specimen was collected live or dead was limited. However, of the 755 lots examined we were able to determine live or dead collection in 254 lots that represented 5,058 specimens.

FMNH ESB subaward **FWRI:**1235 new specimen lots, containing 7287 specimens were digitized this quarter. We are making good progress but doing the 'easy' work first - field data already in the database and mainly only a station identifier and determination needs to be entered.
FMNH ESB subaward **HBOM:**We have set up our imaging station, have developed initial protocols for the work, and are training HBOM personnel using non-NSF samples and other funding so that we can maximize our use of our NSF funds for this project.
ANSP ESB**:** ANSP has digitized 237 new lots containing more than 3500 dry species and 283 alcohol preserved specimens. 1517 lots have had data upgraded, which occurs in a variety of ways, including addition of live-dead determination, number of specimens, date collected, and other forms of data cleaning.
BMSM ESB**:** On August 3, 2021, BMSM (finally!) hired part-time Collection Assistant Haley Kraczek, who is a recent graduate in Environmental Sciences from Florida Gulf Coast University. Since then, BMSM digitized 1,489 new lots, for a total of 3,342 specimens. In the same period, BMSM cleaned and enhanced the data quality of 2,278 lots. Ms. Kraczek, who is well-versed in geolocation and GIS applications, added geolocation to an additional 12,000 lots since early August and eliminated redundancy for 425 ESB localities along the coast of Florida. Additionally, 201 new composite image files were uploaded. The date of last ingestion to iDigBio and GBIF was September, 19 2021, for a total of 130,754 lots and 2,826 image files. (But the currently posted dataset was sent to iDigBio in March 2021.)
CM ESB**:** CM completed georeferencing Maine, New Hampshire, and Massachusetts with 666 marine mollusk records georeferenced..
DMNH ESB**:** DMNH continues to focus on standardizing and improving records prior to upload/georeferencing. Over 130,000 records have been improved to date.
DMNH ESB subaward **RSMAS:** RSMAS has digitized 1,500 new lots containing 3,416 specimens; Finished scanning all cards. Have been working steadily on the data entry for the collection of the scanned card and books.
DMNH ESB subaward **YPM**: Nothing to report.
MCZ ESB**:** 100 lots/records were databased this quarter; to date, 9,107 records (representing 81,558 specimens) in our database were flagged for ESB; 8,899 records have georeferences and of these 8,235 records were cleaned/vetted for accuracy and verified georeferences; 7,394 records are available on iDigBio.
LACM ESB**:** Nothing reported.
NCSM ESB**:** NCSM has digitized 731 new lots containing 7352 specimens. In addition, 731 records have been georeferenced and 731 lot records uploaded to InvertEBase.
UF ESB**:** We digitized 844 new lots of 3834 specimens and enhanced data quality on an additional 1500 lots. This quarter we focused on organizing images and tying them to specimen records. We uploaded 719 images, 1/3 of which were SEM images of microsnails, and 2/3 were live field photographs including a large series of pelagic mollusks. All images are tied to digitized museum specimens.
UMMZ ESB**:** We hired four undergraduate students at the beginning of the fall semester to engage in digitization efforts. During the most recent quarter, we have digitized 445 lots that include 3845 specimens. We also uploaded data from 274 lots to InvertEBase. In addition, we generated 450 images and georeferenced 76 lots.

ESB PEN grant**: PRI**: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. Nothing to report.

Share Best Practices, Standards, and Lessons Learned

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

FMNH ESB**: Review of project procedures and workflows with newly hired coordinator.**
FMNH ESB subaward **HMNS:** Nothing to report.
FMNH ESB subaward **FWRI:** I created a new data entry spreadsheet that automatically checks taxon and agent spelling and flags entries that items not already in the database. Data entry staff are prompted to either check their spelling or handwriting interpretation, etc, or indicate that this new taxon needs to be added to our database taxonomy. Data managers then review these items and make appropriate changes. This saves a lot of time querying all the taxa to make sure they're properly formatted prior to upload.
FMNH ESB **s**ubaward **HBOM:** We have set up an immersion tank for imaging the wet samples to produce better images.
ANSP ESB**:** not reported in the previous quarterly report: Paul Callomon presented a workshop on best practices for specimen imaging on 8 July 2021. A video of the workshop is available on YouTube https://www.youtube.com/watch?v=WEKl82SAkoQ and can be found through iDigBio <www.idigbio.org/content/imaging-workshop-specimen-photography-museum-collections>.
BMSM ESB**:** Refined geolocation practices according to Geolocate, and implemented geolocation for an additional 12,000 lots.
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:** Nothing to report
DMNH ESB subaward **YPM**: Conducted virtual georeferencing training workshop for ESB & DigIn.
MCZ ESB**:** Permanent staff involved in the project participate in Steering, Expedition 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.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
[USNM] ESB**:**
Future ESB PEN grant**:** PRI: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. 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.
FMNH ESB subaward **HMNS:** HMNS migrated to EMu in 2014 and the migration was not completely seamless from the previous database. Work continues on moving specimen data to the proper fields and cleaning records where the migration wasn't perfect.
FMNH ESB subaward **FWRI:**Nothing to report
FMNH ESB **s**ubaward **HBOM:**This quarter we addressed the gaps identified in the previous report (developing an image analysis station and barcoding the HBOM specimens}; no new gaps identified.
ANSP ESB**:** Some lots do not have identifications recorded in the database so they have not been associated with the project. Ongoing inventory of the collection has reached 398,000 records. As ESB lots are found, they are linked to the project. Currently, 30,266 lots are associated with ESB at ANSP. We have also found that in some cases records for alcohol and dry material of the same species from the same collecting event have different records in the database. These are combined as we find them, unless they have different identification histories. When lots are combined, components are marked so the process can be undone if needed. So far, 112 lots that are part of ESB have been affected by this process.
BMSM ESB**:** nothing to report.
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:** Nothing to report.
MCZ ESB**:** macrophotography work-station for imaging is ready for use.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
ESB PEN grant**:** **PRI**: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. Nothing to report.

Share Opportunities to Enhance Training Efforts

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

FMNH ESB**:** Nothing to report.
FMNH ESB subaward **HMNS:** Nothing to report.
FMNH ESB subaward **FWRI:** This quarter I trained several staff in use of OpenRefine for data cleaning and several staff (both involved with this project and not) attended the georeferencing workshop that was put on.
FMNH ESB **s**ubaward **HBOM:**Nothing to report

ANSP ESB**:** Nothing to report
BMSM ESB**:** Nothing to report.
CM ESB**:** Nothing to report.
DMNH ESB**:** Participated in Georeferencing workshop led by N. Rios/YPM.
DMNH ESB subaward **RSMAS:**We have hired two new interns. One is focused on data entry and one is focused on developing our website and data entry. We are in the process of hiring a third intern to help with the data entry.
MCZ ESB**:** Various staff members participated in an internal (MCZ) workshop to enhance metadata capture of uncataloged specimens by working directly in collections space.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Hired one full-time technician, two volunteers and one intern.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Hired four undergraduate students to engage in digitization efforts.
ESB PEN grant**: PRI**: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. Nothing to report.

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

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

Much effort has been spent to facilitate exchanges and avoid duplication with other relevant TCNs. InvertEBase is the main partner for our Symbiota portal – with close coordination with DigIn-TCN, PILSBRY-TCN, and Smithsonian's Panama project (which is also in the process of joining the InvertEBase platform). Shared working groups (with members of multiple TCNs) have been established and are meeting regularly. ESB and DigIn, in particular, share many upcoming needs in authority file development, georeferencing needs, and workflow development, and the two projects have a strong overlap in their steering committees to assure the best-possible flow of ideas and information.

FMNH ESB**:** Nothing to report.
FMNH ESB subaward **HMNS:** Nothing to report.
FMNH ESB subaward **FWRI:**Nothing to report.
FMNH ESB **s**ubaward **HBOM:** Nothing to report.
ANSP ESB**:** Nothing to report.
BMSM ESB**:** Nothing to report.
CM ESB**:** Nothing to report.
DMNH ESB**:** DMNH continues to work with BCEENET to promote the use of collections in undergraduate teaching.

DMNH ESB subaward **RSMAS:** Nothing to report.
DMNH ESB subaward **YPM**: 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.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
ESB PEN grant**:** **PRI**: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. Nothing to report.

Share Opportunities and Strategies for Sustainability

Share information here. You can also embed graphics if desired.
FMNH ESB**:** Nothing to report.
FMNH ESB subaward **HMNS:** Nothing to report.
FMNH ESB subaward **FWRI:** Nothing to report.
FMNH ESB **s**ubaward **HBOM:** Nothing to report.
ANSP ESB**:** Nothing to report.
BMSM ESB**:** Nothing to report.
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:** Nothing to report.
DMNH ESB subaward **YPM**: Nothing to report.
MCZ ESB**:** Nothing to report.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
Future ESB PEN grant**:** PRI: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. Nothing to report.

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

Share information here. You can also embed graphics if desired.
FMNH ESB**:** Nothing to report.
FMNH ESB subaward **HMNS:** Published one HMNS Beyond Bones blog article on spikes and spines on gastropod shells. There were 3 publications in the Houston Conchology Society

publication, The Epitonium, written by Tina Petway. The articles were on *Haliotis pourtalessii* in the Gulf of Mexico, *Janthina janthina* along the Texas coast. and *Aliger gigas* in Florida. An HMNS sponsored shelling trip highlighting coastal mollusk species found along Galveston Island had been planned for October 2nd. This trip was to be led by Tina Petway and Gary Kidder but had to be postponed due to road and beach damage from Hurricane Nicholas. This educational shelling field trip will be rescheduled for Spring 2022.
FMNH ESB subaward **FWRI:**Nothing to report.
FMNH ESB **s**ubaward **HBOM:** Nothing to report.
ANSP ESB**:** On September 25, the PI ran a workshop for children with support from education staff at ANSP on marine mollusks from New Jersey. We developed a key for identification of 55 commonly encountered species, but the age group was younger than expected (5-10 rather than 11-12), so we ended up not using the key in that exercise. We ran a field trip to the Jersey shore for department staff on October 13, with one current co-op and two former coops participating. Work on iNaturalist continues, with the PI now having made more than 12,000 identification for the ESB project https://www.inaturalist.org/projects/eastern-seaboard-mollusks?tab=identifiers, and more than 30,000 live dead determinations.
BMSM ESB**:** In addition to activities in social media (Facebook page with 262 members) , the PI participated via Zoom on a round-table on collections at the 27th Brazilian Malacological Meeting, introducing the BMSM collection, the major goals of the ESB TCN and ensuing digitization efforts. The PI also creates the *Shell of the Week* column for the local *Island Sun* newspaper, an effort highlighting only Florida species, for a total of 13 columns in the report period. Last but not least, the PI produces a blog, the *Curator's Corner*, highlighting malacology and ESB species. a total of 7 issues were published during the report period.
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:** Our team is diverse and strives to hire students from a diverse background who are invested in museum science.
DMNH ESB subaward **YPM**: Nothing to report.
MCZ ESB**:** Nothing to report.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Instagram and TikTok accounts (@marinemollusks_ncsm) were created in July, 2012 and August, 2021 to showcase marine specimens from the grant. Importance of conservation, how to preserve specimens, and many other topics have been covered. These two accounts are currently only for outreach for this grant. A Facebook Group (Invertebrates, North Carolina Museum of Natural Sciences) is being used to provide outreach for this grant, along with other invertebrate research at the museum. A minimum of one post from at least one of the accounts is being provided to the public. There are many videos and pictures, along with helpful and fun information to grab the attention of many different types of audiences. These types of platforms allow the audience to interact with us and ask questions. here is an example of one of the Instagram posts:

UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
ESB PEN grant**: PRI**: Starting date 15 September 2021- Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. 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
FMNH ESB subaward **HMNS:** Nothing to report.
FMNH ESB subaward **FWRI:** Nothing to report.
FMNH ESB **s**ubaward **HBOM:** Nothing to report.
ANSP ESB**:** Nothing to report.
BMSM ESB**:** Nothing to report.
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:**Our website is in the process of being built out. Currently still in the building stages, but we have an intern that is directly in charge of this which is exciting.
DMNH ESB subaward **YPM**: GEOLocate web services process approximately 8,000 georeferencing requests per day.
MCZ ESB**:** Nothing to report.

LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
ESB PEN grant**:** **PRI**: Starting date 15 September 2021- Digitization PEN: Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. 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.

Communication infrastructure and file storage has been organized via a dedicated Slack workspace and file storage on Google Drive. We also are sharing relevant Slack channels with the DigIn TCN.

FMNH ESB**:** Lead PI presented at annual ADBC summit.
FMNH ESB subaward **HMNS:** Our Inventory Manager participated in the ADBC Summit, Biodiversity Digitization Conference, and a Georeferencing workshop. He has also joined an Axiell led bi-monthly EMu and Natural History Special Interest Group.
FMNH ESB subaward **FWRI:** Nothing to report.
FMNH ESB **s**ubaward **HBOM:** Nothing to report
ANSP ESB**:** nothing to report.
BMSM ESB**:** PI and Collection Assistant participated in Specify 7, iDigBio, and GBIF training sessions
CM ESB**:** Nothing to report.
DMNH ESB**:** Nothing to report.
DMNH ESB subaward **RSMAS:** Nothing to report
DMNH ESB subaward **YPM**: Integration of Exclusive Economic Zone Boundaries into GEOLocate mapping interface
MCZ ESB**:** Part-time Curatorial Assistant (Melissa Merkel) was hired; start date was August 4, 2021.
LACM ESB**:** Nothing reported.
NCSM ESB**:** Nothing to report.
UF ESB**:** Nothing to report.
UMMZ ESB**:** Nothing to report.
ESB PEN grant**:** **PRI**: Starting date 15 September 2021- Digitization PEN: Adding unique molluscan live-dead data from the Paleontological Research Institution to the Eastern Seaboard TCN. We are exploring our hiring options and gathering the collections that will be digitized during the grant.

TCN Quarterly Progress Report

TCN Name

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

Person Completing the Report

Miranda Zwingelberg (GLOBAL Project Manager)

Share Progress in Digitization Efforts

This report covers progress completed during the period of July 1 – September 30, 2021.

While many COVID-19 prevention measures remained in place during 2021-Q3, access to collections spaces and student workers improved. All GLOBAL institutions were able to begin GLOBAL work in some capacity during this period, including those collaborators who had been prevented from starting during Year 1.

Imaging Equipment & Workflows

Additional progress was reported in setting up and optimizing imaging equipment and workflows during 2021-Q3. ALA remodeled their imaging station since there were issues with the strobe lights. They are now using a modified imaging station set up with EGO LED lights which is working very nicely and replaced their older strobe light set up. Two BRY undergraduate students organized specimens for digitization and began preliminary light box set up. CINC & MU continued to improve their dedicated bryophyte imaging system, and

[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

recently worked to reposition lighting to minimize reflection from the barcodes. F began developing workflows for imaging whole sheets with the specimen and for packets with the specimen, capturing the label and specimen at the same time. MSC worked on processing data for a complicated lichen accession. WIS made email contact again with their collaborators at NEB to make arrangements for transfer of their collections to WIS for processing. With OH no longer participating they will be working with BRU to digitize their collections.

Personnel

ALA hired a graduate student curatorial assistant and two undergraduate curatorial assistants. DUKE hired and trained five students to assist with label transcription. F gained two dedicated photographers for bryophytes and lichens. FLAS hired two undergraduate students to barcode and card their bryophyte specimens. Alan Franck began work in September as the collection manager upon Kent Perkins' retirement. LSU trained two undergraduate students to digitize bryophytes, including imaging and transcription. One staff member continues to work remotely with limited hours due to the pandemic but has been cleaning records and adding georeferences from matching duplicates in the portals. MIN hired four undergraduate students to start work on the project. A digitization tech started at MO in September and will be working full time on the GLOBAL project. Two students were hired at OSC for the digitization of lichens and bryophytes, respectively. NY hired a new intern who will start work focused on imaging in 2021-Q4. Dr. Tatyana Livshultz joined the GLOBAL project at PH as a co-PI as Dr. Teisher left PH for a new position at MO. Dr. Teisher remains as PI. Five students started working at UC at the end of August, adding barcodes, imaging lichen specimens, and creating skeletal records. WIS interviewed and hired several undergraduate students for hourly vacancies. The students have started imaging lichen specimens and are improving their techniques. They are also being trained in georeferencing with the WIS collection.

Digitization

Nineteen institutions (ALA, ASU, CINC & MU, COLO, DUKE, F, FLAS, ILL & ILLS, LSU, MICH, MIN, MSC, MO, NY, PH, TENN, UC, WIS, and YU) reported progress on digitization deliverables, with a total of 61,925 specimens barcoded (37,449 bryophytes and 24,476 lichens), 50,095 labels imaged (35,376 bryophytes and 14,719 lichens), 45,448 specimens imaged (26,098 bryophytes and 19,350 lichens), 30,073 specimen records uploaded to the portal (25,047 bryophytes and 5,026 lichens), 45,049 skeletal records created (20,542 bryophytes and 24,507 lichens), 27,691 labels fully transcribed (22,945 bryophytes and 4,746 lichens), and 13,278 specimens georeferenced (9,532 bryophytes and 3,746 lichens).

Table 1: Digitization progress by GLOBAL collaborators in 2021-Q3, separated by Bryophyte (B) and Lichen (L) specimens.

	# Barcodes Added		# Labels Imaged		# Specimens Imaged		# Uploaded to Portal		# Skeletal Records Created		# Fully Transcribed		# Georeferenced	
	B	L	B	L	B	L	B	L	B	L	B	L	B	L
ALA	55	1,142	55	1,142	55	1,142								
ASU	141	2,633	23	50	23	50		30	141	2,633	141	2,633	19	1,888
BRY														
CINC & MU	351	1	749		749		749	1			5,954	1	2,501	52
COLO		4,994		4,994				4,994		4,994		1,620		
DUKE	2,331		2,815		688	8,953	4,837		3,016		1,238			
F	5,200	625	1,119	625		157			3,450					
FLAS	925		1,030											
ILL & ILLS	10,670		10,670		10,670						3,205			
LSU	438	1	154	10			438	1	364		65	42	32	134
MICH	4,267		5,006		158		1,754		1,596		2,671		97	
MIN	49										49			
MO	1,928		1,210		1,210				341		341		67	
MSC	1,647		1,647		1,647		2,533		1,644					
NY	445	14,880	228	6,083	228	6,083			445	14,880	136		207	304
OSC														
PH	3,262		3,262		3,262		6,797		6,797		5,005		155	
TENN	2,748		4,416		4,416		4,495		2,748		3,760	35	868	78
UC		200		1,815		1,815				2,000				
WIS						1,150						415	5,586	1,290
YU	2,992		2,992		2,992		3,444				380			
Totals	37,449	24,476	35,376	14,719	26,098	19,350	25,047	5,026	20,542	24,507	22,945	4,746	9,532	3,746
B+L Totals		61,925		50,095		45,448		30,073		45,049		27,691		13,278

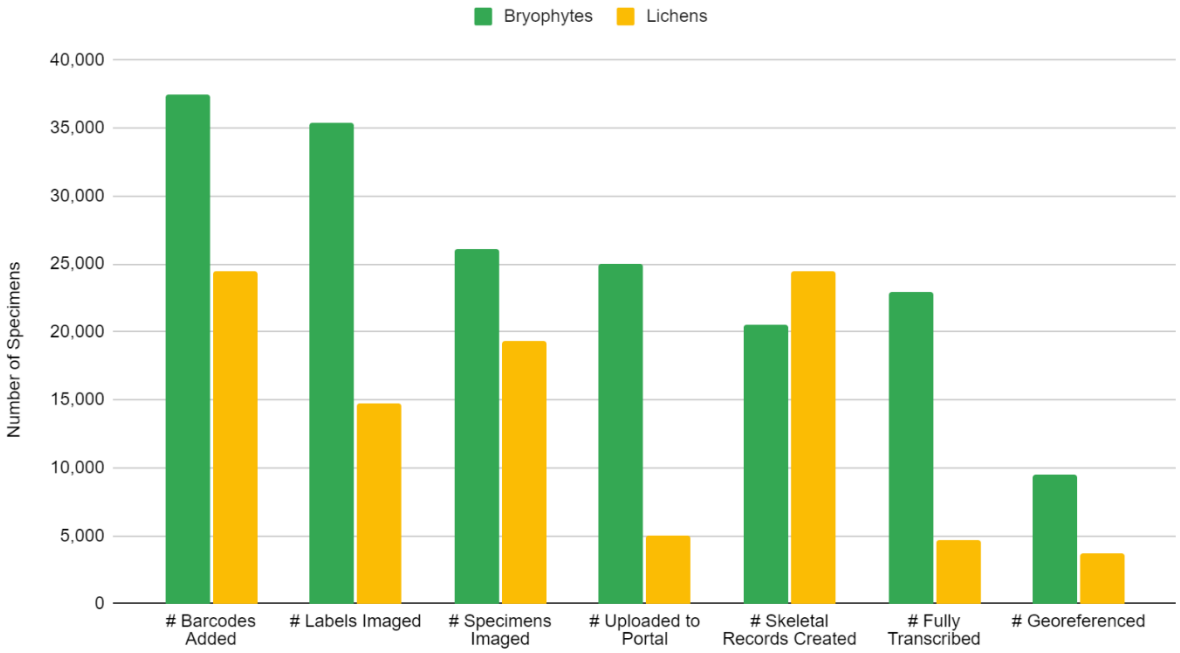


Figure 1: Digitization progress for the GLOBAL collaboration in 2021-Q3, separated by Bryophyte and Lichen specimens.

Share Best Practices, Standards, and Lessons Learned

Flexible Workflows

The GLOBAL teams continued to make use of flexible digitization workflows in 2021-Q3, including some use of remote imaging stations, virtual transcription work, and prioritizing label imaging. However, COVID-19 restrictions continued to ease for most participants, allowing all collaborators to begin some digitization activities and more to transition to on-site work.

COLO is exploring options to start capturing images of specimens and hopes to have a workflow in place soon. Their primary focus has been to capture label data to facilitate transcription and get their specimens ready for centralized georeferencing. Access to the collection improved, but they do not have as many digitizers as they have had in the past. As a collection they were not happy with the image quality of specimens when trying to capture labels and specimens in the same frame. They hope this will be a turning point for the project and they can speed up the process of getting packets imaged to help drive the transcription process. They will most

likely retake the specimen images later in the project when we have a system in place for capturing better specimen images.

DUKE's current imaging system is optimized for specimen images, and single label images. It proved to be more time consuming to capture labels one by one. They will benefit from purchasing a second lens, specialized on capturing whole sheets of labels.

F's collection access opened up during 2021-Q3 so they transitioned back to on-site imaging in place of remote stations. They are correspondingly developing workflows for imaging whole sheets with the specimen and packets with the specimen, capturing the labels and specimens in one image.

NY decided to lower the camera on their light box station to take photos with a slightly smaller footprint but higher definition of the image. This workflow is working well for their specimens in loose packets.

UC has established that for their collection, it is best to take two separate images: one of the packet and one of the specimen. This helps to prevent specimen loss or damage if students were to attempt to remove specimens from their packets for imaging.

Collaboration

Team members continued to make use of Basecamp, Zoom, and email to communicate and collaborate during 2021-Q3. A Management Committee Meeting was held in August open to all GLOBAL team members to review quarterly and Year 1 grant progress. The GLOBAL Project Manager (TENN) completed check-in meetings with most collaborators in September (ASU, BRY, CINC & MU, COLO, DUKE, F, LSU, MICH, MIN, MO, MSC, PH, UC, WIS, and YU) to discuss progress, concerns, and plans for the fall. The GLOBAL IT Team met in September to update progress and priorities.

The Georeferencing Manager (WIS) is continuing to create communities and georeference in the Collaborative Georeferencing Client (CoGe) for those institutions who have opted into centralized georeferencing and have transcribed records available. She is finding nuances to the Collaborative Georeferencing Web Client. For example, utilizing the History function is time-saving when finding similar or exact localities (with slightly different transcription or spelling).

Share Identified Gaps in Digitization Areas and Technology

Image Uploading

While image uploading for collaborators hosting images through ASU has been established, those institutions with alternate hosting may have separate challenges. ALA had a delay in uploading images as there have been changes to the protocol with their partner at TACC (Texas Advanced Computing Center) and they needed to get through a lengthy process of administrative agreements and adjusting the protocols. This has recently been resolved and they have uploaded 68 GB of images to TACC now. The digitization of additional specimens and uploading will now progress nicely with an expected 14GB of image data per month.

ASU continued to provide support with image acquisition and skeletal metadata upload, soon to be streamlined with the new software PhotoWatcher.

Barcode Renaming

ASU's prototype version of PhotoWatcher, a small program to facilitate image acquisition tested at TENN, COLO, F, and OSC is now in the final test stages to be more broadly released to the community of participating institutions. The program will replace previous versions of the BarcodeRenamer. It automatically renames image files by detecting barcodes in the picture during image capture and provides the user with an option to enter skeletal image metadata that are written into the XMP header of the JPGs, as a sidecar for the raw files and a CSV that can be uploaded alongside the images directly to the portal. The PhotoWatcher also now automatically adds the unique exsiccatae identifier (ometid) to the skeletal metadata upload file. Whenever the user captures an image of an exisccata specimen the ometid is added automatically to the XMP metadata and the XMP skeletal metadata CSV upload file.

Share Opportunities to Enhance Training Efforts

Digitization

The GLOBAL TCN website (https://globaltcn.utk.edu) continued to be updated with additional links and resources during 2021-Q3.

Transcription

The GLOBAL Project Manager (TENN) continued compiling transcription resources during 2021-Q3 to share on Basecamp and all resources were posted to the project website.

Georeferencing

WIS began to train recent student hires and found the Georeferencing Resources section of Cal. Phenology Network developed by Katie Pearson to be extremely valuable.

Symbiota

The GLOBAL Portal Manager (ASU) led a webinar for interested GLOBAL collaborators demonstrating the Symbiota Crowdsourcing Module as well as an overview of Notes From Nature in preparation for the October WeDigBio Event. A video introduction can be found here: https://youtu.be/cKHnaYzvI8E and a written protocol here: https://tinyurl.com/9t6wrvcj.

As part of our outreach to lichenologists from Latin America, ASU PI Bungartz held a Symbiota workshop (in Spanish) for the Consorcio de Herbarios de Líquenes en América Latina during the 9th Symposium of the International Association for Lichenology, in Brazil August 1-6.

Citizen Science

The GLOBAL Project Manager (TENN) attended four of iDigBio's Citizen Science webinars to gain more understanding of resources including BioSpex, iNaturalist, DigiVol, and CitSci.org.

ADBC Summit 2021

Many GLOBAL collaborators joined the 2021 ADBC Summit to hear about progress from our and other TCNs, including a few developing unique functions. These and similar workshops are always valuable for training.

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

A meeting with the TCN's External Advisory Committee (EAC) was held in July. Representatives from the GLOBAL Executive Committee (F, NY, TENN, and UC) and EAC members Deborah Paul (University of Illinois Urbana-Champaign; TDWG), Joe Miller (GBIF), Rosa Scherson (University of Chile), Shelley James (Western Australian Herbarium; Australasian Herbarium Collections;

SPNHC; TDWG), and Shuo Shi (Hebei Normal University) reviewed the GLOBAL TCN project's goals, progress, and challenges. The External Advisory Committee members offered advice on possible tools and connections that could be explored by the GLOBAL team.

The GLOBAL team was contacted by a representative from the Canadian Museum of Nature after the BL2021 event and shared resources and information about bryophyte and lichen digitization resources posted on our project website.

Lead PI Budke (TENN) was contacted in 2021-Q3 by the Harvard University Herbarium (FH), the Brown University Herbarium (BRU), and University of California, Davis (DAV) about the possibility of joining the GLOBAL collaboration as PEN's. Initial discussions were conducted via email and resources about the PEN process, as well as current GLOBAL digitization resources, were shared with all institutions. It was decided that BRU's collection was small enough in size to be digitized by WIS in place of the original collection from OS, who has decided not to participate. Their specimens will be loaned to WIS for digitization and preparation is in process. FH and DAV, along with CAS, may pursue the PEN process in 2022.

The GLOBAL TCN agreed to share their Data Management Plan with a researcher at the University of Texas at Austin as part of a project funded by an NSF award seeking to study DMPs and science data practices.

CINC is a member of the newly funded All-Asia TCN. They expect to apply upgrades and updates between projects. Workers on both projects will be sharing the same space (but separate imaging systems), and will benefit from learning from each other. COLO is also a member of the SoRo TCN and the All-Asia TCN and will continue to share info and technology between projects to help optimize workflows.

MICH has ongoing collaborations 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.

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

The GLOBAL Project Manager (TENN) attended an Armchair Botanist Event sponsored by the Botanical Research Institute of Texas (BRIT).

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.

During 2021-Q3, ASU added 4 new bryophyte collection profiles and 15 new lichen collection profiles. They provided regular assistance with custom data management and synchronization tasks and user management help desk requests. They have acquired 10 TB additional storage at ASU in preparation for migrating images from iDigBio servers to ASU servers.

ASU submitted hundreds of code developments and bug fixes to the Symbiota GitHub code repository (https://github.com/BioKIC/Symbiota-light/commits/master). For the GLOBAL project, they have, for example, added exsiccatae to Skeletal Data Entry tool and made adjustments to the crowdsourcing tools in preparation for the WeDigBio event. The PhotoWatcher tool now natively supports generating skeletal metadata als for Exsiccatae specimens. They have also established a framework and started development of a GLOBAL joint control panel that will be used to partially integrate the Lichen and Bryophyte portals.

ASU's revision of the character matrix in the lichen consortium continues. A new glossary with definitions and illustrations is being developed that helps to explain the revised terminology.

NY has been cleaning their internal database records for exsiccatae collections to be able to link these data to the portals more effectively.

Back Ups

ALA continued their collaboration with TACC for the uploading of raw images (DNGs) and JPGs. TACC provides both cloud storage as well as tape back-up of our data.

COLO's raw images and JPGs are being uploaded to the University of Colorado Research Computing. These images are in addition to the local copies housed in the CU Herbarium. The hope is that these images will never need to be accessed, but to serve as a catastrophic backup if 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 our data.

Taxonomy

ASU's data maintenance of the taxonomic thesaurus in the lichen consortium continues as part of regular database maintenance and updating. Most recent updates: revision of higher level taxonomy to match the current Outline of Fungi; updating the taxonomy of Teloschistaceae.

The taxonomic dropdown for the ImagingWorkflow application used by COLO and UC was missing many of the scientific names they use in their collections. They worked with ASU's Frank Bungartz and Katie Pearson to get an export of the lichen taxonomic thesaurus. COLO's Ryan Allen reformatted this list so it could be added to the application. Klara, UC's Lichen Curator, has also been manually adding missing species names to CSpace.

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

PI von Konrat (F) presented the GLOBAL project to conference attendees at Bryophytes, lichens, and northern ecosystems in a changing world (BL2021; July 6-9, 2021), reaching participants from the four major bryological, lichenological and botanical societies: the International Association of Bryologists (IAB), the American Bryological and Lichenological Society (ABLS), the Canadian Botanical Association (CBA-ABC) and the Société québécoise de bryologie (SQB).

Lead PI Budke (TENN) and PI von Konrat (F) presented an update on the GLOBAL TCN during the virtual ADBC Summit in September and many GLOBAL participants attended the Biodiversity Digitization Conference that followed the summit.

The GLOBAL TCN website (https://globaltcn.utk.edu) was maintained and updated with additional links to developed protocols and workflows. Social media accounts belonging to collaborators continued using #GlobalTCN as a way to share progress with the community. The GLOBAL Project Manager (TENN) also updated information on the GLOBAL TCN iDigBio wiki page (https://www.idigbio.org/wiki/index.php/Building_a_global_consortium_of_bryophytes_and_lichens:_keystones_of_cryptobiotic_communities).

The GLOBAL Outreach & Education group held an initial meeting in August and began discussions about WeDigBio. Six GLOBAL collaborators (DUKE, COLO, CINC & MU, F, MSC, TENN) agreed to participate and began planning for the October event. They held three additional WeDigBio Planning Meetings in September. The team from F shared their extensive experience and resources with the GLOBAL team. It was decided to focus on GLOBAL records during the Friday-Saturday of WeDigBio. The GLOBAL Portal Manager (ASU) also helped with preparation for the WeDigBio event.

ASU PI Bungartz held a two day Symbiota workshop (in Spanish) for the Consorcio de Herbarios de Líquenes en América Latina after the 9th Symposium of the International Association for Lichenology, in Brazil August 1-6. He also met online with Latin American collaborators facilitating data management practices in the Lichen Portal.

The Lichen Consortium recently added a new category of GLOBAL checklists, i.e., checklists with global reach, the Global Checklists of Lichens & Lichenicolous Fungi (https://lichenportal.org/cnalh/projects/index.php?pid=558) and, in collaboration with the IUCN, the Global IUCN Red-Lists (https://lichenportal.org/cnalh/projects/index.php?pid=556).

The team at F started working with six student interns from Roosevelt University in Chicago for their biodiversity class. The students are photographing labels and specimens and physically processing specimens that are part of the GLOBAL project on Thursdays until December. July also included working with two high school students (not paid by Museum) from Chicago Public Schools developing a community science project using the Zooniverse platform: https://www.zooniverse.org/projects/nvuitton/unfolding-of-microplant-mysteries.

NY started developing outreach content, publishing two public interest articles on The Hand Lens and working with the Children's Education Department at NYBG to talk about lichen and bryophyte collaborations.

TENN Collections Manager Oliver and the GLOBAL Project Manager participated in a Career and Jobs Mixer associated with the Botany 2021 conference in July. They answered questions from current graduate students about their paths to herbarium and collections careers.

Share Information About Your Website and/or Portal Usage

The GLOBAL project website, https://globaltcn.utk.edu, was utilized by 220 users during 2021-Q3, including 22 from Asia, 16 from Europe, 4 from Oceania, and 2 from Africa (see Figure 2).

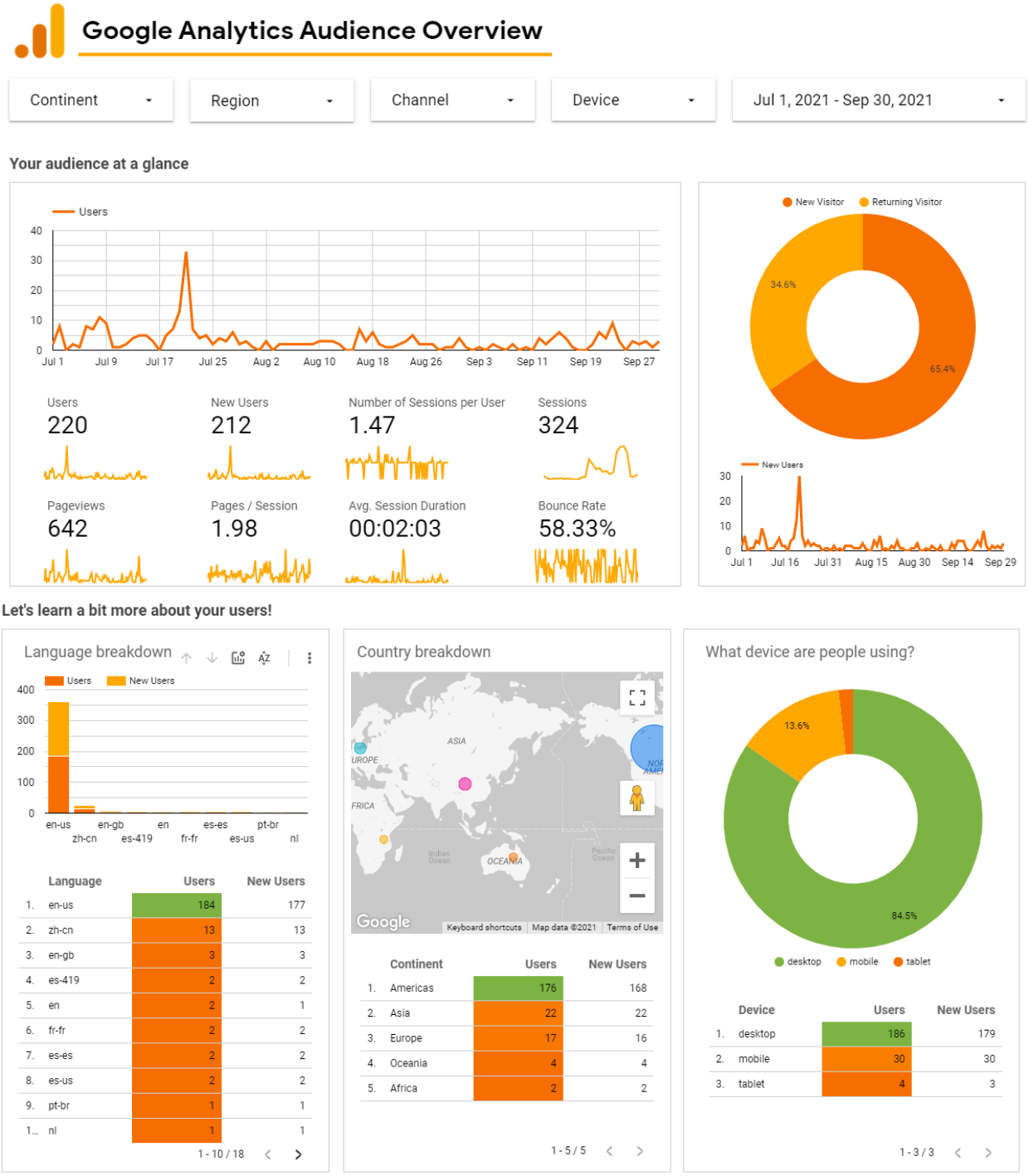


Figure 2: Use metrics for the GLOBAL project website (https://globaltcn.utk.edu) from July 1 – September 30, 2021.

The Bryophyte and Lichen Portals, created as part of the original LBCC grant, host new images and data produced by the GLOBAL collaborators. Over 2,800 users visited the Bryophyte Portal and over 11,500 users visited the Lichen Portal during 2021-Q3 (see Figures 3 & 4).

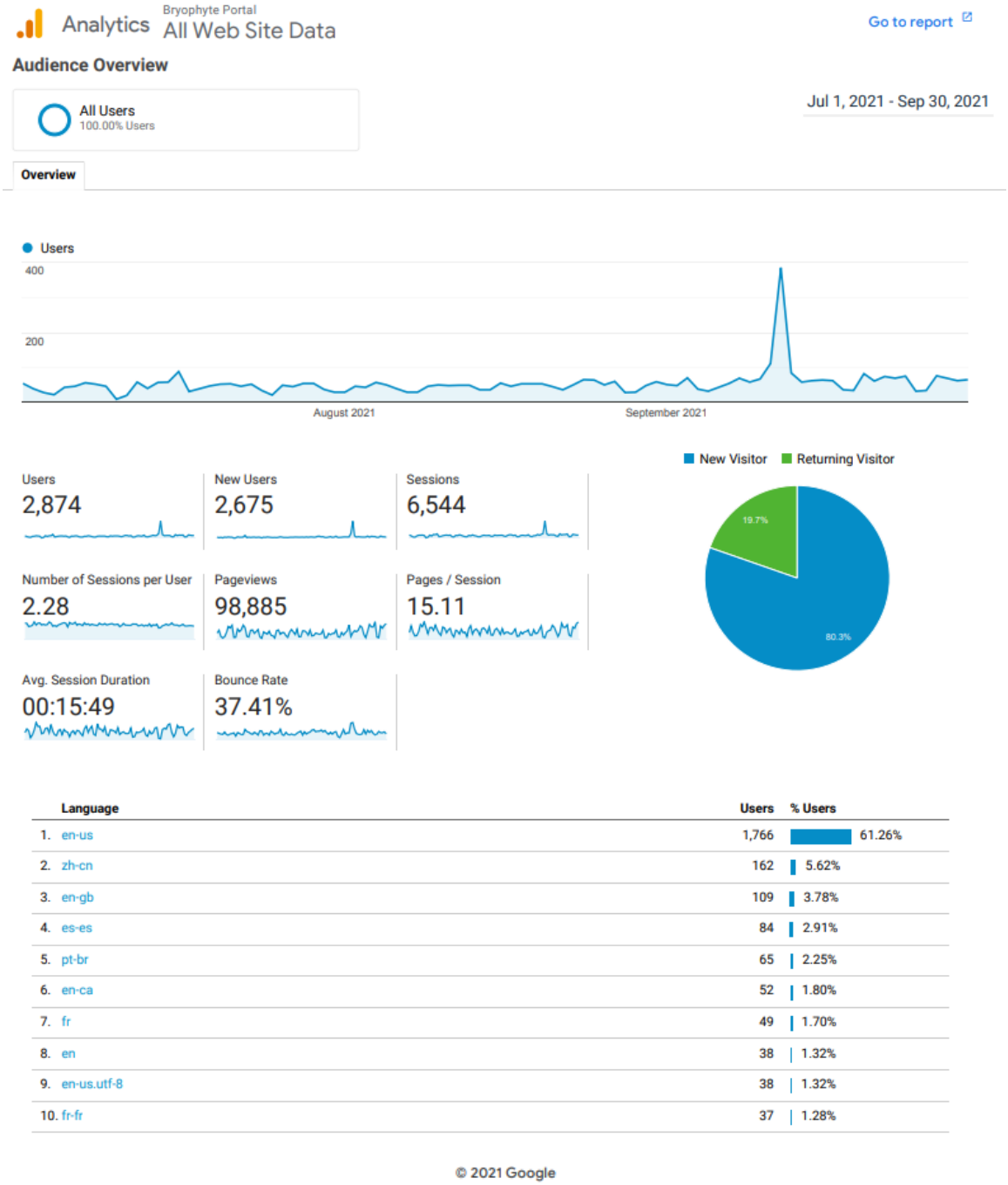


Figure 3: Use metrics for the Bryophyte Portal (https://bryophyteportal.org/portal/) from July 1 – September 30, 2021.

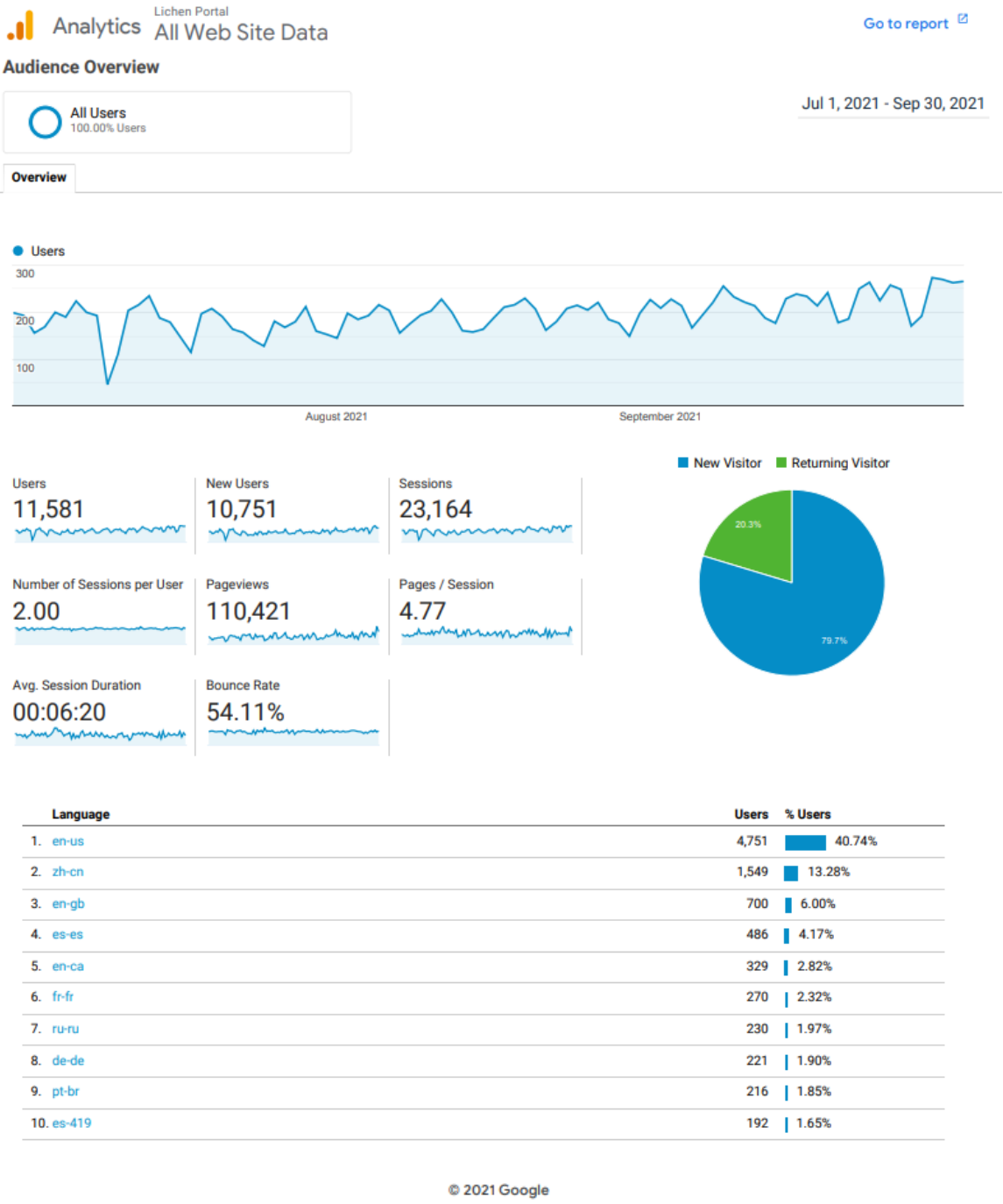


Figure 4: Use metrics for the Lichen Portal (https://lichenportal.org/cnalh/) from July 1 – September 30, 2021.

Share Other Activities and/or Progress

Bryophyte Packet Labels

A new label format has been integrated into the Lichen and Bryophyte portals by the team at ASU, where labels can be directly printed onto full paper sheets that can then be folded into lichen/bryophyte packets. Instructional videos will be shared in 2021-Q4.

Lichen Publication

Dr. Nash published a paper documenting WIS's unique collection of lichenicolous fungi which was only possible thanks to our digitization efforts (Evansia, 38(3):90-99 (2021).

ABSTRACT: The WIS herbarium has ca. 1000 specimens of lichenicolous fungi distributed across 406 species. Fifty-nine of the specimens are types, of which fourteen are isotypes and seven holotypes.

https://bioone.org/journals/evansia/volume-38/issue-3/0747-9859-38.3.90/Lichenicolous-Fungi-in-WIS/10.1639/0747-9859-38.3.90.full

NSF Annual Reporting

All GLOBAL institutions completed their Year 1 NSF Annual Reporting during 2021-Q3. The GLOBAL Project Manager (TENN) compiled the Integrated Report for the TCN which was attached to each main award report.

GLOBAL Logo

The team at TENN worked with scientific illustrator Andi Kur during 2021-Q3 to develop with an official logo for the GLOBAL TCN to use on the project website, resources, and outreach activities.

GLOBAL
Building a Global Consortium of Bryophytes and Lichens

Lepidoptera of North America Network &
Symbiota Collections of Arthropods Network (SCAN)
Quarterly Report

November 2, 2021
Neil Cobb

Progress in Digitization Efforts:

This is a joint report for the two Thematic Collections Networks (TCNs) SCAN and LepNet. Many museums are involved in both SCAN and LepNet, including collections that have received funding from both TCNs, collections that are unfunded for one TCN and funded by the other, and some collections that are providing data to both and are unfunded by the ADBC program. Both TCNs share the same database https://scan-bugs.org/portal/, which depending on the context we refer to as the SCAN-LepNet database or the LepNet-SCAN database. We will also serve arthropod data for InverteBase and will serve Terrestrial Parasite Tracker TCN data when it becomes available (See TPT TCN report for details).

Although we have made progress in developing Symbiota2, we have not added a significant number of new records and images for SCAN and LepNet since the August report, so the numbers presented here are from the August assessment. Summary statistics presented here were compiled from data accessed on the SCAN portal, August 2, 2021. **Table 1** shows the key statistics of Lepidoptera (LepNet) and non-Lepidoptera (SCAN) records to date. These consist of all records and images, including records and images from data providers who have allowed us to post their data on the SCAN/LepNet portal. Providing data from these additional providers increases our ability to georeference, add to taxonomic tables, and more accurately assess the total digitization effort for any given taxon. We provide data specific to institutions that received direct funding from the NSF-ADBC program in the annual reports to NSF.

Table 1. Records in SCAN/LepNet database, "all data" reflects all arthropod taxa, "Non-Lep" includes all non-Lepidoptera arthropod data, and Lepidoptera includes only Lepidoptera taxa.

	All data	Non-Lep (SCAN)	Lepidoptera (All Leps)
Specimen Records	28,541,718	22,878,418	5,663,300
# Georeferenced	24,738,012	19,661,823	5,076,189
# Imaged	6,865,944	4,257,874	2,608,070
# Identified to species	17,706,630	12,243,223	5,463,407

The SCAN network started in 2012 and the TCN funding has ended, but SCAN continues to support PEN projects. The LepNet grant was initiated on July 1, 2016 and there are currently 27 ADBC funded museums and one non-funded museum (Oklahoma State University). The museums comprising the NSF-ADBC LepNet are all serving records and images on the LepNet Portal and are serving data directly to iDigBio via IPT or through DwC archives on the LepNet-SCAN portal. Twenty museums are serving DwC archives to iDigBio and six museums are serving data snapshots with the LepNet portal. We have set up the SCAN Portal to serve all arthropod data from North America as well as all data from North American arthropod collections where specimens were collected outside of North America.

LepNet - The LepNet ADBC-funded museums are still on target to meet goals for records and images. An additional 59 collaborators (non-ADBC funded museums that use our data portal to serve their data) have also provided additional records for Lepidoptera. There are 49 collections (referred to as added-value) that have allowed us to harvest their data via IPT to serve lepidopteran records. Although most of the Lepidoptera imaged are from iNaturalist, 352,841 are specimen images **Table 2** shows the top 10 families of Lepidoptera in terms of total occurrences digitized.

What is most encouraging about the lepidopteran records is that 97% of the records are identified to species, which is higher than any of the other major orders. Thus, the primary factor limiting the production of "research-ready" data is due to georeferencing. For Lepidoptera 87% of the records are research-ready (i.e., identified to species and georeferenced) and by georeferencing existing records we should increase that percentage to 90% over the next three years. We realize that many records represent misidentified specimens and we also need to seek additional non-ADBC funding to review as many specimen identifications as possible. We are sponsoring three LepNet Partners to Existing Networks (PEN) grants (San Diego Natural History Museum, University of Wisconsin, and University of New Hampshire).

Table 2. The number of occurrence records for the top 10 families of Lepidoptera that have been digitized.

Family	Specimens	Georeferenced	Species ID	Georeferenced & Species ID
Nymphalidae	1,434,389	94%	99%	94%
Noctuidae	873,527	92%	97%	90%
Erebidae	742,934	87%	97%	84%
Geometridae	589,510	89%	96%	85%
Pieridae	512,908	86%	99%	85%
Hesperiidae	491,995	88%	98%	86%
Lycaenidae	403,585	94%	98%	93%
Papilionidae	284,263	88%	99%	88%
Crambidae	267,361	90%	97%	88%
Tortricidae	197,916	85%	95%	80%

Symbiota Collections of Arthropods Network (SCAN) - We have surpassed our overall TCN/PEN goals for the network and have been very successful in supporting data mobilization for unfunded museums and cooperation by larger collections that have allowed there data to be used to help mobilize data from other museums. We are sponsoring one SCAN PEN proposal, one through the American Museum of Natural History, focusing on several ground-dwelling families. **Table 3** shows data for the five major taxa we targeted in SCAN. All five groups have enough data to produce several papers, despite only 60% of the records with species-level identifications, accounting for 51% of the records being research-ready when you factor in percent records that are georeferenced.

Share and Identify Opportunities to Enhance Training Efforts: We are developing resources on the WordPress site http://www.scan-all-bugs.org/ .

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

Table 3 Number of records for the five focal SCAN taxa groups.

Taxa	# Specimen Records	# Georeferenced	# Specimen Identified to species	# Georeferenced & Ided to species
Formicidae	1,359,905	1,242,195	684,508	625,292
Carabidae	759,754	646,440	461,306	396,603
Acrididae	537,165	440,756	316,257	268,339
Araneae	487,356	463,247	444,927	326,775
Tenebrionidae	253,841	222,110	130,986	117,053

We share best practices on the SCAN/LepNet project website https://scan-all-bugs.org/ .

Images for Research - We developed a new and efficient process for uploading images to the database https://scan-bugs.org/portal/profile/index.php?refurl=/portal/imagelib/imagebatch.php? .We are participating in a TDWG-sponsored working group to develop standards for specimen images, including definition of morphological traits.

Identify Gaps in Digitization Areas and Technology: We are supporting the "LightingBug" project https://lightningbug.tech/, which will exponentially increase transcription rate of labels and produce specimen images comprising 360-degree image suites. The production of images will be transformational in terms of extending our capabilities to provide automated identifications and examine morphological traits.
We continue to seek out occurrence data to better understand the biogeography of the focal SCAN taxa and Lepidoptera. For most groups there is not enough data to talk about gaps. We are meeting this need by incorporating additional collections into the SCAN-LepNet database, and harvesting observational records from iNaturalist, Pollardbase, Buguide, LepSoc inventories, and smaller observation sets provided by individual lepidopterists.

Share and Identify Collaborations with other TCNs, Institutions, and Organizations:
We are currently only working with the Terrestrial Parasite Tracker TCN. We are also generally collaborating with a variety of individuals, projects and organizations to extend the ability to mobilize biodiversity data and promote the use of data in research. We are serving data from 246 collections, we continue to add one collection per month.

Share and Identify Opportunities and Strategies for Sustainability: Nothing to report

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

Focus on North American Arthropods We continue to provide North American data obtained from any credible sources to increase the quantity of data available to SCAN and LepNet users. We have added 29 new collections since the update.

GBIF Registration - There are 49 Live collections on SCAN that are now registered with GBIF and 93 other entomology collection datasets from the North America being served on GBIF for a total of 181 datasets. This leaves approximately 28 collections in North America that still need to register on GBIF.

Publications - We have published an overview of the LepNet project (Seltmann et al 2017), and several LepNet participants collaborated on a publication below (Belitz et al., 2018). Our review of North American entomology collections has been published in PeerJ. We are now developing a follow up review on completeness in bee data for the United States.

Belitz, M.W., Hendrick, L.K., Monfils, M.J., Cuthrell, D.L., Marshall, C.J., Kawahara, A.Y., Cobb, N.S., Zaspel, J.M., Horton, A.M., Huber, S.L. and Warren, A.D., 2018. Aggregated occurrence records of the federally endangered Poweshiek skipperling (*Oarisma poweshiek*). *Biodiversity data journal*, (6).

Cobb, N.S., L. Gall, J.M. Zaspel, L.M. McCabe, N.J. Dowdy. and A.Y. Kawahara. 2019 Assessment of North American Entomology Collections: Prospects and Challenges for Addressing Biodiversity Research. PeerJ, 7, p.e8086.

Google Analytics: Our Google Analytics data are dynamically shown https://datastudio.google.com/u/0/reporting/1VvEU4pM2LGqQXY0hVCTf98VvGmM7T_bu/page/cLZN for the SCAN portal, http://scan-bugs.org/portal/index.php .

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 **16,865** specimens, fully transcribed **19,182** specimens, imaged **45,193** specimens, and geo-referenced **4,934** specimen records. The total pteridophyte extant specimen progress including work done prior to the start of the grant is **621,018 (38% of goal)** skeletal records created, **1,161,832 (70% of goal)** extant specimens imaged, **1,095,122 (66% of goal)** extant specimens fully transcribed, and **290,665 (18% of goal)** extant specimens geo-referenced.

In the Pteridoportal (http://pteridoportal.org), we currently have **1,691,831** extant specimen records, **1,387,632** (82%) of which are imaged and **449,425** (27%) of which are georeferenced.

For fossil specimen progress during this reporting period, Pteridophyte Collections Consortium members databased **1,998** specimens, imaged **1,759** specimens, and geo-referenced **1,018** specimen records. The total pteridophyte fossil specimen progress including work done prior to the start of the grant is **37,097** (43% of goal) specimens databased, **34,046** (39% of goal) specimens imaged, and **18,365** (21% of goal) specimen records geo-referenced.

In the Pteridoportal (http://pteridoportal.org), we currently have **13,097** fossil specimen records, **10,560 (**81%) of which are imaged and **6,135** (47%) of which are georeferenced.

Institutions are reopening after COVID-19 closures, but progress is still limited due to restrictions on new volunteers, limitations on access to collections, and difficulties in filling open positions.

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

Filling open digitization technician positions has been a challenge at some institutions.

Share Opportunities to Enhance Training Efforts

At least nine new undergraduate students were trained to work on the program.

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

The University and Jepson Herbaria at UC Berkeley hired a new imaging lab manager, Gabrielle Rosa, who brings her expertise gained from working on the NEVP TCN at NYBG to our project.

Share Opportunities and Strategies for Sustainability

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

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

Co-PI Cindy Looy presented on the project at the ADBC Summit 2021 in September 2021.

Kathleen Pigg at Arizona State University published a manuscript on fossil Dennstaedtiaceae and Hymenophyllaceae with co-authors including Michael Sundue of University of VermontHerbarium (International Journal of Plant Sciences: Pigg, et al 2021).

George Yatskievych at the University of Texas, Presented one Zoom program to a Master Naturalist chapter and led two tours of the herbarium for university classes.

The Field Museum participated in their Collections Club virtually with over 100 volunteers transcribing herbarium fern records.

The UCMP at UC Berkeley continues to make regular posts to the PCC social media accounts highlighting specimens, Team Fern members and project progress.

At the University and Jepson Herbaria at UC Berkeley, students in the undergraduate course “Natural History Museums and Biodiversity Science” received a lecture on herbarium specimen digitization and a tour of the digitization lab; current undergraduate student workers demonstrated the process of imaging and databasing fern specimens for this class.

Share Information About Your Website and/or Portal Usage

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

Share Other Activities and/or Progress

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

TCN Quarterly Progress Report

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

TCN Name

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

Person Completing the Report

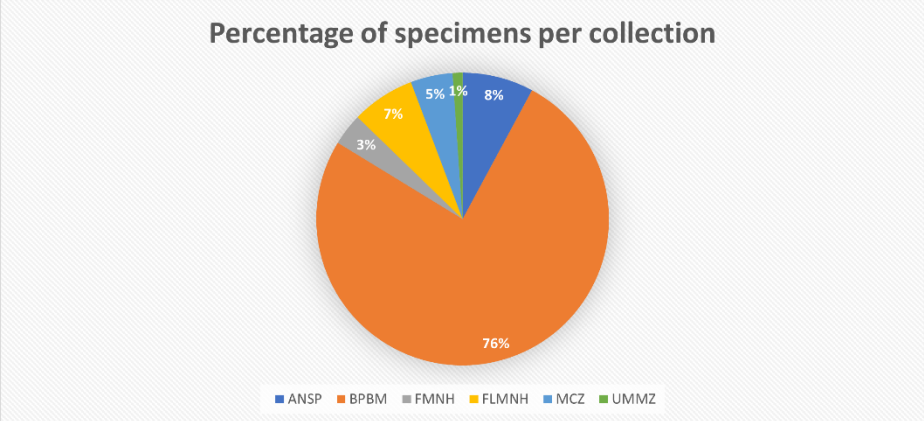
Name and role of the person completing the report, such as: Norine Yeung (Lead PI)

Share Progress in Digitization Efforts

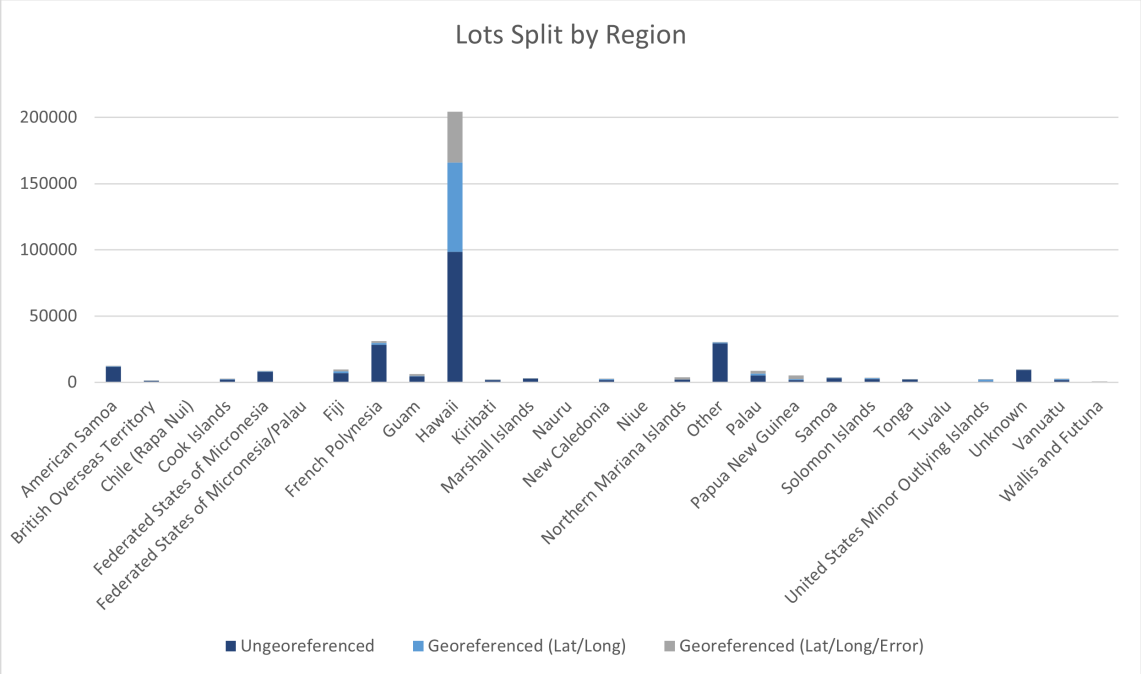
Share information here. You can also embed graphics if desired.

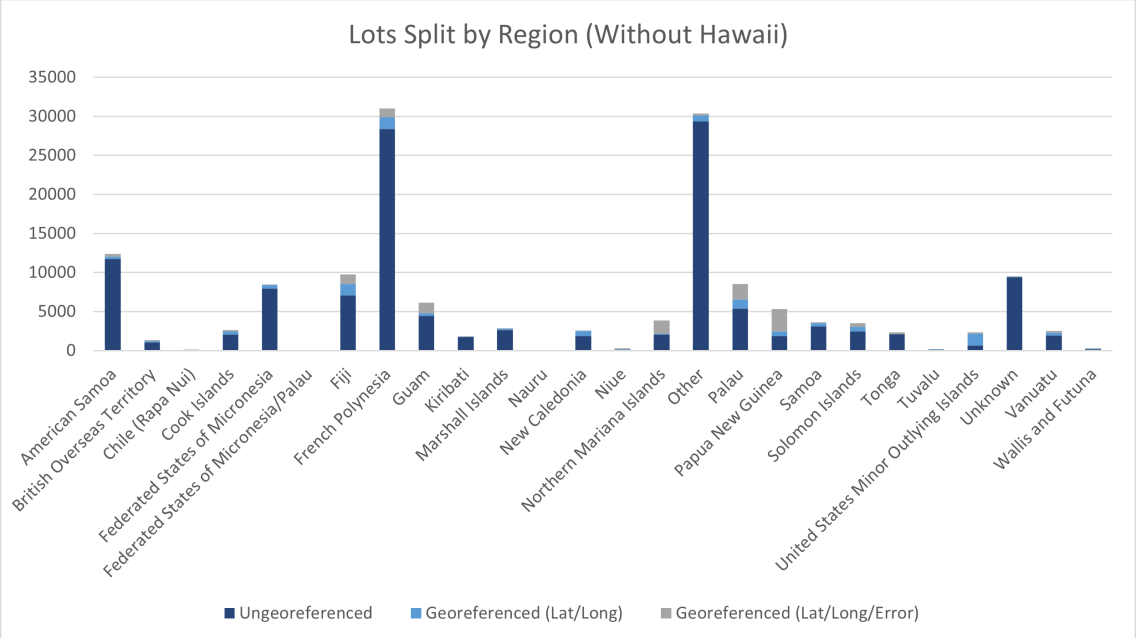
Digitization Overview

- All 6 collections have uploaded their Pacific Island land snail specimen records onto the PILSBRy symbiota portal – these are continually refined as data are cleaned
    - Totals: 250,015 lots, 3,142,715 specimens



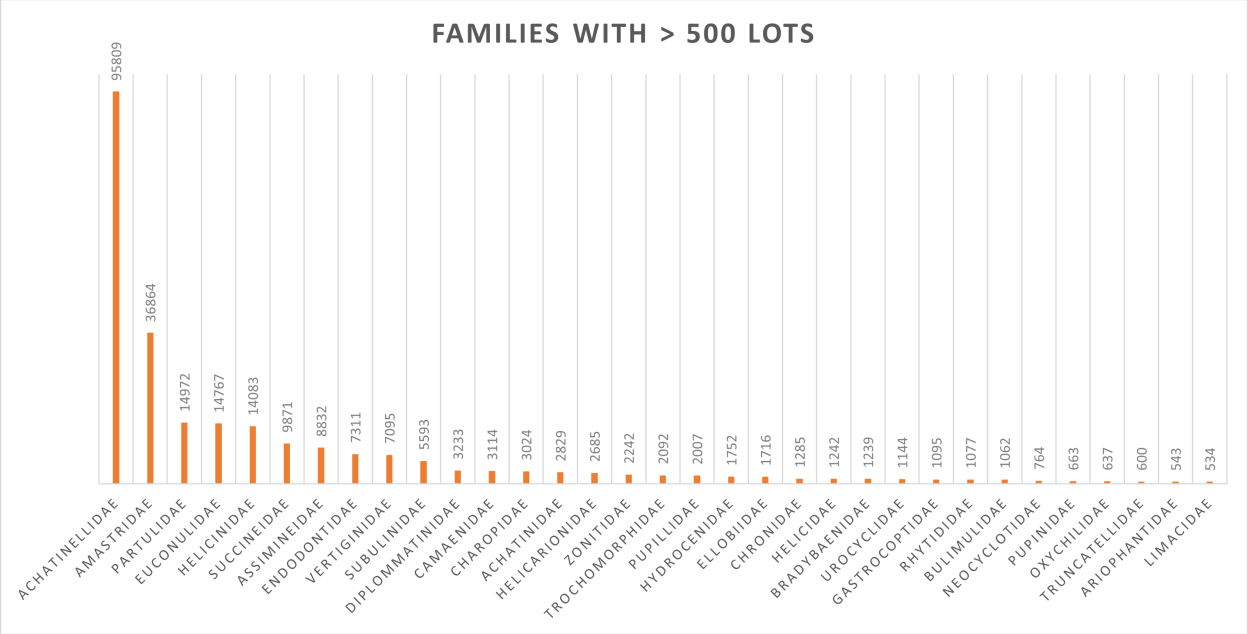
- All data has been coded to fall under a specified region, to ease in parsing out georeferencing data, as this process is being done by region rather than by collection.





  - Totals: Ungeoreferenced (No Lat/Long): 152,578 (61%)
    Georeferenced (Lat/Long): 97,437 (39%)
    Georeferenced (Lat/Long/Error): 43,267 (17%)

- Families for all taxa have been cleaned or added to the data, to ease in parsing out taxonomic data.



- The taxonomic authority file now contains 4,080 names including authorship information.
- Images for all collections except UMMZ have been uploaded into the portal (those images have not been made publicly available).
    - 4,360 specimen images (plated and unplated)
    - BPBM has linked ledger pages to 275,126 lots (94%)
    - BPBM has linked collection maps to 36,026 lots (19%)

Share Best Practices, Standards, and Lessons Learned

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

- Standardized higher level data is imperative for reporting, gathering and querying data. We continue to discover incorrect or missing records purely due to discrepancies in these areas.
- Scripts are being written to search BHL for certain taxonomic names, to help potentially find hidden names in literature.
- If a collection already has protocols specifically designed for their collection management system, it is better to let the collection continue to use those systems and gather that data periodically.

Share Identified Gaps in Digitization Areas and Technology

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

- COVID19 continues to impact access to collections and recruitment of staff and volunteers. For example, per MCZ: work from home; staff occupancy in MCZ limited to 25 -50%. (= 1 staff member 1 day per week). This is similar at the Field Museum and UMMZ.
- Digitization tools (Symbiota/GeoLocate) are not designed for use by insular specimens, highlighting a large gap in biodiversity digitization. This makes it difficult to manage and disseminate data that would be useful to these types of species (ie island and island group). Extra, unexpected time has to be spent to work around or code updates into these tools.
- Gazetteers and other digitized location information are not widely available for Pacific Regions in general, highlighting a need to make those resources digitally available.
- Repatriating data is and remains an issue for Symbiota portals. These data could be published from the portal to GBIF directly, but we've decided not to do this since most (4/6) of our collections already share their data via an IPT and we want to avoid duplicates.

Share Opportunities to Enhance Training Efforts

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

- Similar to the last report, COVID19 continues to impact physical training within the collection. However, we have created ppt presentations, protocol documents, videos, and organized virtual sessions to facilitate training within the project. Discussion are through Slack and meetings are recorded via Zoom and shared via Google Doc through Slack.

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

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

- We are continuing to work with local conservation agencies to incorporate species data and GPS information. Additional geographic areas besides Hawaii are now parsed out to the various collections to start tackling GPS data.

Share Opportunities and Strategies for Sustainability

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

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

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

- Most of the collections are still constrained by the COVID19 pandemic. But any recruitment of staff or volunteers/interns are cognizant in providing opportunities to minorities and reaching out to local residents. However, we have been able to recruit women in science and Pacific Islanders as interns and volunteers for this TCN.

- We have been able to post youtube #collectionbattles to educate the public the about the TCN project and general knowledge of molluscs. Will ask the collective at the next meeting on how to spread the word more broadly. Requesting potential battles across TCNs also.

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.

Institution: All SoRo Collections submitted by COPI/ Project Manager J Ryan Allen

Progress in Digitization Efforts (Database entries, images, captured, georeferences completed):

Collectively for the current quarter roughly August 2021-October 2021 we have entered 7348 new records into databases, barcoded 10,064 new specimens, imaged 19,201 new specimens and georeferenced 25,536 new records.

Our overall project totals are: 449,598 new database records, 966,463 newly barcoded specimens, 989,329 new images and 410,674 new georeferences.

The project after ~50 months (out of 48) has completed.
Data Entry 81.5%
Barcodes 115.5%
Images 113.2%
Georeferencing 66.6%

The SoRo TCN requested a no-cost extension to finish the project and the project has been extended to 8/2022. We are in the process of closing collaborative and subawards that have finished work. NYBG is submitting their final report and roughly half of the COLO subawards have been or are in the process of being closed out.

RM is in the process of staff changes and we are missing a report for the last two quarters. We will catch these up during the next reporting period.

COLO took over the digitization work for ALAM. The remaining ALAM budget was transferred to COLO during the past quarter, but work did not start until this quarter. All vascular plant specimens were imaged at COLO after being barcoded at ALAM in 2018. ALAM estimated 8,300 specimens for the project, but the herbarium only contained 5,161 vascular plants. 294 transcriptions were completed at ALAM. COLO transcribed 3647 specimens and georeferenced 3282 ALAM specimens during the past quarter. Georeferencing was originally included on the COLO budget and our geocoder was simultaneously transcribing records and georeferencing. This essentially uses up the budget that was transferred to COLO. We do not anticipate any additional work on that collection. Most of COLO's efforts this quarter went into completing as much of this collection as possible with the remaining funds.

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

Nothing new to report.

Identify Gaps in Digitization Areas and Technology:

HUH: Georeferenced data has not yet been ingested into out local database or shared with the Southern Rockies portal. Technical development to make this possible is planned.

RSA: We tried applying the batch georeferencing tool in Symbiota – but we think that it is a mistake to leave out habitat and elevation from this tool – so we have abandoned the Symbiota georeferencing method and have been exporting records from the database and georeferencing in batch in excel – we

actually found that this was a faster and more efficient way for us to georeference records in batch, and to accommodate for habitat and elevation.

Share and Identify Opportunities to Enhance Training Efforts:

CSCN: Rolfsmeier recorded workshop videos to train our imaging techs to georeference.

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

COLO: is also on the GLOBAL 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.

RSA: is also on the Endless Forms (NYBG as lead) and CAP TCNs.

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. Because the CAP project has set up a CyVerse account where we load images for that project, it is much more efficient for us to load all images to CyVerse (CAP, SoRo, EF, and all incoming, new acquisitions) where all images are served in the Symbiota platform. To date we are serving 210,661 images through the CCH2.org portal.

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

Share and Identify Opportunities and Strategies for Sustainability:

We have been working with local collections to get project data backed up on local servers. SJNM has been working to get images available online on campus servers. Images now have stable URLs and 35,267 images are now available in their database. They are actively adding barcode numbers to their database so the other ~half of the images can be linked to the specimens.

CSCN is working to build backups on local servers. A central goal of SoRo was to enable infrastructure at local institutions putting funding for backups on collection budgets so future projects also have infrastructure. They are in talks with their local IT to see if a local system to serve images can be created.

RSA: All data (images, databased records, georeferenced coordinates) have been entered directly into RSA's institutional database. This has always been maintained with institutional support and does not rely on external funding. We have migrated our database into Symbiota (from Specify), which we feel is a much more sustainable solution for us. All data generated as part of this project will become part of California Botanic Garden's digital assets, will be managed in accordance with our digital asset

management plan and will persist indefinitely. Digital assets are preserved on CalBG servers and a backup of all digital assets offsite through Amazon Web Services (AWS).

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

RSA: With COVID-19 our outreach activities have been restricted, but we did have one tour with Scripps College students (an art class) in September – along with the highlights of the herbarium, our digitization projects, including the SoRo project, was emphasized in the tour.

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

Most collections have moved or are moving back to regular access with reduced restrictions. Most of the work remaining on the project (data entry and georeferencing) can be completed remotely and some staff continue to work remote.

RSA: Staff have mostly returned to working in the herbarium, but some staff continue to work on data entry and georeferencing tasks from home. We've been trying catch up on barcoding, which seems to be taking a chunk of time out of imaging and data entry efforts.

HUH: Two of our Curatorial Assistants who supported the project resigned during the last reporting period. We are in the process of reviewing candidates for these two positions.

UNM: During this quarter, PI status was transferred from Dr. Tim Lowrey (retired) to Dr. Hannah Marx (UNM Herbarium Curator since Jan. 2021). Dr. Marx has also obtained a no-cost extension for the SoRo UNM grant. Additionally, we are in the process of searching for a new Collection Manager for the UNM Herbarium following the retirement of Phil Tonne (previous co-PI on this grant). We continue to repair specimens as needed when they are identified through imaging or georeferencing.

Google Analytics

Google Analytics for our SoRo site are still showing similar usage with a decrease in users, pageviews, and sessions. The previous quarter had some spikes in usage that we suspect was automated activity, so we expected usage to be down this quarter.

This Quarter (September 1st-October 31st) had 1,022 users over 1,477 sessions and 16,203 pageviews.

Last Quarter (May 1st 2021-August 30th 2021) had 1,398 users over 2,191 sessions and 18,420 pageviews.

We suspect that most of the data use is through the primary SEINet portal.

Analytics SoRo SEINet
All Web Site Data

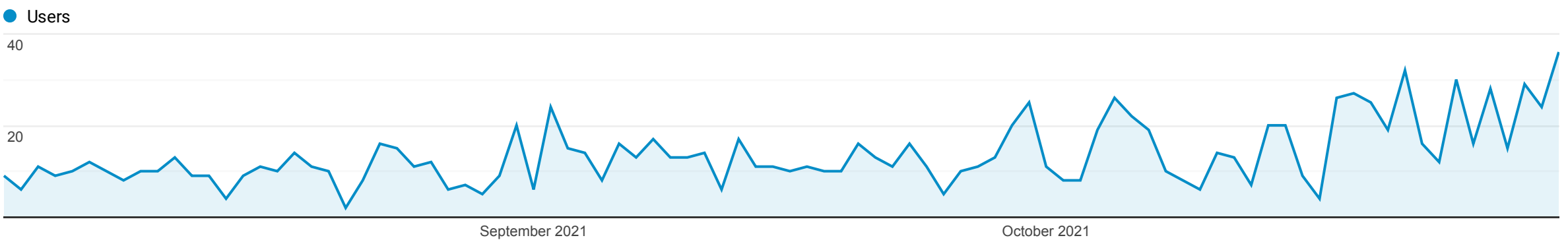
Go to report

Audience Overview

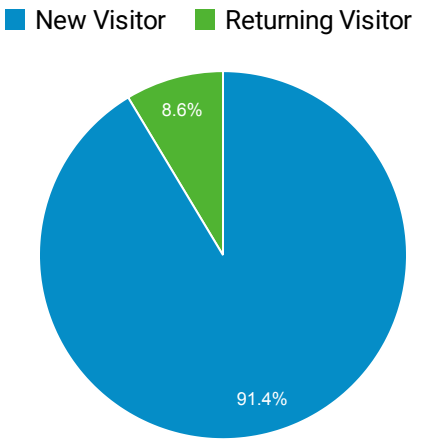
All Users
100.00% Users

Aug 1, 2021 - Oct 31, 2021

Overview



Users	1,022
New Users	1,007
Sessions	1,477
Number of Sessions per User	1.45
Pageviews	16,203
Pages / Session	10.97
Avg. Session Duration	00:12:21
Bounce Rate	61.27%



	Language	Users	% Users
1.	en-us	656	64.19%
2.	en-us.utf-8	145	14.19%
3.	zh-cn	95	9.30%
4.	en-gb	20	1.96%
5.	es-es	16	1.57%
6.	en	11	1.08%
7.	es-419	11	1.08%
8.	en-ca	7	0.68%
9.	it-it	6	0.59%
10.	de-de	4	0.39%

TCN Quarterly Progress Report

TCN Name

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

Reporting Period: August 1st, 2021 - October 31st, 2021
Assembled at BRIT on November 2nd, 2021, for November 3rd IAC meeting

Person Completing the Report

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

Reporting Institutions

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 [*No formal report received from SHST; see message from SHST on last page of this report]
TAES –	Texas A&M University-College Station
TAMUCC –	Texas A&M University-Corpus Christi
TEX-LL –	Plant Resources Center at the University of Texas at Austin [and Data Provider institutions]
TTC –	Texas Tech University
UTEP –	University of Texas at El Paso

Share Progress in Digitization Efforts

* Number of skeletal records created:

BAYLU = 0

BRIT = 0

HUH = 0

KANU = 0

MO = 0 (data reported as of 20 October 2021)

NOSU = 0

NY = 1,036 (project total: 30,423)

OKL = N/A (*134,954 cumulative)

OKLA = 0 (2,419 cumulative)

SHST = N/A

TAES = 0

TAMUCC = 5

TEX-LL & Data Providers (**barcoded** & assumed skeletally transcribed):

Plant Resources Center at UT-Austin (TEX-LL) =	8,698
Angelo State University (SAT) =	0
Fort Worth Nature Center (FWNC) = (finished earlier)	0
Howard Payne University (HPC) =	0
Lady Bird Johnson Wildflower Center (JWC) =	0
Our Lady of the Lake University (OLLU) =	0
Saint Edward's University (SEU) =	5,589
Sul Ross State University (SRSC) =	0
Texas Lutheran University (TLU) =	0
Texas State University (SWT) =	0
University of Texas Rio Grande Valley-Brownsville (RUNYON) =	0
University of Texas Rio Grande Valley-Edinburg (PAUH) =	0

Sub-Total for TEX-LL & Data Providers = 14,287

TTC = 0

UTEP = 0 [our work on this grant is now mostly complete]

Total skeletal records created this quarter: 15,328

* Number of fully-transcribed records created:

BAYLU = 1,645

BRIT = 19,656 (16,656 staff and volunteer transcriptions + 3,000 community science NfN-generated transcriptions)

HUH = 1,388

KANU = 46 (total fully transcribed records from OK and TX = 27,544)

MO = 162 (data reported as of 20 October 2021)

NOSU = 0

NY = 2,369 (project total: 62,807)

OKL = 1,218

OKLA = 2,479 (57,742 total, including import from Oklahoma Vascular Plants Database)

SHST = N/A

TAES = 0

TAMUCC = 0

TEX-LL:

TEX-LL & Data Providers:

Plant Resources Center at UT-Austin (TEX-LL) =	3,744
Angelo State University (SAT) =	63
Fort Worth Nature Center (FWNC) = (finished earlier)	0
Howard Payne University (HPC) =	185
Lady Bird Johnson Wildflower Center (JWC) =	396
Our Lady of the Lake University (OLLU) =	0

Saint Edward's University (SEU) = 1,762
Sul Ross State University (SRSC) = 1,221
Texas Lutheran University (TLU) = 1,176
Texas State University (SWT) = 0
University of Texas Rio Grande Valley-Brownsville (RUNYON) = 346
University of Texas Rio Grande Valley-Edinburg (PAUH) = 0

Sub-Total for TEX-LL & Data Providers = 8,893

TTC = 299

UTEP = 0 [our work on this grant is now mostly complete]

Total fully-transcribed records this quarter: 38,155

* Number of specimens imaged:

BAYLU = 0

BRIT = 3,150

HUH = 1,384

KANU = 0 (total imaged specimens from OK and TX = 23,992)

MO = 369 (data reported as of 20 October 2021)

NOSU = 1,796

NY = 8,250 (project total: 43,446)

OKL = N/A (*84,457 total)

OKLA = 0 (75,301 total)

SHST = N/A

TAES = 10,000

TAMUCC = 1,725

TEX-LL & Data Providers:

Plant Resources Center at UT-Austin (TEX-LL) =	12,442
Angelo State University (SAT) =	63
Fort Worth Nature Center (FWNC) = (finished earlier)	0
Howard Payne University (HPC) =	124
Lady Bird Johnson Wildflower Center (JWC) =	0
Our Lady of the Lake University (OLLU) =	0
Saint Edward's University (SEU) =	5,589
Sul Ross State University (SRSC) =	1,220
Texas Lutheran University (TLU) =	0
Texas State University (SWT) =	0
University of Texas Rio Grande Valley-Brownsville (RUNYON) =	346
University of Texas Rio Grande Valley-Edinburg (PAUH) =	0

Sub-Total for TEX-LL & Data Providers = 19,784

TTC = 1,836

UTEP = 0 [our work on this grant is now mostly complete]

Total number of specimens imaged this quarter: 48,294

* Number of specimens georeferenced:

BAYLU = 268

BRIT = 0

HUH = 2,465

KANU = 46 (total georeferenced from OK and TX = 27,282)

MO = 19 (data reported as of 20 October 2021)

NOSU = 0

NY = 13,433 (project total: 71,823)

OKL = 2,274

OKLA = 0 (11,218 total)

SHST = N/A

TAES = 0

TAMUCC = 0

TEX-LL & Data Providers:

Plant Resources Center at UT-Austin (TEX-LL) =	1,446
Angelo State University (SAT) =	58
Fort Worth Nature Center (FWNC) = (finished earlier)	0
Howard Payne University (HPC) =	0
Lady Bird Johnson Wildflower Center (JWC) =	226
Our Lady of the Lake University (OLLU) =	0
Saint Edward's University (SEU) =	0
Sul Ross State University (SRSC) =	74
Texas Lutheran University (TLU) =	68
Texas State University (SWT) =	0
University of Texas Rio Grande Valley-Brownsville (RUNYON) =	0
University of Texas Rio Grande Valley-Edinburg (PAUH) =	0

Sub-Total for TEX-LL & Data Providers = 1,872

TTC = 211

UTEP = 0 [our work on this grant is now mostly complete]

Total number of specimens georeferenced this quarter: 20,588

* Other digitization or pre-digitization efforts:

BAYLU: Have added tasks of mounting identified specimens in preparation for addition of photographing and adding to TORCH herbarium database.

BRIT:
Data cleaning of records generated from Notes from Nature

Physically located all project specimens in the NLU collection and launched a crowdsourcing project to engage volunteers in complete transcription of these records.

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 (outside of business hours) and ongoing support (via email, Zoom, and Google Docs) has resulted in 12,433 skeletal transcriptions (scientific name, country, state, county) this reporting period, some of which will now be prioritized for complete transcription by staff as they've been identified to have been collected in Texas or Oklahoma.

Completed the imaging and transcription of the entire HSU collection.

A significant amount of time was spent processing TORCH specimen images and uploading these to the TACC server, then linking them to Symbiota records.

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

OKLA:
Data Manager Clay Barrett continued working on project documentation on OSF, and set permissions on the main repository to "public" (*Collection Management Documents*). Also, during this quarter, Barrett reports that approximately 6,000 transcriptions were completed from the previous quarter's subjects, and approximately 8,000 transcriptions have been completed from new subjects. Lastly, 4,000 new subjects were uploaded to Notes from Nature, in order to continue with the #ArmchairBotanist program. At the end of October, 11,196 transcriptions from the BioSpex/Notes from Nature platforms were "repatriated" back into BRIT collections (6,312 NLU; 4,000 BRIT; and 884 VDB).

TAES:
We have scheduled the imaging of specimens at three provider collections – Mercer Botanic Garden, Stephen F Austin, and TAMU-K. These will begin in Spring 2022.

We have initiated the process to put together our first Notes From Nature Expedition. We expect this expedition to go live this upcoming quarter.

TEX-LL: University of Texas Rio Grande Valley – Brownsville (RUNYON) was formally transferred to the University of Texas at Austin (TEX) in August 2021. However, we are continuing to track our digitization efforts separately for the purposes of this grant. Professor Yatskievych also visited University of Texas Rio Grande Valley – Edinburg (PAUH) to reestablish connections there following the retirement of the curator (who has not been replaced).

TTC: TTC now has a GBIF portal active at the following URL: https://www.gbif.org/dataset/a6f37a35-cb18-4395-9a0c-5be222c8e6c8

* Comments about digitization progress:

HUH: We anticipate achieving our total digitization goals (~55,000 specimens) during this no-cost extension year. Georeferenced data has not yet been ingested into our local database or shared with portals. Technical development to make this possible is planned.

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. We systematically checked all cases for folders that might have been overlooked. We began post-processing of images in Lightroom in early September, but that effort was delayed due to computer hardware problems, which have since been fixed. About 5,000 of the roughly 24,000 images have been post-processed, and we expect to complete post-processing in November so all images can be uploaded to our attachment server and then made available via web portals.

MO: The COVID-19 pandemic continued to severely impacted our ability to conduct work on the TORCH TCN project during the period 1 August-20 October 2021. As of this reporting, access to our collections remains restricted to just our science staff. Presently, there are no provisions for access to our facilities by students or volunteers. This has curtailed our ability to make the level of progress that we had anticipated for this project. During this quarter we have been unable to recruit any project participants. This has been our situation since the pandemic started in March 2020. We are hopeful that in the coming months this will change, but we have no sense of when that might happen. Recruiting participants will be a top priority and major concern when we return to some kind of "normalcy".

NOSU: We are working on it!

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.

OKL: A hard drive failed in our hard drive bay. We are still working on backing up the files and then we can rebuild the drive.

TAMUCC: Our digitization is going smoothly, we will need to inquire about retrieving other specimens in our collection that are located elsewhere so that we can incorporate them into our digitization efforts.

TEX-LL: We are still behind our schedule due to the earlier COVID shutdown.

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

BAYLU = 0

BRIT (and Data Providers):
[Searched all collections on 27 Oct 2021, without taxonomic constraints collected in TX or OK]

BRIT-SMU-VDB-NLU:	193,710
TAC:	7,065
NTSC:	0
ACU:	0
HSU:	336

Sub-Total for BRIT & Data Providers = 201,111

HUH = 41,788 (* last ingested by iDigBio 2021-05-20).

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. Uploading of images will commence in November. [for this count, **assumed 27,544 as in "fully transcribed" section above**]

MO = 0

NOSU = 0

NY = 112,458 (also includes bryophytes and fungi)

OKL = 0

OKLA = 0

SHST = N/A

TAES = 0

TAMUCC = 0

TEX-LL & Data Providers:

Plant Resources Center at UT-Austin (TEX-LL) =	235,579
Angelo State University (SAT) =	0
Fort Worth Nature Center (FWNC) = (finished earlier)	0
Howard Payne University (HPC) =	26,778
Lady Bird Johnson Wildflower Center (JWC) =	0
Our Lady of the Lake University (OLLU) =	0
Saint Edward's University (SEU) =	0
Sul Ross State University (SRSC) =	0
Texas Lutheran University (TLU) =	6,673
Texas State University (SWT) =	0
University of Texas Rio Grande Valley-Brownsville (RUNYON) =	0
University of Texas Rio Grande Valley-Edinburg (PAUH) =	0

Sub-Total for TEX-LL & Data Providers = 269,030

TTC = 0

UTEP = 82,383

Total number of records available in iDigBio portal (cumulative): 734,314

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

BAYLU = 50,657

BRIT (and Data Providers):
[Searched all collections on 27 Oct 2021, without taxonomic constraints collected in TX or OK]

BRIT-SMU-VDB-NLU:	197,334
TAC:	7,064
NTSC:	11,324
ACU:	3,746
HSU:	3,965

Sub-Total for BRIT & Data Providers = 223,433

HUH = 41,556 (* last ingested 2021-05-20)

KANU: All KANU records uploaded to GBIF and iDigBio should be accessible via the TORCH portal. [for this count, **assumed 27,544 as above**]

MO = 0

NOSU = 0

NY = 87,315 (same as previous report – IPT has apparently not been updated)

OKL = 136,172

OKLA = 60,424

SHST = N/A

TAES = 236,901

TAMUCC = 0 (We plan to upload everything at the end of our digitization efforts)

TEX-LL & Data Providers:

Plant Resources Center at UT-Austin (TEX-LL) =	236,130
Angelo State University (SAT) =	58,077
Fort Worth Nature Center (FWNC) = (finished earlier)	1,918
Howard Payne University (HPC) =	26,803
Lady Bird Johnson Wildflower Center (JWC) =	3,272
Our Lady of the Lake University (OLLU) =	0
Saint Edward's University (SEU) =	1,762
Sul Ross State University (SRSC) =	27,450
Texas Lutheran University (TLU) =	7,444
Texas State University (SWT) =	0
University of Texas Rio Grande Valley-Brownsville (RUNYON) =	0
University of Texas Rio Grande Valley-Edinburg (PAUH) =	7,502

Sub-Total for TEX-LL & Data Providers = 370,358

TTC = 21,958

UTEP = 85,504

Total number of records available in TORCH Symbiota Portal (cumulative): 1,341,822

Share Best Practices, Standards, and Lessons Learned

Best Practices and Standards (Lessons Learned):

OKLA: We are making better use of duplicate records for transcribing new records, using Symbiotas internal tools for finding duplicates and transferring data.

TAES: Because we have a partially complete database, we have found it to be challenging to determine which specimens require additional transcription. This is because, for the first several quarters of this project, specimen images were named after their barcode number, while the database contains only the TAES accession number. We have adjusted our workflow to record both accession and barcode number at the time of imaging, which should streamline this process in the future. We had hope that accession numbers could be recorded through image recognition software, but this has not been successful to date.

TAMUCC: Write down everything you do so that when new people join the project, you will have a roadmap for them to follow!

Share Identified Gaps in Digitization Areas and Technology

Identify Gaps in Digitization Areas and Technology (issues preventing progress):

NY: McKenna Coyle (and all herbarium staff) continue to work onsite three days per week; return to full-time onsite work is not anticipated until early 2022. Given the Garden's COVID restrictions, we decided not to offer a second TORCH internship, but instead are using the funds to continue McKenna's employment on the project. We anticipate that these funds will be expended in late January or early February of 2022.

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. Data Manager Clay Barrett will be leaving the project on November 5th, 2021, so we will be advertising his position soon, and hope to be hiring a new Data Manager early next year.

TAES: We expected to be able to use image recognition software to record accession numbers off of imaged specimens. This was to be used to link images to specimens that have already been databased. To date, the accuracy of these methods has been insufficient to implement, and we are now needing to go back and create a CSV including both barcode and accession numbers for about 50,000 images. We have adjusted our workflow to record this information at the time of imaging.

TAMUCC: We cannot do a live upload after taking photos (more steps are needed to upload to TACC), which can make it difficult for multiple people to take part in this.

TEX-LL: One of our imaging light-boxes died last July. Until we can get it replaced or re-wired, this will continue to cause a bottleneck in our imaging progress.

Share Opportunities to Enhance Training Efforts

Opportunities to Enhance Training Efforts; Training and Professional Development Opportunities you offered and/or participated in (e.g., webinars, student digitizer training, etc.):

BAYLU: Conducted two training sessions on transcription, including technician, student worker, and Texas Maser Naturalist volunteers.

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

NOSU: Three students are now working on digitization on their own. Graduate level: Lorelei Burnside; Undergraduate level – Emma Mills and Jon Weeden.

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.

OKL: Master's student Leann Monaghan conducted a remote training workshop for the digitizers at our subawardee NOSU.

OKLA: Trained one new undergraduate assistant in transcription

TAMUCC: Attended TACC 2021 symposium (so cool!)

TEX-LL: New workers have been trained in digitization techniques.

TTC: We have trained 18 undergraduate students this quarter on various aspects of digitization. This has included both new undergraduate student workers funded by the TCN subaward (see below) and students in a new course taught in the Herbarium.

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

Collaboration with other TCNs, Institutions, and Organizations:

For the whole project:

During this Quarter, the TORCH TCN Project held three (approximately monthly) Executive Committee Meetings, on August 10th, September 16th, and October 28th. The TORCH Summer Internship program (to be held in 2022) was discussed, and much progress was made. Specifically, advertising and recruiting will begin later this month (November 2021). At the end of their internships, students will present their work in a poster session to be held on August 8th, 2022, just prior to TPCC (Texas Plant Conservation Conference), to be hosted at BRIT in Fort Worth.

TEX-LL: TEX staff attended parts of the iDigBio summit virtually. Nothing else to report.

Share Opportunities and Strategies for Sustainability

Opportunities and Strategies for Sustainability:

TAMUCC: We make sure to use cleaning products that are ecofriendly and effective, reusable bags for specimens (bags are sterilized) and turn off all power when we can.

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

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

For the whole project: Project Manager Diego Barroso presented on behalf of the TORCH TCN Project during the 2021 ADBC Annual Summit (September 21st, 2021).

OKLA: Graduate advisee Sierra Hubbard gave an informal presentation on the status of georeferenced records in the portal available for research at a 0.5˚ scale resolution in Texas and Oklahoma (October 22, 2021)

TAMUCC: Our work has been referenced in classrooms on campus and in student organization activities.

TEX-LL: Professor George Yatskievych presented one Zoom webinar to 43 Master Naturalists and we provided two class tours to UT courses.

Other Education and Outreach Activities:

BRIT:

BRIT TORCH TCN staff organized a Volunteer Appreciation Day / Picnic at BRIT for #ArmchairBotanist volunteers assisting with specimen label transcription through Symbiota and Notes from Nature. 12 attendees. (September 29th, 2021)

Rehman, Bordelon, Barroso, and Barret held a semi-annual virtual WeDigBio event (represented BRIT, joining in this worldwide transcription event), with 12 non-staff attendees (17 total) (October 14th, 2021)

Rehman, Bordelon, and Barroso with BRIT staff member Barney Lipscomb, Brooke Best, and Jessica Lane, and Cristo Rey High School students organized an Armchair Botanist appreciation event and collection tours through Reception at BRIT (Texas Master Naturalist Program Annual Conference). 20 attendees. (October 21st, 2021)

Rehman, Bordelon, Barroso, and Barret Presented #ArmchairBotanist program to Texas Master Naturalists, including an overview of the TORCH TCN project and progress to date. Also emphasized how users can access the data through the online TORCH portal (Texas Master Naturalist Program Annual Conference). 46 attendees. (October 23rd, 2021)

Rehman and Bordelon Presented “Collecting Scientific Herbarium Specimens” to Texas Master Naturalists and showed them how to “find the gaps” by utilizing digitized records in the TORCH portal to see what had been vouchered for the Texas counties their particular chapters support (Texas Master Naturalist Program Annual Conference). 40 attendees.

Rehman Presented “Herbaria and the Importance of Digitization: the Texas Oklahoma Regional Consortium of Herbaria Project” to the Rio Brazos Chapter. 40 attendees.

NY: We had several days of programming for iDigBio this year, including webinars, volunteer training sessions, and volunteer meet-and-greet sessions.

TAES: Students in Dr. Spalink's Agrostology course are conducting independent research projects utilizing TORCH and iDigBio records. The assignment requires students to ask and investigate any question related to the biodiversity, geography, or conservation of grasses in Texas that can be answered using these records. Many are using these records to track the spread of invasive species through time, or the decline or shift in distributions of rare species; others are plotting total grass diversity as it relates to climate or geography.

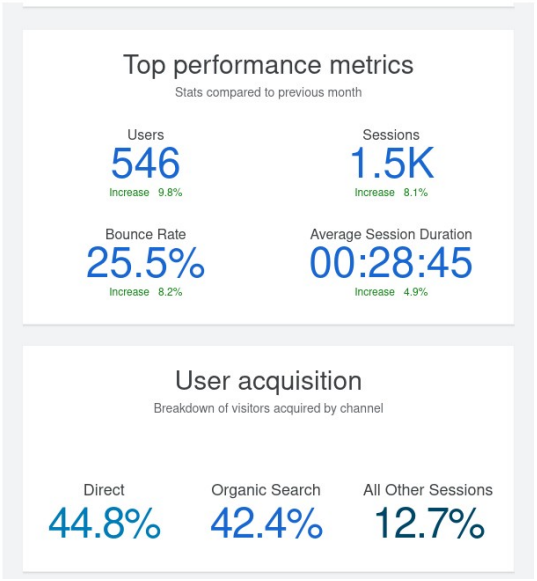
TTC: Subaward PI Johnson developed a new course – BIOL4301-012: Field Botany and Natural History Collections – which is taught in Fall 2021 in the Herbarium. The class has 16 undergraduate students and is 50% lecture/discussion of herbarium specimen use in primary scientific literature, and 50% practical curation activities. Each student was responsible for at least one new collection for the herbarium, including pressing, mounting, labeling, and digitizing specimens. Students also design a term project that involves the herbarium in some way—many students chose to help with our backlog of unmounted specimens, while others are digitizing specimens. Students in the class participated in the WeDigBio event on 10/14/2021 and georeferenced 211 specimens for TTC.

UTEP: “Where We Will Grow” Exhibit at UTEP Centennial Museum and interactive exhibit at the UTEP Chihuahuan Desert Botanical Garden utilizes historical Elsie Slater Herbarium Specimens. This exhibit cites the TORCH TCN grant and is directly associated to the NSF Project and an IMLS project. Designed by undergraduate Muriel Norman and Project Manager Vicky Zhuang.

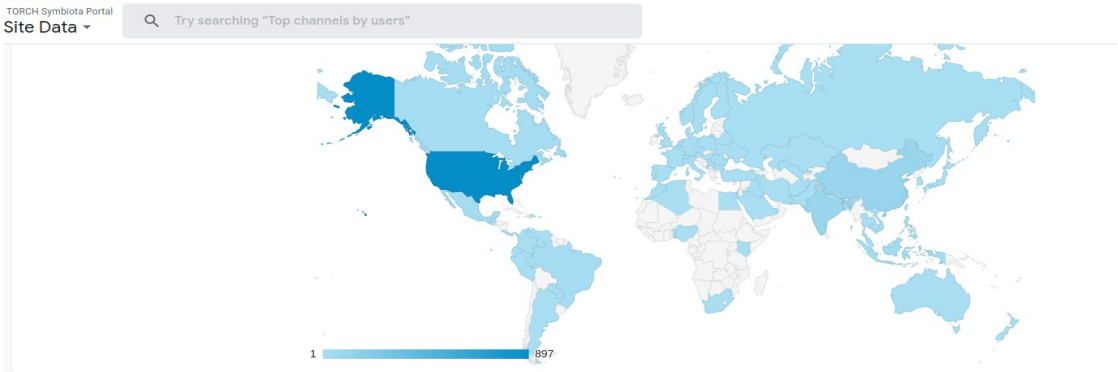
Share Information About Your Website and/or Portal Usage

October 2021 usage below:

In October, you had 546 users visit your website (Google Analytics)



Usage by country (Top Ten list), Aug. 1st through Oct. 31st:

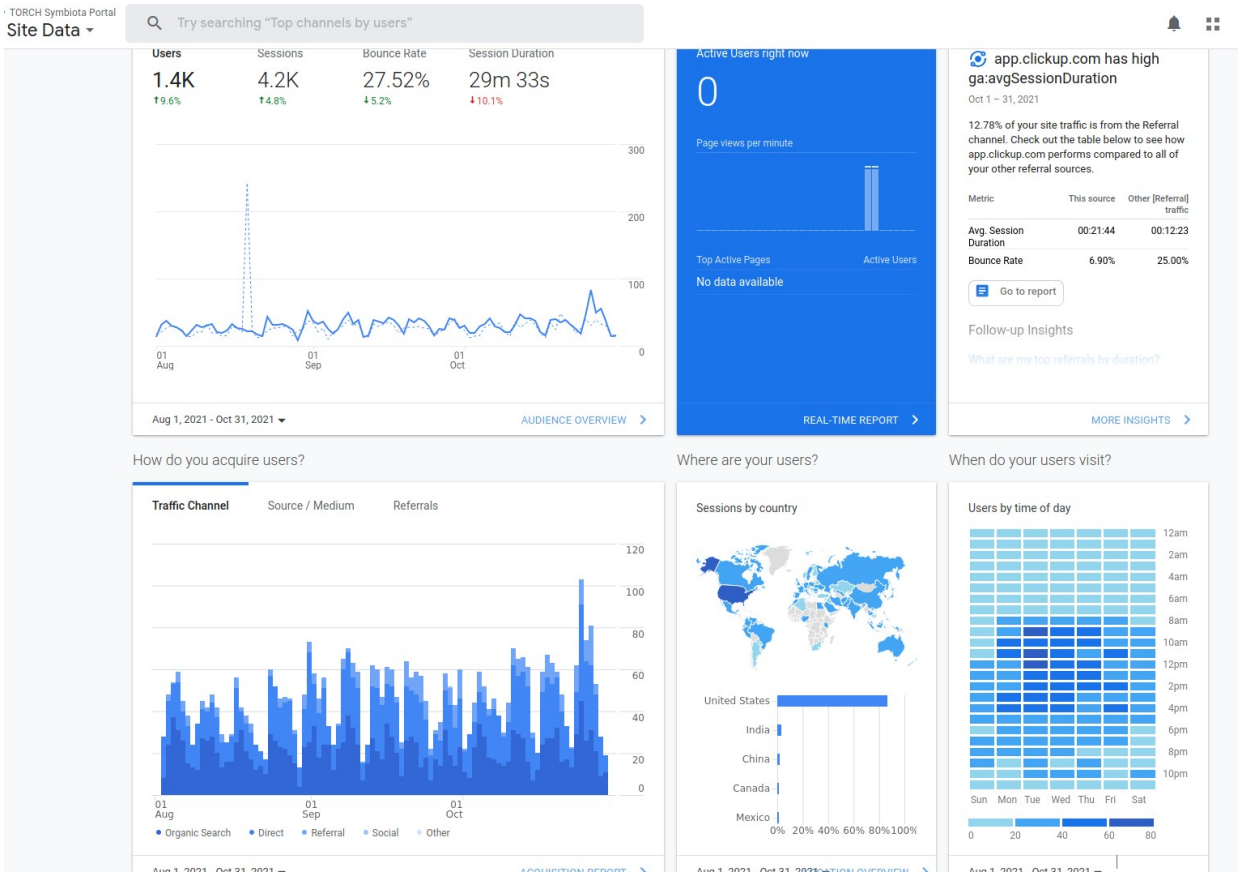


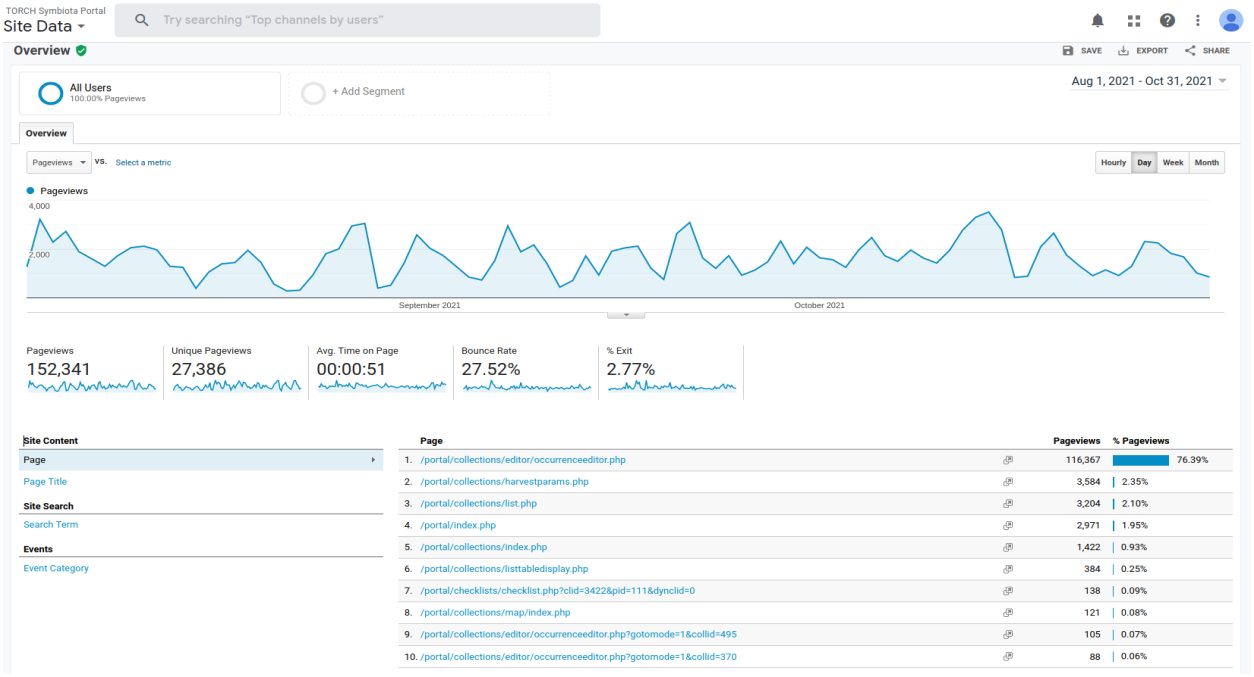
Primary Dimension: Country City Continent Sub Continent

Secondary dimension

Country	Acquisition			Behavior			Conversions
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate
	1,379 % of Total: 100.00% (1,379)	1,293 % of Total: 100.08% (1,292)	4,219 % of Total: 100.00% (4,219)	27.52% Avg for View: 27.52% (0.00%)	36.11 Avg for View: 36.11 (0.00%)	00:29:34 Avg for View: 00:29:34 (0.00%)	0.00% Avg for View: 0.00% (0.00%)
1. United States	897 (64.91%)	814 (62.95%)	3,647 (86.44%)	19.66%	41.35	00:33:48	0.00%
2. China	94 (6.80%)	94 (7.27%)	94 (2.23%)	100.00%	1.00	00:00:00	0.00%
3. India	87 (6.30%)	85 (6.57%)	122 (2.89%)	86.89%	1.18	00:01:02	0.00%
4. Mexico	35 (2.53%)	35 (2.71%)	41 (0.97%)	63.41%	3.56	00:02:52	0.00%
5. Indonesia	33 (2.39%)	33 (2.55%)	33 (0.78%)	100.00%	1.00	00:00:00	0.00%
6. Brazil	20 (1.45%)	20 (1.55%)	29 (0.69%)	51.72%	10.90	00:06:08	0.00%
7. Canada	20 (1.45%)	18 (1.39%)	46 (1.09%)	36.96%	6.87	00:16:20	0.00%
8. Germany	15 (1.09%)	14 (1.08%)	16 (0.38%)	93.75%	1.06	00:00:25	0.00%
9. Philippines	14 (1.01%)	14 (1.08%)	18 (0.43%)	22.22%	8.06	00:05:36	0.00%
10. United Kingdom	13 (0.94%)	13 (1.01%)	13 (0.31%)	61.54%	2.46	00:02:23	0.00%

iDigBio
Integrated Digitized Biocollections





UF UNIVERSITY of FLORIDA
FLORIDA STATE UNIVERSITY 1851
FM FLORIDA MUSEUM
NSF

Share Other Activities and/or Progress

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

TAES:

REFERENCES CITED

* Spalink, D, P Jiménez-Mejías, T Villaverde, S Martín-Bravo, M Escudero, KS Sanbonmatsu, JI Márquez-Corro, I Larridon, E Roalson, KJ Sytsma, and AL Hipp. In Revision. Global drivers of diversification and assembly are spatially structured. New Phytologist.

* Spalink, D, P Jiménez-Mejías, T Villaverde, S Martín-Bravo, M Escudero, KS Sanbonmatsu, JI Márquez-Corro, I Larridon, E Roalson, KJ Sytsma, and AL Hipp. Global drivers of diversification and assembly are spatially structured. Botany 2021.

* Sanbonmatsu, KK, D Spalink. In review. Spatial phylogenetics of mosses (Bryopsida) at a Global Scale: Current Status and Future Directions

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

BAYLU:

The following are Texas Master Naturalists who are helping with transcription: Erin Shields, Diane Cooney, Michaela McCown, Carol Byer*, Rachel Mims, Cari Spiares, Rebecca Simanek, Stanley Harris, Susan Potts, Janet Wallace, Cheryl Foster, Annette Jones, Liz McDaniel, Max Burns, Katie McKenzie

BRIT:

Ashley Bordelon, Digitization Coordinator (virtual engagement); <abordelon@brit.org>
Joe Lippert, Digitization Coordinator (imaging and image processing); <jlippert@brit.org>
Diego Barroso, TORCH TCN Project Manager; <dbarroso@brit.org>
Tiana Rehman, Collections Manager/Institutional Rep; <trehman@brit.org>
Jason Best, Dir. Biodiv. Informatics/Technological Innovator;<jbest@brit.org>
Peter Fritsch, VP of Research/PI; <pfritsch@brit.org>
Jessica Lane, BRIT Herbarium Assistant; <jlane@brit.org>
*Tessa Boucher, Digitization Technician; <tboucher@brit.org>

Rachel Carmickle, Herbarium Technician; <rcarmickle@brit.org>
Kelly Carroll, Digitization Technician; <kcarroll@brit.org>
*Sydney Jackson, Digitization Technician; <sjackson@brit.org>
Natch Rodriguez, Digitization Technician; <nrodriguez@brit.org>

* Denotes individuals who no longer work for the project and whose email address may not return a reply.

HUH: Nothing new to report.

KANU: No new participants.

MO: Nothing new to report.

NOSU: Three students are now working on digitation on their own. Graduate level: Lorelei Burnside. Undergraduate level: Emma Mills and Jon Weeden.

NY: McKenna Coyle, Lead Digitizer

OKL: No newly-joined participants. Two graduate students (Monaghan and Gillum-Morrisette) and three undergraduate students (Beck, Conard, and Ali) participated on the TORCH TCN Project this Quarter.

OKLA: Four undergraduate workers (one new) continued transcribing. Data Manager Clay Barrett will be leaving the project on November 5th, 2021.

TAES: Bethany Freeman, undergraduate digitization technician. Kyle Simpson & Lydia Morley, graduate students.

TAMUCC: Jordan Rodriguez (student intern) and Barnabas Daru (PI).

TEX-LL:

Student workers hired since 1 August 2021:

Aidan Engstrom <aengstro@stedwards.edu>
Adrienne Li <adrienne.li@utexas.edu>
Yining Qian <nnshelleyfish@utexas.edu>
Stephanie Nunez <snunez@utexas.edu>
Mandy Tran <mandytran1226@gmail.com>

Aidan is an undergraduate student at St. Edward's University who will be helping us with label transcription of his institution's specimens. The others are undergraduate students at University of Texas at Austin.

We also just started a new volunteer who is helping with data transcription. Her name is Vicki Wold and she is a Master Naturalist.

TTC:

New undergraduate digitizers: Norma Ruvalcaba, Anukriti Dey, Travis Schubert.

Continuing undergraduate digitizers: Chase Bergeron, Jared Salzman.
Herbarium graduate teaching assistant: Lindsay Williams

UTEP:

* Muriel Norman (Centennial Museum Exhibit)
* Aparna Mangadu (Castner Range Plant List Project)
* Mingna "Vicky" Zhuang (Project Manager)

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

For the whole TORCH TCN project: Project Manager Diego Barroso prepared and successfully submitted the project-wide NSF Annual Report prior to our deadline.

Jason Best, Diego Barroso, and Clay Barrett started initial design work for a digitization "hub" which will simplify and streamline the process of uploading and processing specimen image files. The hub will incorporate existing components of current workflows along with new automated workflows to provide a centralized resource available to all TORCH participants. The hub will automate processes for quality control, image processing, file management, transfer of images to TACC, and tracking and reporting of project metrics.

NY:

Skeletal records: We have essentially completed the barcoding of specimens and creation of skeletal records, though some will continue to be added (from new accessions, returned loans, etc.)

Specimens imaged: 43,446 (out of a promised 57,000; the actual number will be somewhat less that the original estimate)

Full transcriptions: 62,807 (out of a promised 77,000—the actual number will be somewhat less than the original estimate)

Georeferences: 71,832 (out of a promised 68,267)

OKLA:

Subaward work at University of Kansas is almost complete, on track by end of November.

Subaward work at New York Botanical Garden is on track to be completed in early 2022.

Questions / Other Comments:

TAMUCC: Will we need to provide a written report of the project once finished with digitizing specimens?

KANU: We ran into computer problems in September that prevented us from completing our post-processing of images, but that has been fixed. We expect to wrap up all remaining work in November.

MO: Project-wise, not much has changed from the last quarter. However, we am much more hopeful that we will have some new project help in the coming quarter than was previously anticipated.

The most important change for at the Garden is that Jim Solomon has retired from his position as Curator of the Herbarium. His replacement is Jordan Teisher, previously at PH, who started as the Garden's new Director of the Herbarium on 11 October. Thus, officially, Jim is no longer the Garden's contact for the TORCH TCN. You should begin sending future correspondence related to the TORCH TCN to him at: jteisher@mobot.org. There will be a more formal announcement of this change to various community outlets (HERBARIA, Taxacom, etc.) and by direct email in the near future, but you can share this information with others who need to know. Jim Solomon will still be coming to the Garden regularly as Curator Emeritus.

SHST:

We have no numbers to change from August or progress to report. We have spent all this time trying to get our No-cost extension worked out. Since we could spend no money then we could not proceed. This was all worked out recently; I sent approvals for student workers. We will be back at work by the end of the week.

UTEP:

We are done with most of our imaging and georeferencing for the project. We do still have some activities going that can be related to the project, which have been updated here and which will be updated in the future if they come up. So we are all done with TORCH data, but we may add a few more Texas specimens over the next year as we have some backlog and new specimens we are including as we go.

TCN Quarterly Progress Report

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

TCN Name

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

Person Completing the Report

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

Share Progress in Digitization Efforts

This quarter (August-November 2021) coincided with the beginning of Project Year 3. The overarching report was submitted to NSF on July 30, 2021. Below is a summary of all digitization progress to date.

Institution	Transcribed records	High resolution images	Scanned slides	Scanned vials	NFN/crowdsource?
ANS	5842	359	6463	1226	yes
BPBM	8180	960	4744	6418	yes
BYU	2597		2597		
CAS	15025	1230			
CU	7,599				
FMNH	10591	809	26260		
INHS	19979	348	10813	5296	
MPM	1597		1228		yes
MSU	11902		1100		
OSU	6819		1000		
PSU	19112		2139	801	
PERC	6404				
TAMU	43182		4573	13595	

Institution	Transcribed records	High resolution images	Scanned slides	Scanned vials	NFN/crowdsource?
UH	5018		34022		
UM	96795	259	39655		yes
UMSP			94495		yes
HWML	3666		18,280		
UNH	48611				
MSB	1617	618		2140	yes
UU	107866		10186		yes
UWSP	3190		3019		yes
WIRC	22379				
YPM	17427	34088	34090	2401	
Totals	**368,387**	**7,277**	**234,863**	**40,111**	

TPT currently has 4 NfN expeditions transcribing slide images running for UH, FMNH, and UU (2 expeditions). So far we have completed >110,000 transcriptions for TPT across 30 expeditions.

Share Best Practices, Standards, and Lessons Learned

The TPT Taxonomy team continues to work on compiling and cleaning lists of names for the network. TPT Taxonomy group and PIs Zaspel and Allen hosted a discussion session at the iDigBio Digital Data conference in June, which has prompted collaboration with GBIF and other stakeholders in the community in order to share and maintain these resources for long term use. You can now find the cleaned TPT taxonomic resources here: https://github.com/njdowdy/tpt-taxonomy/tree/main or via git on your local machine. Each resource (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 also gives some additional status information for each resource (e.g., whether synonyms were provided by the name providers).

Taxonomic resources ready to use can also be found on Zenodo:
Dowdy, N.J., Barve, V., Mayfield-Meyer, T., Sullivan, K., & Zaspel, J.M. (2021). njdowdy/tpt-taxonomy: TPT Taxonomic Resource v1.0.3 (v1.0.3) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5562742

Global Biotic Interactions team continues to work on improving the filtering by taxonomic names function. You can use the GloBI Parasite Tracker page to review your taxonomic names (https://www.globalbioticinteractions.org/parasitetracker/) by clicking on the heart icon next to your institution. These names are evaluated based on all the present name providers (GBIF, Catalog of Life, ITIS, etc.). During the next period, GloBI will incorporate the taxonomies created by TPT into GloBI and TPT data providers will be able to check their taxon names against the TPT taxonomies via the GloBI TPT webpage.

Version 5 of the TPT full dataset is now published on Zenodo. 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.

> Poelen, Jorrit H., Seltmann, Katja C., & Campbell, Mariel. (2021). Terrestrial Parasite Tracker indexed biotic interactions and review summary (0.5) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5572874

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.

Share Identified Gaps in Digitization Areas and Technology

While digitization has improved over the summer and fall, TPT network members continue to struggle with some staffing issues and access to collections due to COVID19, unplanned medical issues, and one unexpected death in the group. PI Zaspel has reached out to all PIs and collaborators and we are confident that digitization work will be able to ramp up starting this winter and spring.

Share Opportunities to Enhance Training Efforts

Kyhl Austin (recent UH hire now managing data for UH TPT) visited the TPT team at the Bishop Museum for training on the MacropodPro system and to schedule UH specimen photography. Martinez (technician at TAMU) has been training with Dr Barry OConnor (UMMZ) to verify and update mite determinations for slide mounted specimens intended for digitization. Students and PIs at ANS and FMNH have been working closely together to improve workflows and transcription efficiency, including collaborating on Notes from Nature expeditions and database uploads.

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

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 collaborating with and adding expertise to BugFlow (https://entcollnet.github.io/BugFlow/) to help the greater global entomological and collections community with digitization efforts. TPT is also collaborating with the newly funded NSF TCN Big-Bee digitization initiative, and is sharing workflows as well as digitization project insights and expertise. In addition, members of TPT are lending expertise to the NSF 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.

The Carnegie Museum of Natural History (PI Dr. Ainsley Seago) was officially awarded the digitization PEN: *Adding a world-class flea collection to the Terrestrial Parasite Tracker Network*.

Share Opportunities and Strategies for Sustainability

We are actively involved in collaborating on the BugFlow repository project and many of the workflows developed in Year 1 will be shared on this platform (https://github.com/EntCollNet/BugFlow). Many TPT data providers are contributors of various modules, including slide imaging (both high and low resolution), project management, curation, georeferencing, and data transcription.

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

PI Orlofske (UWSP) created a public exhibit about the TPT project which is on display in the public galleries in the UWSP Natural History Museum. Orlofske also provided hands-on activities and opportunities for over 400 members of the public to participate in and view specimens at the Destination Infestation event at the UWSP Natural History Museum. In addition, PI Orlofske has continued to actively work with the UWSP Diversity and College Access Staff and Summer Bridge Program for underrepresented students. This led to the lab hosting four undergraduate students during the two-week program, one of which returned to continue on the TPT project for fall semester. A post-survey to gain feedback for future implementation on the Bridge Program has also been developed.

PIs Cameron and Gall (YPM) are currently conducting 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

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).

Share Other Activities and/or Progress

Conferences, Presentations, & Symposia

iDigBio Summit & Biodiversity Conference

- Zaspel, J. (2021) Terrestrial Parasite Tracker: Digitizing collections to trace parasite-host associations. iDigBio Summit September 2021. Presentation recording: https://vimeo.com/611911173

TDWG 2021

Vijay Barve, Nicolas Dowdy, & Teresa Mayfield-Meyer (TPT postdoc alumni) co-organized and moderated the symposia: *Maintaining the taxonomic backbone (or connecting those who try).* It was one of the largest symposia at TDWG21 with 14 contributed presentations, including representatives of ITIS, Global Names, and TaxonWorks. It was also well-attended, peaking at 185 attendees (43% of all conference attendees). Additionally, Vijay Barve, Nicolas Dowdy, & Teresa Mayfield-Meyer (TPT postdoc alumni), and Erika Tucker (TPT project manager) all participated and contributed to the TDWG 2021 BioBlitz which documented over 2,000 individual organisms and over 1,000 species from around the world through iNaturalist.

Individual presentations included:

- Barve, V. (2021) Taxonomy Compilation & Curation Within R. *TDWG 2021: Maintaining the taxonomic backbone (or connecting those who try).* https://biss.pensoft.net/article/73736/.
- Dowdy, N. (2021) TaxoTracker: A collaborative platform for taxonomic resource maintenance. *TDWG 2021: Maintaining the taxonomic backbone (or connecting those who try).* https://biss.pensoft.net/article/73867/
- Mayfield-Meyer, T. (2021) Using the Taxonomic Backbone(s): The challenge of selecting a taxonomic resource and integrating it with a collection management solution. *TDWG 2021: Maintaining the taxonomic backbone (or connecting those who try).* https://biss.pensoft.net/article/74115/.

SPNHC & ICOM NATHIST 35th Annual Meeting

- McElrath TC, D Dmitriev, M Yoder. 2020. The Evolution of Databasing at the INHS Insect Collection: Lessons Learned From Migrating Three Decades of Digital Data Into TaxonWorks. Virtual. 8-12 June 2020. Available: https://spnhc.biowikifarm.net/wiki/Posters#/media/File:McElrath_poster_TCM_SPNHC2020_optimized.jpg

Entomological Collections Network Annual Meeting (ECN)

Multiple members attended and participated in the ECN annual meeting. Individual presentations included:

- McElrath TC. 2020. *Accidental Pandemic Preparation - how updating digital infrastructure at the INHS Insect Collection allowed us to stay productive during the COVID-19 lockdown*. Symposium: Entomology collections during a global pandemic. Entomological Collections Network Annual Meeting. Virtual*. 09 November 2020.

Entomological Society of America Annual Meeting (ESA)

Multiple members attended and participated in the ECN annual meeting. Individual presentations included:

- E.D. Struckhoff, TC McElrath, C Stone, H Tuten. 2021. *A checklist and taxonomic key of the ticks (Acari: Ixodidae and Argasidae) of Illinois*. Student Poster Competition: Grad MUVE: Pests and the Environment. Entomological Society of America Annual Meeting (Entomology 2021), Virtual/In-Person, 01 November 2021.

Publications

Multiple taxonomic resources were published and made publicly available:

- TPT. GitHub repository (2021). https://github.com/njdowdy/tpt-taxonomy/tree/main
- Dowdy, N.J., Barve, V., Mayfield-Meyer, T., Sullivan, K., & Zaspel, J.M. (2021). njdowdy/tpt-taxonomy: TPT Taxonomic Resource v1.0.3 (v1.0.3) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5562742
- Poelen, Jorrit H., Seltmann, Katja C., & Campbell, Mariel. (2021). Terrestrial Parasite Tracker indexed biotic interactions and review summary (0.5) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.5572874