GBIF Work Programme 2021

Annual Update to Implementation Plan 2017–2022

Version 1, 2020-11-16

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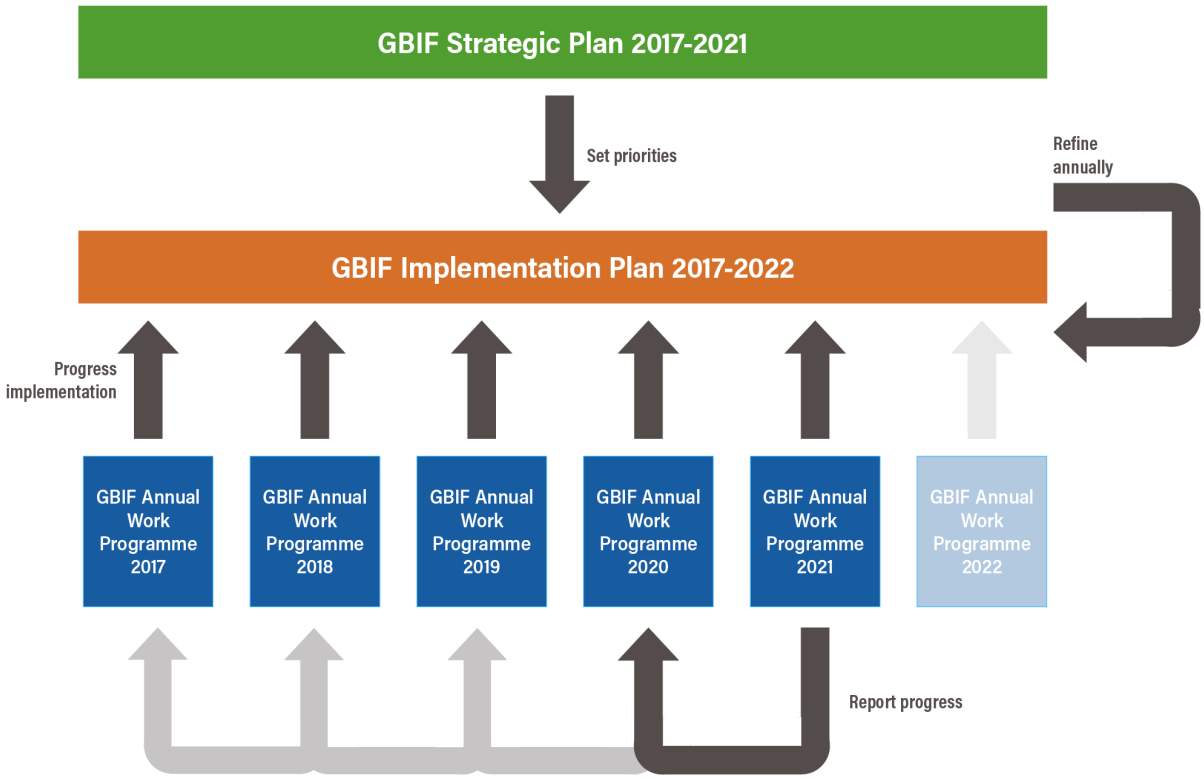
Overview

This document serves both as the 2021 revision of the GBIF Implementation Plan for the period 2017-2022 and also as the GBIF Annual Work Programme 2021. Both elements are based upon the GBIF Strategic Plan for 2017-2022.

The relationship between these documents is represented by the following graphic. Due to unprecedented global interruption due to the Covid-19 pandemic the Executive Committee, without objection from the Governing Board, has extended the current GBIF Strategic Plan for an additional year until 2022. Therefore, this GBIF Annual Work Programme 2021 represents the penultimate programme of this strategic plan.

The Strategic Plan [https://www.gbif.org/strategic-plan] (agreed in 2015 at GB22) established five priorities for GBIF's work. The Implementation Plan presented here in this document identifies 22 activities which GBIF must undertake to address these priorities during the six-year period (and a set of specific tasks under each activity).

The relationship between these documents is represented by the following graphic.



Each year, GBIF reviews progress against these activities and available resources (including Secretariat staff and other uses of core and supplementary funding, as well as resources committed by GBIF Participants). Using this information, an Annual Work Programme is defined for the following year. Each Annual Work Programme identifies a prioritized set of tasks for work during the year. Annual Work Programmes in the second and subsequent years also report on progress against the plan.

The Implementation Plan is reviewed and refined each year. The Implementation Plan is presented

here with updates reflecting progress during 2020 and planned activities for 2021 (the 2021 Annual Work Programme).

The Annual Work Programme 2021 is summarized below, with the revised GBIF Implementation Plan to follow.

GBIF Annual Work Programme 2021

Information on activities planned for 2021 is included under each of the Activity sections included in the 2021 implementation plan update below. For convenience, this information has also been collated as an Overview of 2021 Work Items of the items for which approval is sought from the Governing Board at GB27.

Financial situation

As of September 2020, current and imminent Voting Participant contributions are slightly above total expected contributions approved in the GB26 budget. This total, however, takes into consideration expected inability of some countries to pay contributions. Therefore, the total financial contribution provided by countries remains below the goal set forth in the financial model approved at GB22.

Due to the unexpected COVID-19 pandemic, mid-year alterations to the approved 2020 Work Programme and budget were made by the Secretariat and approved by the Executive Committee. The Work Programme changes took into account the inability to accomplish some items due to travel restrictions and the general changed expectations due to staff remote working for nearly the entire year, including many staff working without normal family/childcare support. A goal of these budget changes was to cushion potential negative financial impacts on 2021 and future budgets by COVID-19 effects on the ability of Voting Participants to fund annual contributions.

A COVID-19 Reserve has been created. It is intended as a short-term (2-3 years) mechanism to fill potential funding gaps. This accounting mechanism was made available from savings the Secretariat received from lower travel and meeting expenditures in 2020.

The Work Programme budget items were adjusted with the overall budget level similar to the budget adopted in GB26. Changes include:

- Increased funding for Capacity Enhancement Support Programme (CESP) from €80,000 to €100,000
- A consultancy was funded for an analysis of biodiversity data needs for the post-2020 global biodiversity framework (€30,000)
- Increased funding for strategic communication on GBIF value proposition and responses to the CODATA 20yr review (€40,000)
- Other major changes in 2020 were the short-term hiring of a staff member to cover parental leave
- A strategic decision was made by the Secretariat to hire a Strategic Partnerships Officer to finalize and implement GBIF's resource mobilization strategy.
- Specific WP items delayed or performed without external contracts are described below

As a result of the past year's staffing and Work Programme changes expenditures requested by the Governing Board, GBIF is expected to close 2020 with net capital of around €574,762, with an additional €461,000 in the Covid-19 Reserve.

The initial phase of the Biodiversity Information for Development (BID) programme completed in 2019; however, the funder—the European Commission Directorate-General for International Cooperation and Development (EU DEVCO)—has funded a continuation of the programme with new funding of €1.6m from 2020-2023. GBIF will receive around €70,000 in salary compensation funding for work by GBIF Secretariat staff in 2021.

A fifth call for proposals under the BIFA programme was issued in early 2020, using €131,395 supplementary funds received from the Ministry of Environment, Government of Japan. Subject to agreement by the BIFA Steering Committee, we anticipate that €20,000 of this supplementary funding is to be allocated to Secretariat staff coordination costs during 2020.

Given the level of capital held by GBIF and the uncertainty of contributions due to the pandemic, the 2021 budget includes a smaller allocation (€260,000) for contracted activities in the work programme expenditure (i.e. non-salary costs allocated to calls, workshops, contracts, etc.) than proposed for 2020 at GB26. Staffing levels do not change in the 2021 budget. The planned expenditure for 2021 is €496,332 greater than the income projected in the budget. This is considered to represent a responsible balance between advancing GBIF's mission and reserving some funds against future risks (€539,430, net capital forecast for the end of 2021). A second, brighter budget scenario is presented in this Work Programme, including extended expenditures on calls, workshops and contracts if more Voting Participant contributions are forthcoming. Work items prioritized for this additional expenditure, to be approved in budget amendments should conditions allow, are indicated in the detailed activity sections below.

Scenario	**Baseline (#1)**	**Optimistic (#2)**
Income assumptions	Participants pay at a similar level	Additional medium to large VP contribution
WP expenditure	€260,000	€465,000
2020 reserve (including COVID-19 Reserve)	€539,430	€531,639

Planned expenditure

In addition to salary and operating costs (including support for GBIF Governance mechanisms), funding is reserved in the Work Programme 2021 for the following activities:

Baseline 2021 Work Programme budget for non-salary items:

Priority Area 1

- Launch a new 2021 call for proposals under the Capacity Enhancement Support Programme (€80,000)
- Support further development of the Living Atlases community (€30,000)

- Support for 2021 Regional Nodes Meetings (€32,000). The Secretariat will investigate possible synergies with BID phase 2 regional meetings, if funding is forthcoming, as well as with a BIFA workshop in Asia. An additional €28,000 has already been transferred from the 2020 budget towards hosting of the Africa regional nodes meeting.
- Develop communications to support the GBIF value proposition (€10,000)

Priority Area 2

- Maintain and update processes for constructing the GBIF taxonomic backbone. €108,000 has been allocated in the budget to support GBIF contractor costs

Other Funds

- Supplementary funds: Implement a sixth call for proposals (approximately €110,000) under the Biodiversity Information Fund for Asia (BIFA), reflecting priorities agreed by Asian nodes and subject to decision by the BIFA Steering Committee.
- Governance funds: Launch 2020 calls for the Ebbe Nielsen Challenge and Young Researchers Awards (€25,000), considering recommendations from the Science Committee based on the 2020 programmes. The Science Committee is exploring potential external funds for these awards.

Secretariat staffing

Staff increases in recent years have enabled the Secretariat to maintain an increasing level of service. We currently have 28 staff (three of whom work part-time). In addition to the Director and Deputy Director, the Secretariat is now structured as four teams, as follows:

- Participation and Engagement (eight staff)
- Data Products (four staff)
- Informatics (eight staff, one contractor)
- Administration (six staff, plus student support)

All staff work towards accomplishing the goals of the five Priority Areas in the 2017-2022 Strategic Plan, with most staff working towards multiple areas. The Secretariat internally reports salary to the Work Programme Priority areas and Secretariat management based on an estimate of staff time spent on the areas.

Overview of 2021 Work Items

This following is a summary of all 2021 Work Items proposed in the 2021 update of the Implementation Plan below. It is intended to summarize the work items for which approval is sought from the Governing Board at GB27. Accordingly, it does not include the additional commitments made and reported by Participants. Items responding directly to recommendations of the GBIF 20-year review are shown in bold text.

Activity 1a: Focus on people

- Further personalize ORCID use on GBIF.org through user profiles and citation tracking; communicate the benefits to users
- In consultation with node managers, Heads of Delegation and committee members, prepare a draft visibility strategy for organizing and coordinating GBIF champions among scientific, policy- and decision-making, and funder communities. **Responds to recommendation 3 of the GBIF 20-year review**

Activity 1b: Strengthen skills

- Based on the 2020 Letter of Agreement between GBIF and the Ocean Biodiversity Information System (OBIS), work to align OBIS and GBIF technical guidance and training materials, explore options for joint training workshops
- Further develop digital documentation to support community needs (author contracts dependent on 2021 budget evaluation)
- Develop e-Learning strategy to support training needs across multiple curricula, including both self-instruction and GBIF-led courses (consultancy contract dependent on 2021 budget evaluation)
- Continue in-kind support for external projects making use of GBIF-developed training modules
- In conjunction with the community, develop an online data cleaning course, to support guidance on expected data quality services to be offered by GBIF Participant nodes
- Expand engagement of volunteer mentors, including through webinars and a mechanism for tracking contributions of mentors
- Develop guidance materials in multiple languages to support project writing for GBIF-led programmes

Activity 1c: Equip Participant nodes

- Support regional nodes meetings deferred from 2020 due to COVID-19 travel restrictions. This may involve co-location with 2021 regional capacity enhancement workshops under the Biodiversity Information for Development (BID) and Biodiversity Information Fund for Asia (BIFA) programmes (€32,000, in addition to €28,000 towards Africa regional meeting reserved in 2020 budget)
- Based on the 2020 Letter of Agreement between GBIF and the Ocean Biodiversity Information System (OBIS), establish and improve links between GBIF and OBIS nodes in all regions
- Continue to enhance guidance resources for nodes, including advice on the role of nodes to maintain data quality (see also Activity 1b), on their engagement with citizen science and the private sector (see also Activity 3c), and on best practices for engaging with indigenous peoples and local communities including community-based monitoring
- Implement 'child branding' establishing recognized logos exclusive to active GBIF Participant nodes, in conjunction with marks for GBIF data publishers, and projects making use of GBIF through 'powered by GBIF' branding (consultancy contract dependent on 2021 budget evaluation)

- Pilot hosted portals at regional, national and institutional level. **Responds to recommendations 6 and 10b of the GBIF 20-year review**
- In consultation with the Participants, explore possible pricing structure for additional services provided by GBIF Secretariat, e.g. hosted portals and national IPT installations, training services, etc, based on country membership status (i.e. Voting Participant, Associate Participant, non-Participant/Observer), while maintaining the core principle that data access will remain free and open to all
- In consultation with Participants, explore possible models for establishment, functions, staffing, governance and funding of GBIF regional offices. **Responds to recommendations 6 and 18 of the GBIF 20-year review**
- Continue offering financial support for the Living Atlases community, currently used to fund project administrators through decision of the Living Atlases Management Committee (€30,000)

Activity 1d: Equip data publishers

- Publish a biannual newsletter to data publishers, keeping them informed of significant developments and meeting the conditions of the European Union's General Data Protection Regulation (GDPR)
- Improve reporting of data use to data publishers, implement clearer display of use information on pages for publishers and download DOIs
- Explore services for publishers to opt in to receive push notifications for new citations
- Enhance regional helpdesk services
- Continue the development of reference vocabularies used in data processing; mature the community of editors, discuss and coordinate governance, priorities and workflows

Activity 1e: Expand national participation

- Actively seek new Voting Participant countries, and the return of former Voting Participants, to broaden the funding base ahead of the 2023-2027 financial period; in particular highlighting to governments the value of GBIF in meeting data and capacity needs for national implementation of the post-2020 global biodiversity framework under the Convention on Biological Diversity (CBD)
- Initiate call for regional outreach project proposals to support expansion of national participation, as well as improved connections with relevant regional organizations and networks (support from core funds dependent on 2021 budget evaluation). **Responds to recommendations 5 and 6 of the GBIF 20-year review**
- Explore additional funded capacity programmes, within the broad umbrella of the BID programme, focussed on underrepresented regions in GBIF. **Responds to recommendation 5 of the GBIF 20-year review**
- Maintain and expand internationalization of GBIF.org, especially translation of key page content and digital documentation, minimally for the six official UN languages and further languages based on demand and volunteer translator capacity
- Develop a 'catalogue of GBIF services' to support implementation of the resource mobilization strategy (see Activity 1g). This will include completion and curation of the capacity portfolio

developed in 2020, with additional components of services offered by GBIF to include in outreach materials for potential funders and implementation partners

- Develop communications to support the GBIF value proposition (€10,000). **Responds to recommendations 4a and 7 of the GBIF 20-year review**

Activity 1f: Plan implementation

- Organize the 3rd Global Biodiversity Informatics Conference (GBIC3), hosted by the LifeWatch European Research Infrastructure Consortium (ERIC), to address the ongoing operation and governance of the *alliance for biodiversity knowledge*
- Organize and run the 2nd Synthesys+ workshop relating to citation of collections
- Plan for the 3rd Synthesys+ workshop relating to Digital Specimen data models

Activity 1g: Coordinate resources

- Select projects in the sub-Saharan Africa, Caribbean and Pacific calls of the extended BID programme, negotiate contracts and coordinate start of 2-year project implementation cycle
- Run BID capacity enhancement workshops in Africa, the Caribbean and Pacific to support project implementation in the extended phase of the programme, exploring co-location for GBIF regional nodes meetings during 2021 (see Activity 1c)
- Launch the 2021 call for proposals under the Capacity Enhancement Support Programme (CESP) (€80,000). **Responds to recommendation 6 of the GBIF 20-year review**
- Launch the sixth call for proposals under the Biodiversity Information Fund for Asia (BIFA) programme, supported by supplementary funding from the Japanese Ministry of Environment, and including a 2021 data mobilization training workshop which may be co-located with the 2021 GBIF Asia regional nodes meeting (subject to agreement by the BIFA Steering Committee). **Responds to recommendation 5 of the GBIF 20-year review**
- Subject to consultation with Participants and nodes, including discussion at GB27, complete, publish and begin implementation of the GBIF resource mobilization strategy aimed at broadening the supplementary funding base. **Responds to recommendation 10b of the GBIF 20-year review**

Activity 2a: Modernize data standards

- Participate in the ongoing Open Digital Specimen and Extended Specimen Network standards development and strive towards a common solution
- Run an open consultation to review the state and direction of specimen-related identifiers across GBIF and document the expectations of, and opportunities offered by the GBIF infrastructure
- Support the work of the Atlas of Living Australia (ALA), and the Living Atlas community, in adoption of the GBIF registry; this will likely require mapping between dataset metadata and alignment of APIs
- Explore existing and potential standards to better accommodate exchange of ecological data; promote collaborations between nodes who have identified a need for this (see also activity 3b)
- Enhance the occurrence records clustering algorithm to improve record linkages, including

better understanding of collecting expeditions and collector names

- Explore standards and interfaces to allow brokering of data clustering annotations to data publishers; broaden the capabilities to include external annotations
- Review the GBIF Metadata Profile to explore the feasibility and benefits of migrating to the latest version of Ecological Metadata Language (EML)
- Review the Darwin Core Archive (DwC-A) [https://github.com/gbif/ipt/wiki/DwCAHowToGuide] exchange model; explore potential for DwC-A datasets to comply simultaneously with Frictionless Data [https://frictionlessdata.io/] and EML data packages, to facilitate ecological dataset exchange and reuse
- Revise the GBIF Data Validator [https://www.gbif.org/tools/data-validator] to be consistent with data ingestion, and to follow best practices
- Revise the GBIF quarterly data analytics, to follow recent changes in data processing, such as handling counts of absence-based records
- Pilot phylogenetic browsing of occurrence data

Activity 2b: Deliver names infrastructure

- Complete outstanding tasks to integrate the extended Catalogue of Life in GBIF
- Focus activities on:
  - assessing and reporting on gaps for organizing GBIF occurrence records
  - broadening the community of contributors
- Prioritize improvements to the Prokaryote taxonomy sector in collaboration with the Genome Taxonomy Database and/or the Silva group
- Maintain and update processes for constructing the GBIF taxonomic backbone, including monitoring the content and helping to prioritize editorial effort (continued from 2020)(€108,000)
- Implement a process enabling key checklists to be used in filtering occurrence data, such as Red Listed species and invasive alien species (carried over from 2020)
- Explore feasibility of supporting national taxonomies for exploring GBIF occurrence data to better enable national level reporting (carried over from 2020)

Activity 2c: Catalogue collections

- Complete outstanding tasks to deploy an enriched catalogue providing search and access of collections, specimens and people
- Continue data management activities for the collections catalogue, integrating data from differing sources; in particular:
  - align similar records from differing sources wherever possible
  - add additional identifiers, such as DOIs, GRID or ROR IDs as appropriate
  - consider expanding the data model to accommodate more flexibility where differing records need to be maintained for the same entity (e.g. "sameAs" relationships)
  - document clear guidelines for data managers to avoid unnecessary record duplication, with a

focus on decisions affecting citation and linking data

- Establish a global editorial team formed by key stakeholders and authorities (including Index Herbariorum, iDigBio, ALA, NCBI Biocollections, DiSSCo, CETAF and GGBN) to agree on future data curation workflows, responsibilities, mandate and issue resolution mechanisms, and to guide development requirements
- Explore synchronization of content with the Consortium of European Taxonomic Facilities (CETAF) [https://cetaf.org/] Registry (under development)
- Pilot a profile of the TDWG Collection Descriptions to capture collection-level metadata; include taxa, geography, time and quantity dimensions as a minimum

Activity 3a: Identify priority gaps

- Develop guidance on use of tools and approaches for targeted data mobilization to address priority data gaps

Activity 3b: Expand data streams

- Scope and establish thematic data mobilization campaigns on zoonotic diseases, private sector data and sequenced-derived data, with calls supported by supplementary funding (see activities 1c, 3c, 5b)
- Continue linking and integration of sequence-derived data in GBIF.org. **Responds to recommendation 9 of the GBIF 20-year review**
- Collaborate with long-term monitoring communities to generate more sampling-event datasets in GBIF.org, and to help fill current data gaps. This work will guide development of enhanced standards for ecological data (see activity 2a).

Activity 3c: Engage data holders

- Launch data mobilization campaign for the private sector, building on guidance resources developed in 2020 (see Activities 1c and 3b)

Activity 3d: Rescue datasets

- Continue to implement workflow for prioritizing and drawing upon potential data sources reported through the ‘suggest a dataset’ tool, including involvement of nodes, mentors and crowdsourced solutions (carried over from 2020)
- Roll out a workflow for processing data mobilization requests arising from the ‘suggest a dataset’ tool

Activity 3e: Liaise with journals

- Explore strengthening of data paper model as a means of promoting data mobilization and quality control, through clear workflow, associated training and guidance, continue experiment of sponsored Article Processing Charges (APCs). May be integrated as a component of existing and future capacity enhancement and data mobilization programmes (see activity 1g)
- Continue engagement with academic journal publishers to improve data citation and data

publication practice; explore interest in publisher-administered, hosted IPT solutions for primary data uploads related to journal articles

Activity 4a: Ensure data persistence

- Following open discussion on the Community Forum, explore preserving periodic copies of GBIF-mediated data on open public and research cloud infrastructures to both ensure persistence and promote wider and easier use of GBIF; develop recommendations and tools to support best-practice citation of GBIF-mediated data accessed through external cloud environments

Activity 4b: Assess data quality

- Supply clear indicator measures for the completeness and usability of data as part of GBIF.org dataset pages, based on examples such as the GEOLabel data branding model: explore DiSSCo's MIDS standard (minimum information for digital specimen) (carried over from 2020)
- Ensure that users of data are able to identify datasets or records that do not fulfil their criteria for geo-accuracy, whether they are accessing data through facets in the GBIF.org, via the API or in downloads (carried over from 2020)
- Continue the work started in 2020 to identify and mark records suspected to be geographic outliers, and report to data users and publishers in suitable formats
- Extend the documentation, prioritization and presentation of data issues identified during data processing, with particular focus on actionable items for data publishers and alerts to data users

Activity 4c: Enable data curation

- Continue to explore the use of the GBIF data index to support stable persistent resolvable identifiers for all specimens and occurrence records (see Activity 2a)
- Continue working with global community via the *alliance for biodiversity knowledge* to explore bidirectional data linking and synchronization with data management systems and publishers, to achieve faster and more accurate mutual updates on data improvements and annotations (see Activity 2a)

Activity 5a: Engage academia

- In collaboration with nodes, develop re-usable materials for supporting use of GBIF-mediated data, as well as best practices on data citation and publication of research data, in academic curricula, especially graduate programmes
- Equip Biodiversity Open Data Ambassadors with updated resources, scale up thematic and geographic coverage
- Engage with academic-based projects that could use GBIF-mediated data better in their pipelines and protocols, through collaborative external funding opportunities
- Engage with professional societies to advance knowldge of GBIF functionalities in these user communities

Activity 5b: Document needs

- Coordinate work of the expert group on mobilization and use of data on zoonotic diseases (funding of face to face meetings dependent on 2021 budget evaluation). **Responds to recommendation 10a of the GBIF 20-year review**

Activity 5c: Support biodiversity assessment

- Publish outcomes of the analysis of primary data needs for the post-2020 Global Biodiversity Framework, promote at relevant fora including the COP15 meeting of the CBD in Kunming, China
- Showcase tools and practices for use of GBIF in Red Listing and other species assessment processes including Key Biodiversity Areas (KBAs), as well as in science-policy processes such as national ecosystem assessments

Activity 5d: Assess impact

- Launch Ebbe Nielsen Challenge and Young Researchers Awards competitions for 2021 (€25,000)
- Explore options for using supplementary funds to support a Grand Challenge competition, targeting data mobilization and analysis to address a high-profile challenge for research and/or policy. **Responds to recommendation 4b of the GBIF 20-year review**

2021 Implementation Plan Update

Priority 1: Empower Global Network

Ensure that governments, researchers and users are equipped and supported to share, improve and use data through the GBIF network, regardless of geography, language or institutional affiliation.

Activity 1a: Focus on people

Rationale

GBIF is the result of work by thousands of people in agencies and institutions worldwide. This network's long-term sustainability depends on demonstrating the value of such contributions and justifying continued investment of effort.

The GBIF Secretariat can enhance efforts to develop capacity within the network and build an effective distributed help desk system that acknowledges and showcases relevant skills and experience that people across the network possess. Users of GBIF data products would also benefit from showcasing the network's indispensable human resources and their impact on assessing and improving biodiversity data.

For these reasons, the next round of improvements to GBIF.org should enhance the network's

capacity to serve as a hub for the GBIF community by identifying its active contributors, integrating information on their relevant GBIF activities, and supporting broader knowledge exchange and skill development.

2020 Progress

GBIF.org introduced two new search filters for occurrence records: 'Recorded By ID' and 'Identified By ID'. This enables searching of records collected by or identified by individuals through use of unique identifiers such as ORCID [https://orcid.org/]. For example, all records from individuals submitting research-grade observations to iNaturalist.org [https://www.inaturalist.org/], or identifying such observations, may now be searched through an ORCID if it is linked to their iNaturalist account. This opens the way for a broader range of applications to link individuals to different roles in GBIF including through citations.

To support the research activities of Bionomia [https://bionomia.net/] (formerly Bloodhound-tracker), a platform aiming to link people to specimens and their citations, GBIF deployed a data processing workflow reducing the amount of processing required by Bionoma.

Following the decision to maintain the GBIF Community Forum [https://discourse.gbif.org/] after a trial period, the platform has been used to promote targeted discussion on a number of issues, including the virtual workshop on advancing the catalogue of the world's natural history collections [https://www.gbif.org/news/6TvOkvpPlxRm5vHxljYNN5/virtual-workshop-advancing-the-catalogue-of-the-worlds-natural-history-collections], under the auspices of the *alliance for biodiversity knowledge* [https://www.biodiversityinformatics.org/en/#]; discussion raised by posts on the GBIF Data Blog [https://data-blog.gbif.org/]; and comments on the proposal to offer exports of GBIF-mediated data as public datasets in cloud environments [https://discourse.gbif.org/t/gbif-exports-as-public-datasets-in-cloud-environments/1835].

2021 Work items

- Further personalize ORCID use on GBIF.org through user profiles and citation tracking; communicate the benefits to users
- In consultation with node managers, Heads of Delegation and committee members, prepare a draft visibility strategy for organizing and coordinating GBIF champions among scientific, policy- and decision-making, and funder communities. **Responds to recommendation 3 of the GBIF 20-year review**

2020 Participant contributions

- **Argentina**: We were forced (due to the pandemic) to virtualize all of our activities, which affected the duration, form of implementation and work in some lines of work and projects.
- **Benin**: Capacity building through workshops and in the framework of the master program in biodiversity informatics.
- **Colombia**: Updated the metadata of the publishing organizations to ensure the value of their contributions. Participated in different discussions in the GBIF Community Forum.
- **Distributed System of Scientific Collections (DiSSCo)**: Started implementing ORCIDs in ELViS [https://elvis.dissco.eu/welcome].

- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has supported and organized workshops, webinars, and symposia related to the use of digitized biodiversity data in research, including an annual Digital Data in Biodiversity Research conference.
- **Japan**: One workshop to expand the GBIF-related biodiversity informatics community held.
- **Korea, Republic of**: Surveys on biodiversity data have been conducted twice, among the biodiversity data network consisting of 59 domestic data providers and other potential participants. Workshop and regular meetings with the 59-member network have been held.
- **NatureServe**: During 2020 NatureServe in collaboration with the GEO BON Secretariat has carried out several activities focused on highlighting the value of GBIF's work in various Latin American countries. Together with several institutions in the Tropical Andes including the nodes in Peru, Ecuador and the incipient node in Bolivia we have been conducting surveys to better understand the connection between data producers and users. The idea is to give more relevance to the information from biodiversity observations for its use in solving urgent problems of society.
- **Netherlands**: NLBIF has advocated NHC collectors to get ORCIDs and claim their specimens and taxonomic identifications through Bionomia [https://bionomia.net/], formerly Bloodhound-tracker. NLBIF has launched a new website where all data mobilization, infrastructure and participation projects that are funded by NLBIF are highlighted, including the people conducting the projects. Furthermore, the website includes a page for citizen scientists directing them to iNaturalist [https://www.inaturalist.org/] and Waarneming.nl [https://waarneming.nl/].
- **Nigeria**: Although COVID-19 has altered several physical activities for the current year, we have been in close contact with relevant individuals who have shown the willingness to share their data via our IPT.
- **Spain**: We will spread through our national communication channels the new and expanded user profile at gbif.org when it is ready. We are already promoting the use of ORCID identifiers among our community of data providers.
- **Sweden**: The new National Swedish Biodiversity Data Research Infrastructure (SBDI), officially starting operations 2021-01-01, represents a consortium of 14 partners with a shared secretariat under the lead of a Managing Director, a Project Coordinator and a Systems Architect at the Swedish Museum of Natural History, and a Deputy MD plus a Communications Officer at the Swedish University of Agricultural Sciences. The MD is also Node Manager of GBIF-Sweden, and the GBIF node is physically located at the museum (technically a part of the consortium). Considerable effort has been spent during 2020 organizing the consortium, quite naturally involving the staff of GBIF-Sweden whose systems developer is also the systems architect of SBDI. All of our efforts within the Swedish GBIF node and SBDI on the whole is expected to benefit GBIF.org and the greater biodiversity informatics community.
- **Zimbabwe**: GBIF Zimbabwe launched its website www.gbifzimbabwe.gq [http://www.gbifzimbabwe.gq].

2021 Participant plans

- **Argentina**: Once the pandemic is resolved the plan is to resume the pending activities of 2020. All our node performs its tasks in home office mode and it has been impossible to continue with many activities that depend on of the Ministry. Therefore, being able to resume activities normally will be our first priority.

- **Benin**: We will continue progress towards more achievements in capacity building through workshops and in the framework of the masters program in biodiversity informatics, data mobilization and data uses.
- **Brazil**: Assess the possibility of using ORCID in SiBBr / assess possibilities of tracking.
- **Cameroon**: For the year 2021, GBIF Cameroon plans to upgrade its Biodiversity Information System in order to facilitate the use of data in strategic biodiversity management documents in Cameroon. As GBIF funds do not finance this type of activity, the national node plans to use internal resources and that of local partners.
- **Colombia**: Continue updating the metadata of the organizations. Make the publishing organizations visible and disseminate the benefits of using ORCID.
- **Distributed System of Scientific Collections (DiSSCo)**: Augmented user profiles based on ORCID in ELViS, to be developed in SYNTHESYS+
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to support and organize workshops, webinars, symposia, and other events aimed at increasing digitization, mobilization, and research use of biodiversity data.
- **Japan**: Provide one workshop to expand the GBIF-related biodiversity informatics community (probably webinar).
- **Korea, Republic of**: Field surveys on biodiversity data will be conducted twice with 61 biodiversity data network. Workshop and regular meeting with the 59 network will be held.
- **LifeWatch ERIC**: Meetings at the executive level will continue and technical teams will meet to find complementarities and commonly shared vision between GBIF and LifeWatch ERIC.
- **NatureServe**: In North America, and specifically in the United States, we have been working with our member organizations of the NatureServe network to include georeferenced data in the information that NatureServe publishes on GBIF. This is an old goal that we are taking up again in our priorities as an organization and we have made some initial steps in the technical aspects in 2020, we anticipate that we will arrive in 2021 with the pleasant surprise that the ~one million records on threatened species that NatureServe publishes on GBIF will have latitude, longitude and degree of uncertainty.
- **Netherlands**: Continued advocacy for ORCID. NLBIF as DiSSCo-NL national node plans to organize a symposium for Dutch DiSSCo partners on DiSSCo developments and the interactions between GBIF and DiSSCo.
- **Nigeria**: In the year 2021, the Nigerian Node hopes to involve more data holders in its activities. Potential collaborators including researchers and other biodiversity data users have been identified and will be contacted soon. We would ensure that data providers also provide us with a registered ORCID Id in an attempt to meet today's metadata standards.
- **Poland**: We plan to implement ORCID identifiers in databases and use them in a new biodiversity data system of KSIB that is under construction now.
- **Sweden**: Being part of SBDI, GBIF-Sweden will contribute to operate and maintain a website for the joint consortium [https://biodiversitydata.se] offering efficient data access, and lots of tools for ingestion, management, analysis and visualization of a multitude of data types. Extensive support facilities are also provided. The underlying technology is based upon the Atlas of living Australia stack but pre-conceived tools of other origin as presented by SBDI consortium partners may also be reached at the site. The SBDI Spatial Portal (the "BioAtlas" - which is the prime tool for

extraxting https.//bioatlas.se[species occurrence information] will facilitate users to search and analyse Swedish biodiversity data from numerous environmental and other aspects. Helpdesk and provider/user workshops will be arranged and successively more data types made available.

- **United States of America**: USGS will lead an ESIP cluster on Biological Data Standards to help build a community of practice in the US around standardizing biological data to meet FAIR principles.
- **Zimbabwe**: Maintain the GBIF Zimbabwe official website [http://www.gbifzimbabwe.gq].

Activity 1b: Strengthen skills

Rationale

The strengthening of personal skills through international collaboration has been one of the great successes of the GBIF global network. During this implementation period, GBIF must build on this past experience (including the support mechanisms developed for the BID programme) to reinforce efficient training and capacity enhancement across the network.

Central to this is the development of a collaborative help desk capability and the alignment of relevant aspects of national training initiatives with a global curriculum to facilitate direct reuse of resources.

2020 Progress

The travel restrictions caused by COVID-19 severely limited options for holding face to face training around the GBIF network in 2020. Nevertheless, some training was conducted in a virtual environment, and work continued to consolidate and expand the training resources available to the community.

The 2020 data mobilization training workshop under the Biodiversity Information Fund for Asia (BIFA) [https://www.gbif.org/programme/82629/bifa-biodiversity-information-fund-for-asia], originally planned to be hosted in Nepal by the International Centre for Integrated Mountain Development (ICIMOD) [https://www.gbif.org/participant/320], was re-designed as a fully virtual training workshop [https://www.gbif.org/event/BoAe3g7KjGeJUzC3oxs9v/data-mobilization-workshop-for-asia-2020] which took place in July. Thirty-seven participants from 15 countries included nominated trainees from the project teams selected under the fifth round of BIFA, as well as from GBIF nodes in Asia. The virtual workshop replicated all the key components of previous face to face versions of this course, including preparatory and follow-up activities, 'live' sessions in plenary and breakout groups, use of mentors from the region to support learning, and awarding of digital certification (badges) based on completion of exercises. Trainers updated presentations and recorded videos to reflect changes to the course since 2016. This version of the data mobilization course was being released as a new online-only version in September 2020.

Training of students in biodiversity data mobilization in Eastern Europe, Central Asia and South Caucasus, under the Norwegian-funded BioDATA project [https://www.nhm.uio.no/english/research/projects/biodata/], was delayed with the need to cancel in-person workshops in 2020, but the project has been extended for one year and will close in June 2022. The Secretariat has provided in-kind support to this project in the form of trainers and learning resources. The travel restrictions delayed

plans to hold a pilot training workshop in Tbilisi, Georgia, in collaboration with the International Barcode of Life consortium (iBOL) [https://www.gbif.org/participant/353], combining GBIF data mobilization and DNA barcoding skills. However, work continued in collaboration with GBIF Norway and the BioDATA team to develop the training resources required for such a workshop when conditions permit it to be rescheduled (incorporating the guidance on publishing sequence-derived data, described in Activity 3b). Once completed and piloted, this curriculum is designed to be re-used for projects in which biodiversity data may be mobilized simultaneously into GBIF.org and the Barcode of Life Database (BOLD) [https://www.boldsystems.org/].

The development of new documentation to support participation in GBIF continued in 2020, with the first two commissioned manuals released in July [https://www.gbif.org/news/6zqQkaevPH17NbGJoJ8Zi4/gbif-releases-two-technical-documents-for-community-peer-review] for community peer review. The guides are on data cleaning using OpenRefine (released as a 'Spanish-first' document) [https://docs.gbif-uat.org/openrefine-guide/1.0/es/], and on best practices for generalizing sensitive species occurrence data [https://docs.gbif-uat.org/sensitive-species-best-practices/master/en/].

All e-Learning resources for the GBIF curriculum on data mobilization, including instructional videos, were made available online [https://www.gbif.org/article/2IE7tH4dlcik1BnmniIPAc/training-and-e-learning] in 2020, enabling this course to function as a fully self-instructed set of modules. Progress was made to do the same with the curriculum on data use in decision making. Plans to develop a strategy for broader self-instructed training across the GBIF network were deferred until 2021.

2021 Work items

- Based on the 2020 Letter of Agreement between GBIF and the Ocean Biodiversity Information System (OBIS) [https://obis.org/], work to align OBIS and GBIF technical guidance and training materials, explore options for joint training workshops
- Further develop digital documentation to support community needs (author contracts dependent on 2021 budget evaluation)
- Develop e-Learning strategy to support training needs across multiple curricula, including both self-instruction and GBIF-led courses (consultancy contract dependent on 2021 budget evaluation)
- Continue in-kind support for external projects making use of GBIF-developed training modules
- In conjunction with the community, develop an online data cleaning course, to support guidance on expected data quality services to be offered by GBIF Participant nodes
- Expand engagement of volunteer mentors, including through webinars, and a mechanism for tracking and ensuring visibility of the contributions of mentors and trainers
- Develop guidance materials in multiple languages to support project writing for GBIF-led programmes

2020 Participant contributions

- **Argentina**: Participated as trainer (national and regional) on virtual channels. Continued with the advice of our publishers, through virtual channels, to facilitate and promote the publication of datasets.
- **Australia**: (updating 2019) Members of the Atlas team helped organise BiodiversityNext and

attended the event in Leiden. The Atlas contributed to the Living Atlases symposium and gave presentations on BHL and Australia's digital research infrastructures for biodiversity informatics.

- **Belgium**: Completed set of explainer texts in multiple languages: French and Dutch translations.
- **Benin**: Capacity building through workshops and in the framework of the master program in biodiversity informatics, data mobilization, data uses.
- **Brazil**: Availability of digital documentation to support Living Atlas community is underway / tutorial videos were produced.
- **Cameroon**: Although having identified several institutions holding data on biodiversity, GBIF Cameroon did not succeed in organizing a training workshop due to lack of resources. GBIF France's support in this area was hampered by this lack of financial resources and a conflicting agenda.
- **Colombia**: Online workshop to strengthen skills in data managment and data publication [https://sibcolombia.net/formacion/]. Support the actions to replicate the Data Use For Decision Making workshop for the Iberoamerican community (CESP2019-005), National.
- **France**: GBIF France supplied trainers and mentors for workshops organized by GBIF during 2020 under BID and BIFA for capacity enhancement in data publishing and use.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued its training and workforce development activities, including the maintenance of key partnerships, such as with The Carpentries, to improve computer and data skills. In addition, iDigBio has established a bi-monthly "office hour" aimed at helping participants use R to access digitized biodiversity data via APIs. Over the course of FY20, iDigBio conducted 49 distinct workshops, webinars, symposia, and other events which were attended by nearly 1,900 participants.
- **Japan**: Two workshops for data carpentry done, and use cases collected.
- **Korea, Republic of**: New IT staff has been employed to operating and managing KBIF IPT server. He attended the BIFA workshop to get more knowledge and technical skills to implement his role.
- **NatureServe**: Three highly integrated flagship concepts that NatureServe promotes by developing capacities and skills in Latin America and the Caribbean are the Red List of Species, the Red List of Ecosystems and the Key Biodiversity Areas. These concepts in their different criteria use at their core information on taxonomic observations in space and time. NatureServe has organized webinars (i.e., Pulse of the Planet) in relation to the Red List and the KBAs, and also to more basic elements such as the Darwin Core standard which is used to transfer information on biodiversity observations.
- **Netherlands**: Natuurhistorisch Museum Rotterdam is now hosting their own IPT to mobilize data, including images to GBIF without assistence of NLBIF.
- **Nigeria**: In the year 2020, the Node ensured that data holders are updated on the need to ensure data quality before publication on GBIF platform. Students and Corps Members were actively involved in data mobilization and data cleaning. The workshops organised by the Node in 2019 ensured rapid understanding of the processes as researchers and users of biodiversity data have been equipped with the required techniques for data mobilization and quality control.
- **Norway**: BioDATA data mobilization training events in Armenia (April 2020) and in Ukraine (October 2020) was disrupted by the COVID-19 travel restrictions and have been delayed to 2021. A one-year project extension was approved by the Norwegian funding agency.

- **Poland**: A group (10 persons) of representatives of KSIB partners attended the Training School "Digitisation and data management challenges in small collections" of COST Mobilise Action held in Warsaw on 13-14 Feb 2020. The program and training materials were based on GBIF trainings regarding data management so it can be easily treated as strengthening skills within the local network. Independently, in August, extended training on management of digitized data was launched, involving employees of 18 institutions participating in the dititization project IMBIO (stands for Integration and Mobilization of Biotic Data on Eukaryota in Resources of Polish Scientific Institutions) led by the node manager. While it cannot be treated as a counterpart of GBIF training, being focused on scope and goals of the project, the training improves understanding of basic rules in biodiversity data management (identifiers, data atomization, data types) and provides trainees with skills and tools necessary to work efficiently.
- **South Africa**: Implementation of SANBI-GBIF e-learning work in the SANBI Research Strategy. Discussions are ongoing with service provider on development of training modules.
- **Spain**: We will replicate the Data Use For Decision Making workshop for the Iberoamerican community in coordination with other nodes from the region. We will continue to provide support for GBIF coordinated training through our e-learning platform, as well as for other members of the network (e.g. GBIF South Africa). We will work together with the Secretariat to expand the functionalities of the GBIF.ES e-learning platform. We remain fully committed to the Living Atlases, and support and contribute to its activities and approach.
- **Sweden**: International collaboration is a corner-stone of SBDI (incl. GBIF-Sweden) and its predecessors. All consortium partners have contributed and drawn experience from a great number of bi- and multilateral activities.
- **United Kingdom of Great Britain and Northern Ireland**: The NBN is Supporting the Living Atlas community:
    - Providing general technical assistance/advice through the Slack community
    - Working on the development of the ALA4R package, providing requirements and reviewing the development proposals
    - helping with comms (e.g. helping develop the story board and script for the videos produced last year)
    - The NBN is assisting review of the Capacity Enhancement Support Programme applications
- **United States of America**: USGS led trainings on using Darwin Core for biological data. Additionally, USGS started a Standardizing Marine Biological Data working group to help the marine community with aligning their data to Darwin Core resulting in eight new datasets being published since a training in October 2019.
- **Zimbabwe**: We conducted two training sessions, one on Data mobilisation and the other on Data Access and Use.

2021 Participant plans

- **Argentina**:Participation as mentor and trainer (national, regional and global), (start to) publish the National Biodiversity Inventory of the Environment Secretariat on the ALA Portal of Argentina . Continue with the advice of our publishers to facilitate and promote the publication of data sets.
- **Australia**: Members of the Atlas team plan to support Living Atlas events in 2021.

- **Belgium**: Help developing an online data cleaning course, to support guidance on expected data quality services.
- **Benin**: We will continue progress towards more acheivements in :Capacity building through workshops and in the framework of the master program in biodiversity informatics Data mobilization, Data uses.
- **Brazil**: Based on the 2020 Letter of Agreement between GBIF and the Ocean Biodiversity Information System (OBIS), an alignment will be made from the technical guidance and training materials from OBIS and GBIF.
- **Cameroon**: For 2021, GBIF Cameroon plans to submit once again a capacity building project for members of its network to CESP 2021 (this after two failures in 2019 and 2020). The node is also considering exploring local resources to implement this activity.
- **Colombia**: Continue the capacity enhancement activities and workshops.
- **Distributed System of Scientific Collections (DiSSCo)**: Training and capacity enhancement activities will be organised through the COST Action MOBILISE
- **France**: GBIF France will continue support for capacity enhancement activities and workshops.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its training and workforce development activities through workshops, webinars, symposia, and other events.
- **Japan**:Provide two workshop for data carpentry and more usecases to be collected (probably Webinar).
- **NatureServe**: For 2021 we have several activities planned (some that should have happened in 2020 but were delayed by the global health crisis). The Tropical Andes Biodiversity Observatory project supported by GBIF, iNaturalist, and the GEO BON Secretariat has planned a series of workshops to build capacity at the local level in Bolivia, Peru and Ecuador, funded by the University of Cordoba in Spain. The second activity we have planned for 2021 will be the socialization of technical approaches for NatureServe data that will be released in their spatial dimension with associated uncertainty which will require their socialization for their correct use and application and analysis.
- **Netherlands**: Organize a workshop on data cleaning and the use of the IPT to mobilize data to GBIF. Develop a georeferencing pipeline in collaboration with Naturalis.
- **Nigeria**: In 2021, we look forward to strengthening our capacity involvement through seminars and workshops (virtual and physical environments), were recent techniques will be taught to ensure publication standards are met.
- **Norway**: BioDATA will organize data mobilization training events in Armenia and Ukraine, both delayed from 2020. BioDATA is also contributing to developing a (reusable) training curriculum for the mobilization of molecular DNA data streams in close collaboration with the GBIF Secretariat for a BioDATA training course planned for Georgia (rescheduled from 2020 to 2021). BioDATA also plans for launching a virtual data mobilization training course to be open to all BioDATA partners, including participants from Norway, in early 2021 (or late 2020).
- **Poland**: We continue the struggle for substantial governmental funding for KSIB's activities, including training and capacity building. The corresponding module will be included in the next proposal for extension of the GBIF cooperation project (currently comprising only the GBIF fee). We aim at implementing a star schema of trainings – a training (or a set of trainings) done by GBIF community in Poland (training trainers) and subsequent local regional trainings in Poland

conducted by local trainers trained earlier.

- **Portugal**: Support capacity enhancement through mentoring in training workshops and translation of materials to Portuguese.
- **South Africa**:SANBI-GBIF will continue to conduct training workshops and develop communities of practice in identified biodiversity informatics areas Capacity building for the different communities involved in GBIF is a pilar of our ongoing strategy. Our e-learning platform and the use that GBIF and its communities make of it so proves it. We plan to continue and expand this area of activity and collaboration
- **Sweden**: By participation (membership and practical participation in systems development of the Living Atlases community), by being active partners in numerous thematic organizations and by taking part in training program(-mes) in cooperation with colleagues practicing exchange of ideas and material, and education/teaching in Biodiversity Informatics (first, second, tertiary, Master, Research level) support will be given to existing and prospective new partners in GBIF, in the LA community and elsewhere. Mentoring and participation in LA community workshops are essential components of biodiversity informatics technical development, and support will be given to developers at other GBIF nodes, at universities and at governmental bodies constructing software and web services for biodiversity data harvesting and publication. SBDI/GBIF-Sweden will also assist Swedish data providers, systems developers and users with the means to develop tools and to apply data and functions in the SBDI web. GBIF-Sweden will continue its engagement in the setting-up of a national BI-portal in Tanzania started up in 2020, we have been contacted by GBIF in Nigeria for potential collaboration, and by colleagues in Ethiopia interested in cooperating in data harvest and presentation.
- **United Kingdom of Great Britain and Northern Ireland**: Support for the Living Atlas community will continue.
- **United States of America**: USGS will lead an effort to create best practice documentation focused on using Darwin Core for marine biological data and will publish the best practice in the Ocean Best Practices System. USGS will seek endorsement of this best practice by the Global Ocean Observing System. USGS will also participate in MBON Pole to Pole workshops to train data providers in using Darwin Core for marine data. USGS was also invited to participate in a Scientific Committee on Ocean Research (SCOR) working group data schema subgroup on Coordinated Global Research Assessment Of Seagrass Systems.
- **Zimbabwe**: We plan to conduct two training workshops: one on R and the second one on Ecological Niche Modelling.

Activity 1c: Equip Participant nodes

Rationale

By coordinating national, regional and thematic networks, Participant nodes play an essential role in helping GBIF engage the broadest possible community of institutions, initiatives and individuals engaged in biodiversity informatics. GBIF must provide learning materials and tools to support nodes efficiently as they work to mobilize biodiversity data, promote the reuse of available data and support users by improving data management and quality. Preferred approaches enable any one node to invest in developing tools and capacity that others can easily leverage for the benefit of the whole community. The skills and experience of the node managers and other team members are

recognized as uniquely valuable in helping new Participants establish their nodes and allowing the community to develop together.

2020 Progress

The COVID-19 travel restrictions forced the cancellation of all face to face regional nodes meetings planned for 2020. However, all of the planned meetings were redesigned as virtual regional meetings coordinated by the Secretariat in collaboration with the regional nodes representatives and their deputies. The original priorities for the 2020 regional meetings were retained in the agenda for the virtual versions: the global nodes strategy, engagement/outreach strategies to strengthen GBIF participation in each region, and responses to the GBIF 20-year review. The meetings were well attended, with 14 nodes taking part in the North America [https://www.gbif.org/event/5iluOArQeYT29U402zDrwi/north-american-virtual-nodes-meeting-2020] meeting on 5-6 May, 21 nodes in the Europe and Central Asia [https://www.gbif.org/event/513CFo2fc5hhww0ci9NF5z/europe-and-central-asia-virtual-nodes-meeting-2020] meeting on 11-12 May, 11 nodes in the Latin America and the Caribbean meeting [https://www.gbif.org/event/3CRkTIGOTe3qfVr3FUvjJF/latin-america-and-caribbean-virtual-nodes-meeting-2020] from 18-20 May, 17 nodes in the Africa [https://www.gbif.org/event/2YqTOjAAVFLwlnGZLrujYW/africa-virtual-nodes-meeting-2020] meeting from 10-12 July and six nodes in the Asia meeting [https://www.gbif.org/event/1MCr1vZxG5s5oRizSnvQVB/asia-virtual-nodes-meeting-2020] on 17 July.

The Secretariat continued to enhance guidance documentation for nodes, including through incorporating products developed in projects supported by the Capacity Enhancement Support Programme (CESP) [https://www.gbif.org/programme/82219/capacity-enhancement-support-programme] within the GBIF documentation package. An example in 2020 was the guidance developed by the OpenPSD [https://www.gbif.org/project/2Zik1tfJoh3C92ZslvhDIr/openpsd-promoting-publication-and-use-of-private-sector-data-on-biodiversity] project on promoting publication and use of private-sector data on biodiversity.

GBIF continued to support the Living Atlases [https://living-atlases.gbif.org/] community through funding both an administrative and a technical coordinator. Significant developments in 2020 included the launch of the Brazilian Biodiversity Information System [https://sibbr.gov.br/] portal, using the Atlas of Living Australia (ALA) [https://www.ala.org.au/] tools including the spatial portal. Changes to the deployment process have simplified adoption of the Living Atlas platform and through private remote sessions, new teams are guided through the process by the technical coordinator.

With the halting of international travel, activities involving Biodiversity Open Data Ambassadors [https://www.gbif.org/article/6dNF1d0tgcI4cmqeoS2sQ4/biodiversity-open-data-ambassadors] were limited in 2020, but progress continued on developing resources for ambassadors including the design of a new slide template for GBIF-themed presentations.

2021 Work items

- Support regional nodes meetings deferred from 2020 due to COVID-19 travel restrictions. This may involve co-location with 2021 regional capacity enhancement workshops under the Biodiversity Information for Development (BID) and Biodiversity Information Fund for Asia (BIFA) programmes (€32,000, in addition to €28,000 towards Africa regional meeting reserved in 2020 budget)
- Based on the 2020 Letter of Agreement between GBIF and the Ocean Biodiversity Information System (OBIS), establish and improve links between GBIF and OBIS nodes in all regions

- Continue to enhance guidance resources for nodes, including advice on the role of nodes to maintain data quality (see also Activity 1b), on their engagement with citizen science and the private sector (see also Activity 3c), and on best practices for engaging with indigenous peoples and local communities including community-based monitoring
- Implement 'child branding' establishing recognized logos exclusive to active GBIF Participant nodes, in conjunction with marks for GBIF data publishers, and projects making use of GBIF through 'powered by GBIF' branding (consultancy contract dependent on 2021 budget evaluation)
- Pilot hosted portals at regional, national and institutional level. **Responds to recommendations 6 and 10b of the GBIF 20-year review**
- In consultation with the Participants, explore possible pricing structure for additional services provided by GBIF Secretariat, e.g. hosted portals and national IPT installations, training services, etc, based on country membership status (i.e. Voting Participant, Associate Participant, non-Participant/Observer), while maintaining the core principle that data access will remain free and open to all.
- In consultation with the Participants, explore possible models for establishment, functions, staffing, governance and funding of GBIF regional offices. **Responds to recommendations 6 and 18 of the GBIF 20-year review**
- Continue offering financial support for the Living Atlases community, currently used to fund project administrators through decision of the Living Atlases Management Committee (€30,000)

2020 Participant contributions

- **Argentina**: Mentor to new nodes. Support and organization of virtual regional nodes meeting. We had to ask other node managers for assistance as the deputy representative was not available during the organization. Situation that still remains in any activity related to regional representation (we should review this type of situation, since all responsibility ends up falling on a representative).
- **Australia**: The Atlas continues to provide support to the Living Atlases community and assisting the work of the Living Atlas coordinators. The Living Atlas coordinators have been involved in the Systems upgrade work that has been a key project for the Atlas in 2020.
- **Benin**: In the framework of our master program, courses are being registered and will be provided to JRS Biodiversity Foundation, our donor. It will be then popularized and disseminated to be available for the general public.
- **Brazil**: Significant developments in 2020 included the launch of the Brazilian Biodiversity Information System Living Atlas platform [https://sibbr.gov.br/], including the spatial portal.
- **Cameroon**: In 2020, GBIF Cameroon identified potential suppliers of data on biodiversity. Working sessions were tenuous with some of them finally laying the foundations for future collaboration.
- **Colombia**: i) Supported two countries in the LAC region (Panama & Bolivia) to consolidate their participation in the GBIF network. ii) Supported the translation activities of GBIF content into Spanish.
- **France**: Based on the Living Atlas portals, we contributed to the French national portal "openobs"

and helped Togo and Benin to set up and sustain their portals.

- **Integrated Digitized Biocollections (iDigBio)**: iDigBio attended the GBIF network webinars and found them valuable. Although, we encourage the Secretariat to establish a regular schedule for the webinars. iDigBio is leading the Collections Data Infrastructure Working Group (CDIWG) aimed at developing partnerships, collaborations, and a community of practice among the major global aggregators.
- **Japan**: Continuous improvement of S-Net system (domestic website for searching natural history specimens).
- **Korea, Republic of**: Constantly working on updating the data to increase usability in use in research, exhibition, and education.
- **NatureServe**: NatureServe participated not only in the North American regional meetings but also in the meetings of the Latin American and Caribbean Nodes as guest participant in 2020.
- **Netherlands**: NLBIF is leading the "ECA Working Group - GBIF nodes and Research Infrastructures" to draft a document that describes different national models on how GBIF nodes can collaborate and align efforts/activities with European biodiversity RIs (DiSSCo, ELIXIR, LifeWatch, eLTER,...), EOSC and EGI. NLBIF supported the ALA officer. NLBIF explores (through Naturalis) the implementation of hosted portals at institutional and national levels together with GBIF.
- **Nigeria**: The node attended the regional virtual meeting held this year.
- **Norway**: As part of the BioDATA project, GBIF Norway will provide node mentoring services to partner countries who make progress towards joining GBIF as new members (see also Activity 1e).
- **Poland**: The Polish Participant Node cooperated with Belarussian Node to prepare CESP proposal and the initiative turned out to be successful.
- **South Africa**: SANBI-GBIF has continued work and engagements on the GBIF-Africa Business Case, and regional engagement strategy. The Node has developed an information product to support messaging and promotion of the African Coordinating Mechanism, which was discussed at the GBIF-Africa Regional Meeting. SANBI-GBIF will highlight the role of GBIF and engage the scientific community at the annual Biodiversity Information Management and Foundational Biodiversity Information Programme Forum, on the Biodiversity Open Ambassador programme.
- **Spain**: We will keep on supporting the Living Atlases community: support coordinators to find a model of governance for the community; assist other data managers of the different Atlases around the world. We will work to develop online exercises on different modules of the Atlas to continue improving LA documentation for users.
- **Sweden**: Continued development and addition of ALA tools will be shared through the new Swedish "Bioatlas" and by sharing code at GitHub. Support to other nodes employing techniques where we may be of help will continue/increase.
- **United States of America**: USGS has worked to include OBIS nodes (OBIS Canada, Ocean Tracking Network) in GBIF meetings like the North American Regional meeting held in May 2020.
- **Zimbabwe**: GBIF Zimbabwe installed the Integrated Publishing Toolkit (IPT) that is hosted at Bindura University of Science Education [https://ipt.buse.ac.zw/ipt/]. The node also launched its website [https://www.gbifzimbabwe.gq].

2021 Participant plans

- **Argentina**: Mentor to new nodes. Support and organization of regional nodes meeting.
- **Australia**: The Atlas plans to continue provide support to the Living Atlases community, assisting the work of the Living Atlas coordinators. In addition, continue to involve the Living Atlas coordinators in the Atlas' Systems upgrade work the Atlas has undertaken to help assist the Living Atlases community during this transition.
- **Belgium**: Help to pilot hosted portals at regional, national and institutional level.
- **Benin**: In the framework of our master program, courses are being registered and will be provided to JRS Biodiversity Foundation, our donor. It will be then popularized and disseminated to be available for the general public.
- **Brazil**: Engagement with the private sector (see also Activity 3c), and best practices for engaging with indigenous peoples and local communities including community-based monitoring. Exploring differential pricing structure for additional services provided by GBIF Secretariat, e.g. hosted portals and national IPT installations, training services, etc, based on country membership status (i.e. Voting Participant, Associate Participant, non-Participant/Observer).
- **Cameroon**: In 2021, GBIF Cameroon plans to upgrade its Biodiversity Information System. It plans to connect its system to the databases of future local partners in order to centralize the data for better decision-making. This activity can only be fully realized with the validation of the project submitted to the BID programme.
- **Colombia**: Support the actions of the projects "Improving biodiversity data quality: a regional need from digitization to data repatriation" (CESP2020-018) and "National Portals Workshop: taxonomic databases, species data information and visualization" (CESP2020-006). Mentoring project with Bolivia, a potential GBIF country participant. Continue the translation activities of GBIF content into Spanish.
- **France**: GBIF France will continue to participate in the activities of the Living Atlases Community.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Explore possibilities to jointly organize Hindu Kush Himalaya level regional workshop to define data gap in collaboration with Chinese Academy of Sciences(CAS) and other GBIF Asian Nodes.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to attend the GBIF network webinars. iDigBio will continue its partnerships, discussions, and collaborations among the major global aggregators via the CDIWG.
- **Japan**: Continuous improvement of S-Net system (domestic website for searching natural history specimens).
- **Korea, Republic of**: Back-up system of KBIF will be upgraded.
- **NatureServe**: Our goal for 2021 is to try to translate the training materials resulting from the Tropical Andes Observatory project into Portuguese, English and Spanish and to upload the code and data so that anyone in the region can use, modify and improve them.
- **Netherlands**: Continued support for the Living Atlases officer. Together with Naturalis continue to explore the implementation of a national hosted biodiversity portal.
- **Nigeria**: Through GBIF's Capacity Enhancement Support Programme (CESP), we hope to improve our national IPT and capacity building through active involvement of stakeholders from all geo-

ecological zones of Nigeria. The node is also looking forward to becoming a voting participant of GBIF, with support from the government.

- **Norway**: As part of the BioDATA project, GBIF Norway will offer node mentoring services to partner countries who make progress towards joining GBIF as new members (see also Activity 1e).
- **Poland**: We hope that Belarussian CESP project will be realized as planned, enabling transfer of skills, tools and experience from GBIF in Poland to Belarussian colleagues in relevant areas.
- **South Africa**: SANBI-GBIF will continue to look at opportunities to support the establishment of the Afican Coordination Mechanism (ACM), as part of the broad concept to establish regional offices (bullet 5).
- **Spain**: In conjunction with GBIF-Portugal and technological partners EGI and Ibergrid, we have submitted a proposal to the EC for a project aiming for the development of a pilot biodiversity data portal for Europe. All Living Atlases activities continue.
- **Sweden**: GBIF-Sweden excpects to continue participation in the GBIF NSG until the fall of 2021. We will also participate at GBIF GB28 and if invited the GBIC3. Apart from disseminating our knowledge through channels like GitHub (for code) and in the Living Atlases community (systems development), other Swedish participation in international GBIF activities includes coordination of nodes work, feedback with respect to informatics development projects, participation in strategic discussions etc. Collaboration with lots of other international initiatives continues involving individual SBDI partners, e.g. GEO BON, GEOSS, IUCN, UNEP, IIPBES, LifeWatch ERIC, Marine LifeWatch, CETAF, NPOMP, ICES, OBIS, EMODnet, IOC-GOOS, GLOBIS-B (EBV), BLS. Semi-locally within the Nordic countries leading the NeIC DEEP DIVE project for biodiversity information collaboration across borders in the region, remains on the list of planned activities aimed at equipping also other nodes. Likewise cooperation on data management and processing, support and training within ASSEMBLE+ (EMBRC) and SYNTHESYS (DiSSCo) plus cooperation with EcoTaxa and UniEuk on images are pursued.
- **United States of America**: US Node will seek to be a pilot project for hosted portals for US data with BISON simple branding.
- **Zimbabwe**: Have an Official Office manned by one person.

Activity 1d: Equip data publishers

Rationale

Data publishers are an essential component of the GBIF network as they share their content through the common infrastructure. More than 1,600 data publishers actively distribute datasets through GBIF.org, and their ranks increase steadily. Publishers from different parts of the world often face unique challenges, though common themes emerge. These problems range from lack of data publishing experience or skills, lack of equipment, language barriers, difficulties in managing data hosting facilities, and the inability to publish high-quality data or curate data into the future. The Integrated Publishing Toolkit (IPT) requires ongoing improvements and enhancements, including the establishment of hosted instances that reduce the technical burden on data publishers.

2020 Progress

The GBIF Secretariat is now hosting two regional installations of the Integrated Publishing Toolkit (IPT), one for Latin America and the Caribbean [https://cloud.gbif.org/lac], and one for Europe and Central Asia [https://cloud.gbif.org/eca]. The aim of the regional IPTs is to support dataset publication and hosting from institutions in the region, especially those in countries not yet participating in GBIF. The Secretariat maintains the technical requirements for the server on which these IPTs are hosted, while volunteer mentors from each region provide the user administration and publishing support. Information about the regional IPTs has been added to the data hosting page [https://www.gbif.org/article/4qfLORxmM8kYOIwSYSMc2M/data-hosting] on GBIF.org.

The Secretariat released a simple citation widget [https://www.gbif.org/article/1E6v02SFQyhupvB7JqDXPN/citation-widget] for web developers to embed on data publisher websites, helping them to demonstrate the research enabled by datasets they have shared, and encouraging better citation practices.

Secretariat staff provided a background presentation on planned advice to be extended to data publishers and nodes on handling data privacy issues in compliance with the European Union's General Data Protection Regulation (GDPR) [https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32016R0679&from=EN] during the GBIF Community Webinar [https://www.gbif.org/event/6Ad3mlTfVwkWo1bZNMO1d4/gbif-community-webinar-june-2020] in June. Planning now underway will establish transactional email service to support delivery of the first in a series of regular biannual communications to data publishers aimed at fulfilling GBIF's commitments under its privacy policy [https://www.gbif.org/terms/privacy-policy].

The GBIF Registry [https://registry.gbif.org] is open for nodes staff to manage registrations and metadata, initiate data ingestion, follow logs and diagnose issues. In 2020, more external users made use of this, and were assisted in learning the processes through helpdesk support. During 2020 changes have been made to accommodate the newly-deployed data processing pipelines.

Working closely with the TDWG Vocabulary Task Group [https://www.tdwg.org/community/bdq/tg-4/], GBIF is developing an open environment for editing the reference vocabularies used in data processing. This will include vocabularies for controlled terms such as *Life stage*, *Sex*, *Establishment means* etc. Once complete, data managers will be able to influence data interpretations in GBIF.org without the need for software changes.

2021 Work items

- Publish a biannual newsletter to data publishers, keeping them informed of key infrastructure developments and best practices for complying with GDPR
- Improve reporting of data use to data publishers, implement clearer display of use information on pages for publishers and download DOIs
- Explore services for publishers to opt in to receive push notifications for new citations
- Enhance regional helpdesk services
- Continue the development of reference vocabularies used in data processing; mature the community of editors, discuss and coordinate governance, priorities and workflows

2020 Participant contributions

- **Argentina**: Argentina has a collection catalogue (and institutions) since 2003. We keep updating it. Trying to reduce the number of IPTs to centralize all the datasets in one IPT (all activities suspended by COVID-19).
- **Australia**: Comment from last year's submission - "Develop a community of practice in the management of trait information. Develop a roadmap for trait mobilisation activities." 2020 progress - After a scoping study was undertaken, our overall conclusion was that the complexity of the data and the immaturity of current standards within trait based research communities would mean that the level of investment to achieve the goals would be prohibitive and we have decided to prioritise other activities at the Atlas.
- **Belgium**: Hosted IPT installations.
- **Benin**: Capacity building in data mobilization and data uses.
- **Brazil**: Data usage reports for data publishers have been improved and made available on SiBBr.
- **Cameroon**: Since 2018, GBIF Cameroon has identified some data publishers and enrolled others on the GBIF portal. However, the lack of training on GBIF standards and publication tools did not allow them to post data on the GBIF portal.
- **Colombia**: Improvement in the national helpdesk for data publisher with new templetes by type of data and tools to data validation. Published a monthly report of publishing activity [https://sibcolombia.net/actualidad/reportes/]. Updated the guidelines to share data.
- **France**: GBIF France offers data hosting and maintains IPT instances for southern countries.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to coordinate a national effort to digitize and mobilize specimen-based biodiversity data in the United States. iDigBio has staff dedicated to helping with digitization, data mobilization, and data ingestion.iDigBio has been working with GBIF on the global collections registry with the goal of having a unified source for information about biodiversity collections.
- **Japan**: S-Net system and tools updated for improvement.
- **NatureServe**: Progress on this point for 2020 is not characterized by specific activities but rather by the constant support that the more than 90 partner institutions that are part of our network get from NatureServe in order to mobilize their data towards GBIF.
- **Netherlands**: NLBIF has mobilized datasets of several new data publishers that were educated in DwC-A data format, the use of the IPT, the importance of metadata (EML), new developments of GRSciColl, and the relevance of ROR and GRID identifiers.
- **Nigeria**: In 2020, the node has published data made available from data holders, while some are underway.
- **Poland**: IPT has been in use of GBIF Poland for years and still is planned to remain the main method of connecting data to the global network. Our server has been also in use by North Macedonian colleagues for publishing their data.
- **Portugal**: GBIF Portugal mantains a trusted data hosting centre with and IPT installation serving 16 publishing institutions, seven of them framed by a Service Level Agreement (SLA). Three of the institutions are from Angola, and one is a private sector publishing institution.
- **South Africa**: SANBI-GBIF hosts an IPT which supports both national and regional data

publishing. This includes helpdesk support.

- **Spain**: GBIF Spain will continue to offer online support to data publishers also outside Spain in using IPT. We will assist GBIF Zimbabwe to configure and maintain its own IPT.
- **Sweden**: Considerable progress has been achieved in regard to developing methods and presenting tools for sharing sequence data.
- **United States of America**: As the US Node Manager has become more familiar with the US GBIF community, she has increased active participation in helpdesk type of activities.
- **Zimbabwe**: GBIF Zimbabwe installed the Integrated Publishing Toolkit IPT [https://ipt.buse.ac.zw/ipt/] that is hosted at Bindura University of Science Education. This is available for use by data publishers in Zimbabwe. We also conducted a training workshop on Data Mobilisation in January 2020.

2021 Participant plans

- **Argentina**: Try to reduce the number of IPT to centralize all the data sets in one IPT.
- **Australia**: The ALA will be exploring data mining techniques to extract more useful impact metrics from science publications to improve our understanding of users and their data requirements. These analysis approaches may provide an opportunity for fruitful collaboration.
- **Benin**: Capacity building in data mobilization and data uses involve data publishers and encourage them to participate more in project calls.
- **Brazil**: Implement clearer display of use information on pages for publishers. Improve governance and data flow.
- **Cameroon**: In 2021, GBIF Cameroon plans to build the capacities of potential data editors with the support of external and local financial partners.
- **Colombia**: Improve the monthly report of publication activity with data access and use topics. Support dataset publication and hosting from national organizations. Promote the use of DOI. iv) Promote publication of data from business sector and molecular data.
- **France**: GBIF France will continue to support data hosting and publishing services for southern countries.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Sensitize data holders and data providers in ICIMOD's eight regional member countries in the Hindu Kush Himalayan region about the importance of data publishing, and use of global publishing platform.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its efforts to coordinate the national digitization effort. iDigBio will continue to work with GBIF on the global collections registry.
- **Japan**: Tools (including dictionaries for controlled vocabularies) to be updated for improvement.
- **NatureServe**: By 2021 we plan to not only maintain constant support for NatureServe's network partners in Canada and the US but also to provide additional support for the ability to manage data with lower degrees of uncertainty.
- **Netherlands**: NLBIF closely follows the developments of GRSciColl and aims at the registration of all Dutch data publishers and their collections at GRSciColl.
- **Nigeria**: In the coming year, we would ensure that data publishers are strengthened through

training and workshop programmes, which will keep them informed of the key infrastructural developments and best practices in compliance with the European Union's General Data Protection Regulations (GDPR)

- **Poland**: We are going to explore additional tools and resources available (citation widget, Registry, reference vocabularies), as well as refresh and improve metadata published by our existing IPT instances. New users of IPT in Poland should appear in 2021 and they will receive guidance from the National Node.
- **Portugal**: Maintain the support of the trusted data hosting centre and enlarge the number of SLAs.
- **South Africa**: The Node will continue hosting of the IPT and will continue its support to data publishers.
- **Sweden**: Further development of mechanisms enabling molecular information to be harvested, managed and presented is highly prioritized by GBIF-Sweden. Additionally we will offer workshops and user training events on how to use the Swedish and international infrastructures, and specifically support individual nodes requiring assistance mobilizing data.
- **United States of America**: USGS will explore ways to inform data providers about their data being used in prominent policy documentation like the IPCC Special Report on 1.5 degrees C.
- **Zimbabwe**: Conduct Training Workshops on Data Mobilisation to new Publishers. Assist new data publishers with data cleaning and publication

Activity 1e: Expand national participation

Rationale

GBIF's national membership has remained largely static in recent years. Active participation in the network is confined to a limited number of regions, with the most dynamic activity in node collaboration and data publication focused in Western Europe, North America, Latin America, Oceania, increasingly sub-Saharan Africa and limited parts of Asia. Thus, significant parts of the world have little or no direct involvement in GBIF's activities, which poses a risk to the long-term credibility of GBIF as a global collaborative network. Secretariat staff and existing Participants constantly engage potential new members through ad hoc contacts, but the situation calls for a more strategic approach to expand membership.

2020 Progress

Cambodia joined GBIF [https://www.gbif.org/news/6JJPxjVVaL2tWN6CN9m5DI/cambodia-joins-gbif-as-associate-participant] as an Associate Participant.

Plans for a separate funded call in 2020 for regional outreach activities, alongside the Capacity Enhancement Support Programme (CESP) [https://www.gbif.org/programme/82219/capacity-enhancement-support-programme], were deferred due to the COVID-19 restrictions, as it would have been impractical to implement such projects in the current circumstances. However, the 2020 virtual regional nodes meetings (see Activity 1b) each discussed regional engagement strategies aimed at targeting outreach actions to support new national participation in the region, as well as engagement with relevant regional networks and institutions. These strategies will help with the rationale for

proposals under a call for funded regional outreach activities, expected to be implemented in 2021.

To prepare for plans to expand GBIF's engagement, data mobilization and capacity enhancement to all global regions, the Secretariat developed a 'capacity portfolio' describing the outcomes that can be achieved through funded programmes and the resources developed by GBIF to help implement them, especially through the Biodiversity Information for Development (BID) programme [https://www.gbif.org/programme/82243/bid-biodiversity-information-for-development]. This portfolio is designed to demonstrate to potential funders and implementation partners the range of activities GBIF can support through well-tried mechanisms for project selection, project management, training and mentoring. The appointment of a Strategic Partnership Officer in 2020 (see Activity 1g) provided further support for GBIF's outreach and engagement capabilities.

Regional engagement webinars associated with the BID programme were organized for Latin America and the Caribbean [https://www.gbif.org/event/3nGVsg7lEvjEgbQICxDom6/bid-regional-engagement-webinar-for-latin-america-and-caribbean], Africa [https://www.gbif.org/event/5lI2qSUlXonhcg2X63ATLU/bid-regional-engagement-webinar-for-africa] and Oceania. These webinars attracted at total of 209 participants from 57 countries and areas, including many countries not yet participating in GBIF. Additionally, a GBIF Asia Virtual Summit [https://www.gbif.org/event/2mhSFStVVJVdM8pYK7TScR/gbif-asia-virtual-summit], associated with the Biodiversity Information Fund for Asia (BIFA) programme [https://www.gbif.org/programme/82629/bifa-biodiversity-information-fund-for-asia], attracted 145 participants from 22 countries and areas, and included a high-level panel discussion on enhancing GBIF participation in Asia in response to recommendations of the GBIF 20-year Review [http://doi.org/10.35035/ctzm-hz97].

The internationalization of GBIF.org user interface continued with the completion of the Arabic translation, meeting the commitment to provide the interface in all six UN languages. Additionally, voluntary efforts from the community enabled the translation of the user interface into Ukrainian, bringing the number of GBIF.org language versions to ten.

2021 Work items

- Actively seek new Voting Participant countries, and return of former Voting Participants, to broaden the funding base ahead of the 2023-2027 financial period; in particular highlighting to governments the value of GBIF in meeting data and capacity needs for national implementation of the post-2020 global biodiversity framework under the Convention on Biological Diversity (CBD)
- Initiate annual call for regional outreach project proposals to support expansion of national participation, as well as improved connections with relevant regional organizations and networks (support from core funds dependent on 2021 budget evaluation). **Responds to recommendations 5 and 6 of the GBIF 20-year review**
- Explore additional funded capacity programmes, within the broad umbrella of the BID programme, focussed on underrepresented regions in GBIF. **Responds to recommendation 5 of the GBIF 20-year review**
- Maintain and expand internationalization of GBIF.org, especially translation of key page content and digital documentation, minimally for the six official UN languages and further languages based on demand and volunteer translator capacity
- Develop a 'catalogue of GBIF services' to support implementation of the resource mobilization strategy (see Activity 1g). This will include completion and curation of the capacity portfolio

developed in 2020, with additional components of services offered by GBIF to include in outreach materials for potential funders and implementation partners

- Develop communications to support the GBIF value proposition (€10,000). **Responds to recommendations 4a and 7 of the GBIF 20-year review**

2020 Participant contributions

- **Argentina**: Argentina participates actively in the translation of GBIF content. Support is provided, as a regional representative, to all countries that do not have a node yet, but are interested in joining GBIF.
- **Brazil**: National calls for proposals were were launched (Programd PELD and PROTAX) that should support the expansion of national participation. Partnerships were also carried out with relevant regional organizations and networks
- **Cameroon**: GBIF Cameroon has studied the possibility of re-mobilizing members of the Central African sub-regional network for managing information on biodiversity.
- **Colombia**: More than 10 new publishing organizations in 2020 (143 to date).
- **France**: Help for French translations: GBIF.org, BID, workshop materials.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Sensitize data holders and data providers in ICIMOD's eight regional member countries in the Hindu Kush Himlayan region about the importance of data publishing, and use of HKH-BIF regional platform for data publishing or use of available in-country platforms such as in India and China: We wanted to explore this through CESP proposal which did not materialize. However, we aim to reach out to selective partners towards the end of 2020 and then continue in 2021. One-to-one sensitization might be necessary and ICIMOD will try to embed this agenda with biodiversity related actions in different countries in near future.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio is has continued to provide the services of its Node Manager as the North America Regional Representative. iDigBio has continued its involvement with professional societies, such as SPNHC and TDWG, and continues its partnership with other national activities, such as BCoN.iDigBio organizes two large conferences per year, the Digital Data conference and the ADBC summit, which facilitate expanded participation in the region.
- **Japan**: Meeting occasions to enroll more organisations done.
- **Korea, Republic of**: Two additional institutions participated in Korean biodiversity data network which are the domestic data providers and other potential participants.
- **Netherlands**: NLBIF is funding a project to implement the ALA platform in Ukraine and mobilize data from Ukraine to GBIF [https://www.nlbif.nl/mobilization-of-biodiversity-data-from-ukraine-to-gbif/].
- **Norway**: The BioDATA project managed by GBIF Norway contributes to promoting expanded GBIF country membership in Eurasia (including strategic partners from Belarus, Tajikistan, Armenia, and Ukraine). In addition to the primary goal of providing academic training (Activity 1b), BioDATA aims to build the capacity needed for establishing national GBIF Participant Nodes (Activity 1c and 1e). Belarus joined as an Associate Participant in July 2019 and Armenia joined as Associate Participant in August 2020. GBIF Norway contributes to the nodes task group for developing a regional engagement strategy for Europe and Central Asia 2020-2022.

- **Poland**: The Belarussian CESP project prepared in cooperation with the Polish and Estonian Participant Nodes aims at enhancing regional involvement in GBIF, including colleagues from Latvia and Lithuania. We hope that the initiative will trigger GBIF-related activities in these countries, helping to create a “critical mass” necessary to become official GBIF members.
- **Portugal**: Contributions to translations of the global portal (gbif.org) and data platforms (ALA) to Portuguese. Contributed to translations of news, key documents and manuals to Portuguese.
- **South Africa**: 2020 SANBI-GBIF will consider expanding participation through supporting the implementation of the African Coordination Mechanism (ACM).
- **Spain**: Translation of gbif.org to be continued. Exploring ways to expand participation in North African countries in collaboration with Ministry of Science.
- **Sweden**: As stated in 2019. GBIF-Sweden will primarily be engaged in the Living Atlases Community as a means to contribute to the expansion of the global network of GBIF.
- **United States of America**: Continued coordination with the U.S. Integrated Ocean Observing System (IOOS) to increase the awareness and use of Darwin Core for marine biological data. USGS served on the planning committee for an IOOS-ESIP Biological Data Workshop in July 2020. USGS assists IOOS Regional Associations with understanding and implementing Darwin Core.
- **Zimbabwe**: Trained new stakeholders in Data Mobilisation (January 2020) and Data Access and Use (March 2020).

2021 Participant plans

- **Argentina**: Argentina participates actively in the translation of GBIF content. Support is provided, as a regional representative, to all countries that do not have a node yet, but are interested in joining GBIF.
- **Belgium**: French and Dutch translations to help maintaining and expanding internationalization of GBIF.org
- **Benin**: Involve national partners and encourage them to more participate in project calls.
- **Brazil**: Maintain and expand internationalization of GBIF.org, especially translation of key page content and digital documentation.
- **Cameroon**: GBIF Cameroon plans to re-mobilize the members of the biodiversity information management network of the Central Africa sub-region.
- **Colombia**: i) Support the translation of key page content and digital documentation to GBIF.org ii) Expand the participation of new organizations.
- **France**: Translations to be continued.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio is planning a Biodiversity Summit in 2021, which will ideally be a collaborative meeting of the ADBC community, GBIF governing board, TDWG, and the National Museum of Natural History (Smithsonian). The meeting will feature the evolution and accomplishments of specimen-based science and the impact of digitization.
- **Japan**: Provide meeting occasions to enroll more organisations.
- **Korea, Republic of**: Two new institutions will participated in Koaren biodiversity data network.
- **NatureServe**: In 2021 we plan to expand our efforts to Latin American countries, especially in countries where GBIF nodes are non-existent or incipient.

- **Netherlands**: The Netherlands has a strong historical connection with Indonesia and houses a lot of duplicate specimens form Indonesia. NLBIF want to explore the possibilities of digital repatriation of biodiversity data and digitisation knowledge to allow further mobilisation of data from Indonesia in the near future.
- **Nigeria**: The Node plans to increase the number of participating of data holders in its activities. In the first quarter, we hope to organize a physical meeting of stakeholders to discuss modalities for the involvement of the Government in biodiversity-related programmes.
- **Poland**: Poland should take part in GBIC3 and develop connections with the Alliance. Our goal is to coordinate progress of GBIF in Poland with other important biodiversity-related projects like DiSSCo, trying to create an effect of synergy through proper connections and dependencies between them in the local landscape.
- **Portugal**: Contribute to expand the awareness about GBIF in the Community of Portuguese Language Countries (CPLP) community, through documentation and engagement with countries or institutions.
- **South Africa**: SANBI-GBIF will consider the ideal strategic approach to support expanding participation, in line with the ACM.
- **Spain**: Mantaining and expanding our ties with LifeWatch, increasing patrticipation with the LTER communities via our participation the eLTER Plus and eLTRRE PPP, projects (EC funded) Willing to get involved in BID projects pertaining the Caribbean.
- **Sweden**: Technical development of GBIF-Sweden within SBDI will demand further engagement in the Living Atlases community. Bilaterally we have taken part in discussions with GBIF Norway and other colleagues on closer collaboration while suggesting and building amn updated and coherent Norwegian biodiversity infrastructure. We also explicitly expect to continue reviewing proposals for data harvesting projects on behalf of GBIF-Norway.Other Swedish participation in international GBIF activities include coordination of nodes work (decribed above), feedback with respect to informatics development projects, and participation in strategic discussions etc.in global context. Specifically, cooperation on data management and processing, support and training within ASSEMBLE+ (EMBRC) and SYNTHESYS (DiSSCo) continue as does cooperation with EcoTaxa and UnEuk on inmages.
- **United States of America**: USGS will continue to seek new partnerships such as with the new National Park Service Inventory 2.0 project lead to facilitate faster integration of monitoring data into GBIF.
- **Zimbabwe**: Engage new participants, including those from government and non-governmental organisations and have MOUs signed.

Activity 1f: Plan implementation

Rationale

Implementing this plan hinges on effective coordination with the plans of individual GBIF national and organizational Participants. GBIF must also ensure that node activities are well recognized and integrated with other biodiversity research and informatics initiatives at national, regional and organizational levels.

2020 Progress

As part of the EU-funded SYNTHESIS+ project [https://www.synthesys.info/] and within the framework of the *alliance for biodiversity knowledge* [https://www.allianceforbio.org/], GBIF convened a virtual workshop [https://www.gbif.org/news/6TvOkvpPlxRm5vHxljYNN5/] in March and April around the needs for an integrated catalogue of the world's scientific collections. It began with publication of an ideas paper [https://doi.org/10.35035/p93g-te47] in English, Spanish [https://docs.gbif.org/collections-idea-paper/es/], French [https://docs.gbif.org/collections-idea-paper/fr/] and Simplified Chinese [https://docs.gbif.org/collections-idea-paper/zh/], followed by a two-week community discussion [https://discourse.gbif.org/c/collections-catalogue/18] moderated by a group of volunteers. The discussion reinforced the community's interest in and support for an integrated collections catalogue and provided several avenues for further exploration. The workshop summary of this workshop will be prepared as a road map outlining next steps before the end of 2020.

A second SYNTHESYS+ workshop focused on citation aspects of collections had been scheduled for the 2021 conference of the Society for the Protection of Natural History Collections (SPNHC) [https://spnhc.org/], but was postponed with the conference's cancellation.

The Secretariat improved the visibility of the work contributions and plans of individual nodes by including all national updates for the annual Work Programme on the country pages of GBIF.org.

2021 Work items

- Organize the 3rd Global Biodiversity Informatics Conference (GBIC3), hosted by the LifeWatch European Research Infrastructure Consortium (ERIC) [https://www.lifewatch.eu/] in Andalucia, Spain (dependent on external funding), to address the ongoing operation and governance of the *alliance for biodiversity knowledge*
- Organize and run the 2nd SYNTHESYS+ workshop relating to citation of collections
- Plan for the 3rd SYNTHESYS+ workshop relating to Digital Specimen data models

2020 Participant contributions

- **Argentina**: Continue contributing to national, regional and global activities.
- **Australia**: Comment from last year's submission - "Review GBIF's data pipelines work and data registry as part of an Atlas infrastructure review and refresh. Aim to align with GBIF where possible." 2020 progress - After consulting with the informatics team at GBIF, and developing a proof of concept for the Atlas, we have started work on adoption of GBIF's data pipelines as part of our System upgrade work.
- **Benin**: Capacity building, data mobilization, data uses.
- **Cameroon**: A reflection on the establishment of a national implementation plan aligned with the GBIF plan has been initiated.
- **Colombia**: Support and participate in the Latin America and Caribbean Virtual Nodes Meeting 2020. Promove the community discussion and ideas for the catalogue of the world's natural history collections. Diseminate at national level the calls for the Ebbe Nielsen Challenge and Young Researchers Awards 2020.
- **Distributed System of Scientific Collections (DiSSCo)**: Responded to GBIFS questions, other

work done with GBIF through the year.

- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to organized, support, and host the North America regional meetings. iDigBio has worked with other regional nodes to establish a steering group for the region. The North America region is now planning to conduct quarterly "check in" meetings to retain engagement of the various stakeholders.
- **Korea, Republic of**: Data gap discovery has been carried out for the data from National Science Museum, a record of approx. 1.50 Mil.
- **NatureServe**: Our work in 2020 has focused on connecting the activities of the biodiversity observation network in the Americas under the GEO BON umbrella and the GBIF nodes at the national level.
- **Norway**: GBIF Norway contributes staff resources to the DiSSCo National Task Force (NTF) representing Norway in the DiSSCo Prepare process. GBIF Norway maintains liaison with the international organizations in the agrobiodiversity community to promote and actively support the harmonization with GBIF provided and solutions endorsed standards (see also Activity 2a, 3c, and 5b).
- **South Africa**: Engagements with SANBI-GBIF Node Manager and HoD/DSI to evolve the Node planning and Africa portfolio
- **Spain**: Collaboration with EU Nodes and EOSC to explore best ways to integrate Node's services in the EOSC. This resulting in publication of services in the EOSC marketplace", and preparation and subssion of collaborative prokects.
- **Sweden**: Text 2019-020: GBIF-Sweden will continue to take part in leading and contributing to the development of interconnections at national and international levels (GBIC 2 follow-up etc. incl. participation in Synthesys). Comment August 2020: As stated
- **United States of America**:USGS continues to be involved in and contribute to advancing and contributing to the ideas around the GBIC2 workshop sharing implementation and infrastructure suggestions as they pertain to the US and the various global communities of practice.

2021 Participant plans

- **Argentina**: Continue contributing to national, regional and global activities.
- **Australia**: Further alignment work with GBIF on metadata registry and APIs for occurrence data.
- **Benin**: Capacity building, data mobilization, data uses.
- **Brazil**: Monitor GBIF activities and whenever possible participate in workshops.
- **Cameroon**: Development and implementation of a national biodiversity information management plan.
- **Colombia**: Continue to support the implementation of the GBIF program.
- **Distributed System of Scientific Collections (DiSSCo)**: Working towards a Digital Specimen identifiers solution that could potentially be a global solution.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio plans to continue attending, supporting, and/or hosting regional meetings in North America as required. iDigBio will also continue to offer the annual Digital Data Conference as a potential venue for the annual regional meetings.
- **Korea, Republic of**: Data gap discovery will be carried out, and constantly updating and

correcting the KBIF data.

- **LifeWatch ERIC**: Plan for the 3rd Global Biodiversity Informatics Conference (GBIC3), hosted by the LifeWatch ERIC, to address the ongoing operation and governance of the alliance for biodiversity knowledge has agreed and is progressing.
- **NatureServe**: In 2021 we will strengthen the connection between GEO BON and GBIF in the region.
- **Poland**: Poland should take part in GBIC3 and develop connections with the Alliance. Our goal is to coordinate progress of GBIF in Poland with other important biodiversity-related projects like DiSSCo, trying to create an effect of synergy through proper connections and dependencies between them in the local landscape.
- **South Africa**: Further engagements with SANBI-GBIF Node Manager and HoD/DSI to evolve the Node planning and Africa portfolio
- **Spain**: Ongoing collaborations and activities with LifeWatch, Syntesys+, and CETAF. Increase collaboration and integration of our citizen science activities with iNaturalist.
- **Sweden**: All code produced by SBDI partners will be thoroughly documented and published on GitHub. We will participate by developing tools for SYNTHESYS+ (WP4, WP6, WP8). Locally we will set-up of Tier 1 (documentation and help desk) & Tier 2 (support network) of SBDI. GBIF-Sweden will be represented at SPNHC 2021, and (by invitation?) to GBIC3.
- **United States of America**: USGS will plan to attend the 3rd Global Biodiversity Informatics Conference (GBIC3).

Activity 1g: Coordinate resources

Rationale

Among its other roles, the GBIF Secretariat coordinates efforts to expand the scale and scope of GBIF activity beyond the levels achievable using only annual core Participant contributions. GBIF Participants commit to establish and operate nodes which serve as significant centres for GBIF activity. Some nodes have sufficient resources to contribute skills and developments which advance GBIF's work, while others may require external support to become fully active. A limited amount of funding has been allocated each year under the GBIF work programme to support capacity enhancement for GBIF nodes. GBIF or individual Participants may also secure supplementary funds to contribute to particular areas of GBIF work. Improved coordination of these various resources will assist GBIF to advance more rapidly at all scales.

2020 Progress

The European Commission's Directorate-General for International Cooperation and Development (DG DEVCO) [https://ec.europa.eu/international-partnerships/] signed an addendum to the contract with GBIF funding the Biodiversity Information for Development (BID) programme [https://www.gbif.org/programme/82243/bid-biodiversity-information-for-development], extending the period of the programme to 2023, with a budget 'top-up' of €1.6 million. This extension enabled the Secretariat to launch a second phase of the BID programme, starting with a new call for project proposals from sub-Saharan Africa [https://www.gbif.org/article/6YMaBaQKPDDfBSGTO6jvg5/bid-call-for-proposals-sub-saharan-africa-2020] in June. Further calls [https://www.gbif.org/news/2CWAyHikixiCKf7tjm5J28/new-calls-planned-in-2020-for-

biodiversity-information-for-development-programme] were being launched for the Caribbean and Pacific regions in September 2020.

The extended BID programme was designed in collaboration with a Steering Committee composed of DG DEVCO, GBIF Secretariat, the GBIF Nodes Chair, the GBIF regional nodes representative for Latin America and the Caribbean, the Secretariat of the Pacific Regional Environment Programme (SPREP) [https://www.gbif.org/participant/377], the South African National Biodiversity Institute (SANBI) [https://www.sanbi.org/], UN Environment World Conservation Monitoring Centre (UNEP-WCMC) [https://www.unep-wcmc.org/], and the EU Joint Research Centre (JRC) [https://ec.europa.eu/info/departments/joint-research-centre_en]. The structure of the programme is similar to the first phase from 2015-2019, with the following changes:

- Eligible countries in the Caribbean region have been extended to include all Caribbean island nations, all South American countries with a Caribbean coastline, and all Central American countries plus Mexico. Overseas countries and territories (OCTs) of the European Union and United Kingdom will be eligible to take part in regional consortium projects led from independent states in the target regions
- In additional to data mobilization grants at institutional, national and regional scales, the extended phase includes a new type of grant, the data use grant, which targets consortia bringing together end users and data holders experienced in GBIF data publishing, to address a specific policy or decision need through targeted data mobilization and the development of relevant information resources

The 2020 call for proposals under the renewed Capacity Enhancement Support Programme (CESP) [https://www.gbif.org/programme/82219/capacity-enhancement-support-programme] attracted 19 concept notes, from which five projects were selected involving collaborations between 28 nodes in Latin America and the Caribbean, Africa and Europe and Central Asia, with core funding of €100,000 (increased from the original allocation of €80,000 in the 2020 budget). Due to the COVID-19 restrictions, successful projects were allowed to extend their implementation period to the end of 2021.

The Secretatiat coordinated a fifth call for proposals under the Biodiversity Information Fund for Asia (BIFA) [https://www.gbif.org/programme/82629/bifa-biodiversity-information-fund-for-asia], supported with €116,000 supplementary funding provided by the Japanese Ministry of Environment [https://www.env.go.jp/en/]. From 32 concept notes submitted, nine data mobilization projects were selected [https://www.gbif.org/news/4ASoMt9mIxQ44Z8rPVOR7q/bifa-programme-awards-funding-to-nine-new-projects-in-asia], with project leads from Bhutan, China, Indonesia, Nepal, Philippines, Thailand and Viet Nam. A virtual data mobilization training workshop [https://www.gbif.org/event/BoAe3g7KjGeJUzC3oxs9v/data-mobilization-workshop-for-asia-2020] was held for the funded projects, as well as for GBIF Participant nodes in Asia (see Activity 1b).

Additional funds (€30,000) provided by the Finnish Biodiversity Information Facility (FinBIF) [https://laji.fi/en] to promote data mobilization in European Russia were used in 2020 to support an innovative call [https://www.gbif.org/news/1VHfuSBGwSzDBxqRHucAHY/call-for-data-papers-from-european-russia], in collaboration with Pensoft Publishers [https://pensoft.net/], to submit data papers describing GBIF-published datasets covering the region of Russia west of the Urals. Under this call, the author processing charge is waived for up to 20 data papers accepted following peer review, published in a special issue of the Biodiversity Data Journal [https://bdj.pensoft.net/]. This model is being explored for

potential re-use in future projects to encourage good metadata authoring and quality control for GBIF-published datasets, as well as academic recognition for the data mobilization process (see activity 3e).

The new GBIF Grants Portal [https://gbif.fluxx.io/], using the Fluxx grant management software, has greatly streamlined the process for managing project calls within the CESP, BIFA and BID programmes. Despite some early bugs the rollout of the Grants Portal in 2020 has been well-received by applicants, reviewers and Secretariat staff. An evaluation is under way to estimate the time saved through use of the online application, review, budgeting and reporting system, as well as lessons learned in implementation of this major IT project for the Secretariat.

The Secretariat commissioned Development Vision [http://www.development-vision.com/] consultancy to conduct a landscape assessment on the potential for GBIF to diversify its funding base, focussing especially on the targeting of philanthropic foundations and bilateral/multilateral government funding agencies. As well as providing a shortlist of foundations with potentially aligned priorities to support GBIF engagement, the review recommended recruitment of a staff member focussed primarily on fundraising and partnerships. After a competitive selection process, the Secretariat appointed Hilary Goodson of the London Natural History Museum (NHM) to the new post of GBIF Strategic Partnership Officer, beginning in September 2020.

2021 Work items

- Select projects in the sub-Saharan Africa, Caribbean and Pacific calls of the extended BID programme, negotiate contracts and coordinate start of 2-year project implementation cycle
- Run BID capacity enhancement workshops in Africa, the Caribbean and Pacific to support project implementation in the extended phase of the programme, exploring co-location for GBIF regional nodes meetings during 2021 (see Activity 1c)
- Launch the 2021 call for proposals under the Capacity Enhancement Support Programme (CESP) (€80,000). **Responds to recommendation 6 of the GBIF 20-year review**
- Launch the sixth call for proposals under the Biodiversity Information Fund for Asia (BIFA) programme, supported by supplementary funding from the Japanese Ministry of Environment, and including a 2021 data mobilization training workshop which may be co-located with the 2021 GBIF Asia regional nodes meeting (subject to agreement by the BIFA Steering Committee). **Responds to recommendation 5 of the GBIF 20-year review**
- Subject to consultation with Participants and nodes, including discussion at GB27, complete, publish and begin implementation of the GBIF resource mobilization strategy aimed at broadening the supplementary funding base. **Responds to recommendation 10b of the GBIF 20-year review**

2020 Participant contributions

- **Argentina**: Participation in 2 CESP programs (one as participant, one as coordinator), coordinating national co-financing for CESP, coordinated from Argentina.
- **Belgium**: Help establishment of a second phase of BID in collaboration with the European Union.
- **Benin**: Continue to exert the mentorship among partners.
- **Brazil**: Brazil submitted a proposal under the Capacity Enhancement Support Program (CESP) to

be implemented with Latin American countries.

- **Integrated Digitized Biocollections (iDigBio)**: iDigBio is leading the Collections Data Infrastructure Working Group (CDIWG) aimed at developing partnerships, collaborations, and a community of practice among the major global aggregators. iDigBio has joined the Research Data Alliance (RDA) and is helping to chair the Biodiversity Data Integration Interest Group.
- **Korea, Republic of**: 3.93 Mil biodiversity data from 39 data providers have been provided and increased 68% from 2018. Approx. 1 Mil ecological data from National Institute of Ecology will be shared with GBIF in December 2020.
- **NatureServe**:Nothing to report.
- **Norway**: The GBIF CESP OpenPSD project developed by the GBIF Nodes from Spain, Portugal, Norway, Colombia, and France has documented best practices for mobilizing biodiversity data from the private sector (see also Activity 1d, 3b, and 3c).
- **Poland**: In 2020, we used an opportunity of the COST Mobilise Action to activise some data publishers in Poland and strengthen links within KSIB. The most important external resource in this respect was the digitization project funded withing the European Regional Development Fund). GBIF became a strategic platform for exchanging biodiversity data for all major projects financed by the "Digital Poland" Operational Programme. Over next three years there should be clear increase in data publishing activity from Poland made possible through this funds [https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/poland/2014pl16rfop002].
- **South Africa**: SANBI-GBIF has supported these efforts through participation on the EU-DevCo Steering Committee. The Node also supported the evaluation of the CESP project proposals for 2020.
- **Spain**: GBIF Spain will be involved in 3 CESP projects that will take place from June 2019 to June 2020 (deadline extended until the end of 2020). We are coordinating the OpenPSD CESP project to mobilize data from private sector. We will be available to help in the second phase of BID programme if this takes place.
- **Sweden**: As stated in 2019-2020: GBIF-Sweden will continue to contribute by offering opportunities for ist staff members to participate in coordinated activities aimed at expand the scale and scope of GBIF.
- **United States of America**: USGS included in the Enhancing capacity for biodiversity data mobilization and use in support of sustainable development in West Africa, with the assigned Project ID CESP2020-005.
- **Zimbabwe**: We had a small budget mainly from GBIF's CESP grant and institutional budget.

2021 Participant plans

- **Argentina**: Participation in 2 CESP programs (as a participant).
- **Belgium**: Help by mentoring BID, BIFA, CESP projects.
- **Benin**: More frequent calls for project.
- **Brazil**: Implement the proposal under the Capacity Enhancement Support Program (CESP) with the countries of Latin America for strengthening regional nodes
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its partnerships, discussions,

and collaborations among the major global aggregators via the CDIWG. iDigBio will continue its participation and involvement in RDA.

- **Korea, Republic of**:More than 1 Mil ecological data from National Institute of Ecology will be shared with GBIF within 2021.
- **NatureServe**: We will leverage projects (e.g., Tropical Andes Biodiversity Observatory) to increase the relevance of GBIF data in the region.
- **Nigeria**: The Nigerian node seeks to improve skills and development of capacity through CESP activities in a bid to advance the work of GBIF locally and internationally
- **Poland**: The National Node will maintain active involvement in CESP and BID projects where possible.
- **South Africa**: Continue discussions with DSI on funding options to support the Africa Coordinating Mechanism Business Case. Continued data mobilisation funding through FBIP large and small grants of ± € 645 000 will continue in 2021.
- **Spain**: Aiming to contribute to the CESP and BID programs.
- **Sweden**: As above, and in addition GBIF-Sweden will take active part in BID 2020 and CESP 2020 reviews.
- **United States of America**: As part of the North America Regional steering group, help plan and draft CESP and BID projects as appropriate.
- **Zimbabwe**: Lobby government to fund the node's activities and apply for data mobilisation grants such as BID.

Priority 2: Enhance Biodiversity Information Infrastructure

Provide leadership, expertise and tools to support the integration of all biodiversity information as an interconnected digital knowledgebase.

Activity 2a: Modernize data standards

Rationale

The GBIF network participants are able to reliably exchange data thanks to their adherence to a set of standards. As GBIF looks to grow in capability, enable exchange of richer content and improve the quality of data, the standards must be revised and evolve accordingly.

Current standards adopted by GBIF are not yet adequate to accommodate the needs expressed by many potential and existing data publishers. Weaknesses in the model have led to ambiguous or over-complex data representations and unclear documentation, leading to difficulties in data integration and use. The main issues relate to uncertainties around the use of Darwin Core record types, the basisOfRecord element, and the use of Core and Extension vocabularies. Reviewing and updating the core domain model, tightening up the vocabularies and documentation and adopting

more robust exchange standards will result in an easier to use, and a wider reaching GBIF data exchange network.

2020 Progress

A data clustering algorithm has been deployed [https://www.gbif.org/news/4U1dz8LygQvqIywiRIRpAU/new-data-clustering-feature-aims-to-improve-data-quality-and-reveal-cross-dataset-connections] to automatically link records including specimens, taxonomic treatment citations and sequence-based records in GBIF.org. This algorithm will be improved iteratively.

As part of research and development towards hosted portals, work is underway to explore a more explicit data model for the entities shared through GBIF, based on a GraphQL approach. This investigation will likely guide work on future data models for the wider GBIF network.

GBIF has deployed new data processing pipelines for all occurrence record handling, and new search infrastructure using Elasticsearch [https://www.elastic.co/elasticsearch/]. GBIF and the Atlas of Living Australia (ALA) [https://www.ala.org.au/] are working on enhancing the pipelines to accommodate the needs of the ALA platform in a shared codebase. The proof of concept was completed in Q2 2020 and it is expected to be deployed before the end of 2020.

The Secretariat continued to maintain the Integrated Publishing Toolkit (IPT) [https://www.gbif.org/ipt] throughout 2020, for example with security releases and addressing minor bugs. Plans to re-design the software will begin with an open consultation to review the product starting at the TDWG Conference 2020; an ideas paper [https://doi.org/10.35035/cdps-md62] is in draft for this workshop.

The informatics team has begun scoping work on comprehensive technical documentation for GBIF.org. The intention is to collate information on architecture, data processing, definitions of formats, tutorials, guides and the API into an integrated technical documentation site before the end of 2020.

In addition to participating in the Community Engagement Steering Group of DataCite [https://datacite.org/], GBIF's Head of Informatics joined DataCite's Services and Technology Steering Group to ensure that GBIF remains up to date with developments, and to enable GBIF to influence aspects of data citation and reuse.

Work is under way to provide better filtering capabilities for records providing evidence of absence. The priority within 2020 is to make it easy to remove records declaring absence, and to tighten standards around how to document absence data using the Darwin Core (DwC) [https://www.tdwg.org/standards/dwc/] standard.

2021 Work items

- Participate in the ongoing Open Digital Specimen and Extended Specimen Network standards development and strive towards a common solution
- Run an open consultation to review the state and direction of specimen-related identifiers across GBIF and document the expectations of, and opportunities offered by the GBIF infrastructure
- Support the work of the Atlas of Living Australia (ALA), and the Living Atlas community, in adoption of the GBIF registry; this will likely require mapping between dataset metadata and

alignment of APIs

- Explore existing and potential standards to better accommodate exchange of ecological data; promote collaborations between nodes who have identified a need for this (see also activity 3b)
- Enhance the occurrence records clustering algorithm to improve record linkages, including better understanding of collecting expeditions and collector names
- Explore standards and interfaces to allow brokering of data clustering annotations to data publishers; broaden the capabilities to include external annotations
- Review the GBIF Metadata Profile to explore the feasibility and benefits of migrating to the latest version of Ecological Metadata Language (EML)
- Review the Darwin Core Archive (DwC-A) [https://github.com/gbif/ipt/wiki/DwCAHowToGuide] exchange model; explore potential for DwC-A datasets to comply simultaneously with Frictionless Data [https://frictionlessdata.io/] and EML data packages, to facilitate ecological dataset exchange and reuse
- Revise the GBIF Data Validator [https://www.gbif.org/tools/data-validator] to be consistent with data ingestion, and to follow best practices
- Revise the GBIF quarterly data analytics, to follow recent changes in data processing, such as handling counts of absence-based records
- Pilot phylogenetic browsing of occurrence data
- Implement changes to the IPT as identified by the 2020 consultation

2020 Participant contributions

- **Argentina**: Promote development of a shared domain model for sharing and linking all components of biodiversity information (slower development than expected)
- **Australia**: Comment from last year's submission –" Align with international projects in establishing and using standardised tests and reporting." 2020 progress - Continued support for TDWG standards and use in all data publishing activities. Involvement in the development of standards for citizen science data and metadata and machine observations through the TDWG Interest and Task groups.
- **Belgium**: Help documenting a unified information model that covers the scope of GBIF content.
- **Biodiversity Heritage Library (BHL)**: Have plans for implementing IIIF in alpha production. Review options for implementing IIIF; implemented beta version of IIIF viewer.
- **Brazil**: The SiBBr team worked on the documentation referring to the standards and tools used on the national platform, produced tutorial videos and made it available on the website to assist standardization in DarwinCore and use of IPT by collection curators and researchers.
- **Cameroon**: Adoption of a format for the exploitation of biodiversity data on the biodiversity information system.
- **Colombia**: i) Participation in the "Species Information Interest Group" with the Plinian Core in TDWG. ii) Participation in public consultations of the "Darwin Core Maintenance Group".
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to develop partnerships and collaborations among the major global aggregators via the CDIWG. iDigBio promotes data standardization in its education and workforce development activities as well as in its data

mobilization process. iDigBio has continued to support TDWG, including representation in key areas such as the Natural Collections Description (NCD) group.

- **NatureServe**:During 2019 and 2020, NatureServe has been working on modernizing the data standard for biodiversity observations. This work has been focused on aligning the data standard that NatureServe network members use to mobilize information with the data standard used by GBIF.
- **Netherlands**: NLBIF is part of the TDWG CD (Collection Description) group that is the devloping a new standard to describe collections. The output of this work is likely to feed into GRSciColl.
- **Norway**: Representatives for GBIF Norway contributed to modernize and expand the support in GBIF for new data types for genome and eDNA data linked to “material samples”; and data types for ecological data sets based on the “sampling event” model (see also 3b).
- **Poland**: At the moment we use a basic IPT version, without additional cores or extensions.
- **Spain**: We routinely check and assess data quality of records published via GBIF-Spain using the "Darwing Test" tool (https://www.gbif.es/en/software/darwin-test/) and provide feedback. We organize on line training on data publishing and data quality. We are leading and finalzining formal submission of the Plinina Core Data specification to TDWG as a standadr for registering and exchanging Species-level information (https://github.com/tdwg/PlinianCore)
- **Sweden**: Text 2019-2020: GBIF-Sweden will further work on taxonomic and other data standards for various kinds of "new" data types (molecular data, tracking data, sensor data).Comment August 220: As stated - but see below.
- **United Kingdom of Great Britain and Northern Ireland**: The NBN is Improving data standards through convening a TDWG Task Group, the aim of which is to develop new terms and vocabularies for Darwin Core to express the vitality of the organism at the time of the observation or collection and any cause of death (https://www.tdwg.org/community/osr/how-did-it-die/). Sophie Ratcliffe will lead a workshop at the TDWG conference in September 2020 to work on the Task Group.
- **United States of America**: USGS continued to promote the use of Event Core in multiple forums to increase adoption and gain feedback.

2021 Participant plans

- **Argentina**: Complete the pending 2020 objective and be able to obtain more information and training on Frictionless Data.
- **Australia**: ALA intends to commence work on the inclusion of more complex occurrence data including event-core (e.g. ecological survey plot data).
- **Belgium**: Further integration of Frictionless Data, EML and DarwinCore, see 2019 tool [Frictionless Darwin Core](https://github.com/frictionlessdata/FrictionlessDarwinCore)
- **Biodiversity Heritage Library (BHL)**: Move towards a beta production for IIIF. Plan for a more robust beta version and review launch implications.
- **Brazil**: As many researchers have searched for ecological data repositories, SiBBr will invest in tools and standards for publishing these types of data. Review Darwin Core Archive (DwC-A) exchange model; explore potential for DwC-A datasets to comply with Frictionless Data and EML data packages simultaneously, to facilitate ecological dataset exchange and reuse Participate in

discussions and guide the community around aspects of persistent record identifiers and citation tracking. Revise the GBIF quarterly data analytics, to follow recent changes in data processing, such as handling counts of absence-based records. Explore options for displaying occurrence data from long-term sampling sites, piloting with projects like BIOSCAN and/or Norwegian ecological datasets (carried over from 2020). Continue to explore approaches for adding a phylogenetic/evolutionary dimension to the GBIF taxonomic backbone. Pilot phylogenetic browsing capabilities of occurrence data.

- **Cameroon**: Implementation of the format for using biodiversity data on the biodiversity information system.
- **Colombia**: i) Maintain the participation in discussions about data standards. ii) Continue technical discussions with other instances to consolidate profiles for share data.
- **Distributed System of Scientific Collections (DiSSCo)**: DiSSCo seeks to join forces with GBIF and other infrastructures to work on interoperability standards for natural scientific collections.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its partnerships, discussions, and collaborations among the major global aggregators via the CDIWG. iDigBio will continue to promote data standards and vocabularies throughout its various activities.
- **NatureServe**: During 2021 we will continue to work internally and externally on the socialization of this new standard for biodiversity observation data and the levels of harmonization with Darwin Core.
- **Netherlands**: Continued participation in TDWG CD.
- **Nigeria**: The Nigerian Node plans to integrate new tools provided by GBIF in the publication of biodiversity data.
- **Poland**: Due to planned increrase of volume, complexity, types, taxonomic scope of data published by GBIF Poland we will thoroughly consider applicability of new tools and standards available in GBIF community.
- **Spain**: We plan to integrate Plinian Core compliant data in our ALA-based national data portal; linking species level information based on Plinian Core with occurrence-level data based on Darwin Core
- **Sweden**: Data standards, data source development, and the development of connected tools are central to SBDI and GBIF-Sweden, Therefore to the benefit of SBDI and other BI research infrastructures, in 2021 GBIF-Sweden will among other tasks be engaged in the following activities: We will continue to contribute to the progression of standardization work in TDWG in key areas.Full ALA adaptation and possible development into a global site through international collaboration will be investigated. We will maintain our code-base on GitHub. Track, coordination and prioritization issues will be managed through GitHub project management systems. Authentication based on OAuth2 will be added to the former Swedish LifeWatch (SLW) infrastructure, thus making this mandatory for all export from SLW datasets. Code for integration of molecular data into the ALA platform will be added: version 1 for metabarcoding data. Links will be added to sequence data when reference libraries have been constructed; also to be continuously update d on web-site. Tracking and sensor data: The final merger of CAnMove and Zoatrack systems will be executed, extending ZoaTrack with CAnMove models. Cleaning/validation tools will be built for new datasets containing tracking data. WRAM1 (Wireless Remote Animal Monitoring) infrastructure with existing soft- and hardware (adding minor updates to ensure data security) will be maintained awaiting having WRAM2 in full

production after initial data loading and performance testing under production conditions. New standards development also cover investigating how the complex dating of data of fossils can be integrated into the SBDI data layers by means of e.g. aggregation, and by mapping/ingesting special environmental and cultural traits for interpretaion of fossil species. A new REST based harvest service to ingest SEAD (Strategic Environmental Archaeology Database) data into the SBDI data layers will be presented, and all other related harvest services rebuilt as REST services using the SEAD Harvest Service as a template and adapted to work with the SBDI data layers. Data products production process will be establshed for phylogeny trees based on SUPERSMART pipeline, and products available through the SBDI Support Centre_ A system for pre-computed data products will be established, an image database for flow cytimetry set up in collaboration with Ecotaxa and a Nordic Microalgae extension added covering also related trait information such as information included in the HELCOM PEG (biovolume, cell size, toxicity). We weill operate marine data flow from University of Gothenburg (GU) to Swedish Meteorological and Hydrologivcal Institute (SMHI) and start adaptation of ´Nordic Microalgae´ functionality to ALA systems (incl. update of species lists). Further development of databases and systems for data distribution at the Swedish National Oceanographic Data Centre (SHARK) will increase the number of data types (images, videos, soundfiles, molecular data). A marine ALA portal covering SMHI, SLU Aqua, GU, NRM will be considered. An Investigation of mobilization of fish data in the FD2-database together with SLU Aqua and other SBDI-partners is at hand. The BioVel platform will be up-graded with SEEK-FAIRDOM and Common Workflow Language and migration from Amazon to SNIC finalized plus a pilot project for computer vision and georeferencing initiated. ´Plankton Toolbox´ developmentcontinues by a new version with major upgrade including statistical tools and additional algorithms (R and/or Python). Additionally new web services will be developed for mobilizing terrestrial vegetation/raster - and plot data.

- **United States of America**: USGS will explore data formats like Frictionless Data Packages and NetCDF. USGS will also work to include eDNA data.

Activity 2b: Deliver names infrastructure

Rationale

The most significant challenge to improving the quality of aggregated occurrence data is the continuing need for a comprehensive checklist of known species, and even for a comprehensive list of published scientific names. Interpreting and mapping names depends on the quality and completeness of these resources. Even in cases where names in occurrence records are incorrect or misspelled, better names infrastructure can assist by increasing confidence that fuzzy match algorithms or human intervention is required.

Delivering these resources is the focus of a number of GBIF Participants and other stakeholders, including the Catalogue of Life partnership, WoRMS, nomenclators (IPNI, Index Fungorum, ZooBank) and many national, regional or taxonomic databases. A comprehensive resource for scientific names and taxon concepts organized at least as a workable reference classification (but with support for additional classifications as appropriate) would also benefit other infrastructures, including Encyclopedia of Life, Biodiversity Heritage Library, Barcode of Life and GBIF nodes, and improve interoperability between data from these infrastructures. It would also be beneficial to accommodate vernacular names, informal names for undescribed species and other identifiers such as Barcode Index Numbers.

2020 Progress

Three virtual meetings held with the European Environment Agency (EEA) [https://www.eea.europa.eu/] team developing a new taxonomic backbone for the European Nature Information System (EUNIS) [https://eunis.eea.europa.eu/]. EEA are exploring using the Catalogue of Life Plus (CoL+) [https://github.com/CatalogueOfLife/general/blob/master/docs/CoL+slide-doc.pdf] APIs to match their data. As part of the Synthesys+ [https://cordis.europa.eu/project/id/823827] work, a joint report on opportunities for EEA to use CoL+ will be drafted in Q4 2020. EEA legislative lists have been published successfully to the CoL+ clearinghouse.

The GBIF contributions to the CoL+ project aim to replace the GBIF Backbone Taxonomy [https://www.gbif.org/dataset/d7dddbf4-2cf0-4f39-9b2a-bb099caae36c] with the extended CoL+. The technical developments of the web-based administration console now enable:

- Managing of checklists in the CoL+ clearinghouse by an individual, or a group of collaborators
- Assembling a backbone using managed checklists, or sectors from within them
- Community contributions from patch uploads and decisions around taxonomic sectors (subtrees)

Development work is still required around the management of user communities. Once complete, the CoL+ project and GBIF data management groups can develop the necessary processes around tasks.

2021 Work items

- Complete outstanding tasks to integrate the extended Catalogue of Life in GBIF
- Focus activities on:
    - assessing and reporting on gaps for organizing GBIF occurrence records
    - broadening the community of contributors
- Prioritize improvements to the Prokaryote taxonomy sector in collaboration with the Genome Taxonomy Database and/or the Silva group
- Maintain and update processes for constructing the GBIF taxonomic backbone, including monitoring the content and helping to prioritize editorial effort (continued from 2020). €108,000 has been allocated in the budget to support GBIF costs. This work is in collaboration with the Catalogue of Life.
- Implement a process enabling key checklists to be used in filtering occurrence data, such as Red Listed species and invasive alien species (carried over from 2020).
- Explore feasibility of supporting national taxonomies for exploring GBIF occurrence data to better enable national level reporting (carried over from 2020)

2020 Participant contributions

- **Argentina**: Keep working to publish more checklist at the nodes related on the CESP2018-011 and any other with interest (slower development than expected).
- **Australia**: Improving the currency of taxonomic information in the Atlas and its application is an ongoing activity for the Atlas. In addition, we continue to work with ommunities through the

Indigenous Ecological Knowledge project (IEK) to build vocabularies for plants and animal names in indigenous languages within Australia.

- **Benin**: Still at work.
- **Biodiversity Heritage Library (BHL)**: Continue to participate in GlobalNames Workshop and Catalogue of Life Plus meetings. Implementation of new Global Names services in BHL; implemented new names finding in Beta w/links go GBIF backbone.
- **Brazil**: Two national reference lists, of the fauna and flora of Brazil, were incorporated as a taxonomic backbone of the national platform. A DarwinCore standard database was created, with more than 165 thousand valid species names, in addition to vernacular and synonym names. In addition, lists of endangered species at the global (IUCN), national and state levels have been added and related to the taxonomic backbone.
- **Colombia**: Update of different national species checklists, supported by specialist groups and biological collections: Birds [https://doi.org/10.15472/qhsz0p], Mammals [https://doi.org/10.15472/kl1whsl], Freshwater Fishes [https://doi.org/10.15472/numrso], Publication of the National Catalog of Plants and Lichens of Colombia [https://doi.org/10.15472/7avdhn]
- **Denmark**: Development of the Danish national species portal www.Arter.dk includes incorporating the previous Danish national checklist “Allearter”, reformatting this to adhere to the normalised structure, as recommended when publishing in GBIF. This checklist, now called “Taxonbasen”, will be published in GBIF in 2020. Taxonbasen will contribute to GBIF with: Danish vernacular names for both species and higher taxonomic levels; An updated national taxonomy maintained by Danish taxonomic experts; National Red List status for species occurring in Denmark.
- **France**: Update of TAXREF, the French national checklist.
- **Integrated Digitized Biocollections (iDigBio)**: Nothing to report. iDigBio relies on services such as GBIF and CoL+ for names reference.
- **Japan**: Training data for Endangered Species improved.
- **Korea, Republic of**: We do updating and correcting the incorrect or misspelled names in occurrence records.
- **Netherlands**: NLBIF co-funds the CoL+ project.
- **Nigeria**: We conveniently utilized the names infrastructure tool embedded in open-refine, in filtering our data.
- **South Africa**: As an institution SANBI makes significant efforts to support the consolidation of plant and animal names through institutional databases, which are consolidated into the National Biodiversity Information System. These checklists are also published to GBIF where possible.
- **Spain**: Through our linkages with the National Research Council (CSIC) and Ministry for the Ecological Transition we and collaborating in the developing of (official) national species and how to a) publish them in GBIF as check-list, b) visualize them in our national portal and c) linking occurernce records to them (providing views, filters, etc.)
- **Sweden**: Text 2019-2020: More taxonomic names and concepts (esp. related to fungi and procaryotes) will be included in the set of services offered by GBIF-Sweden. Comment August 2020: As stated.

- **Switzerland**: Publication of national species checklists for red list groups and important invertebrate groups.

2021 Participant plans

- **Argentina**: Complete the pending 2020 objective.
- **Australia**: Continue the work of the IEK project and inclusion of these vocabularies in Atlas tools [https://www.ala.org.au/indigenous-ecological-knowledge/].
- **Biodiversity Heritage Library (BHL)**: Move to production: new names finding in Beta w/links go GBIF backbone, Implemented revised Global Names finder and links outs to sources in live site.
- **Brazil**: A reference list for microorganisms is expected to be built, in addition to updating the current lists of flora and fauna species. Lists of invasive alien species also will be added.
- **Colombia**: Continued work on improving access to the Colombian Checklist to feed GBIF taxonomic backbone.
- **Japan**: Improvement of training data for Endangered Species.
- **Korea, Republic of**: We will constantly update and correct the incorrect or misspelled names in occurrence records.
- **NatureServe**: We plan to work with Arizona State University on improving our capacity to resolve taxonomic issues within our species database.
- **Netherlands**: Explore opportunities for continued support to CoL+ phase 2.
- **Nigeria**: In 2021, we plan to employ the best names infrastructure approved by GBIF in the improvement of our checklist and occurrence datasets. We would also ensure the availability of vernacular names as much as possible even for undescribed species.
- **Poland**: We plan to established a country-wide service for taxonomic names of Eukaryota as a reference for local users. It will be created using existing external databases but our aim is at crerating an active community of local taxonomists around a system that would maintain and control checklists and create an infrastructure for taxonomy and related services.
- **South Africa**: Efforts to mobilise taxonomic data and support the names infrastructure will continue.
- **Spain**: We will continue working on the activities already ongoing in 2020 in this area.
- **Sweden**: SBDI expect to further develop the taxonomy database Dyntaxa software and web service, including securing synchronization and interoperability with other international taxon databases, providing high quality taxonomic master data. Additionally analyzing remaining conflicts between the most recent version of Dyntaxa and the GBIF backbone taxonomy is highly prioritized in 2021.Names infrastructures for microfungi and procaryotes are being developed in international collaboration (Australia, Norway, Sweden, GBIF).
- **United Kingdom of Great Britain and Northern Ireland**: RBG Kew will continue to work with GBIF/COL+ partnership in providing nomenclatural and taxonomic data for use in the COL+ infrastructure.

Activity 2c: Catalogue collections

Rationale

Natural history collections are the largest source of data on biodiversity outside nature itself. Collectively the worlds natural history collections number about 3 billion specimens and document over 300 years of active human exploration of biodiversity on earth. In addition the fossil remains provide us with glimpses into the very far past before humans existed. The collections and their ancillary materials (images, collectors' notes, sequences, measurements, etc.), contain colossal amounts of data that should be digitized and shared. Only about 10% of the world's collections have been digitized and only a portion of digitized collections are shared publicly through the internet. A large number of current GBIF publishers comprise natural history museums and herbaria. The Secretariat will work with Participants to deliver the most comprehensive catalogue possible of collections, including metadata to publicize undigitized collections as a first step towards their digitization and mobilization.

2020 Progress

Weekly synchronization of the GBIF Registry of Scientific Collections (GRSciColl) [https://www.gbif.org/grscicoll] from Index Herbariorum [http://sweetgum.nybg.org/science/ih/] is operational. The iDigBio [https://www.idigbio.org/] collection catalogue data has been imported into a test environment and data issues are being resolved. Once complete, iDigBio will edit directly in the collections catalogue through the shared online interface. Explorations to synchronize with the NCBI Biocollections [https://www.ncbi.nlm.nih.gov/biocollections] are starting in Q3 2020. Integrating data from catalogues has proved more time-consuming than anticipated.

A service is being specified to enable linking of collections to specimen records in GBIF, and expected to be deployed in Q3/4 2020.

User interface components to deploy a richer collections catalogue are being considered within the hosted portal developments. The current development focus relates to improving the necessary APIs (using GraphQL) and developing a suite of ReactJS-based widgets. Assembling these into the refined collection catalogue is anticipated to start later in 2020 and expected to continue into 2021.

Induction webinars have been held with several GBIF nodes staff and a small group of editors now actively curating content in the registry.

2021 Work items

- Complete outstanding tasks to deploy an enriched catalogue providing search and access of collections, specimens and people
- Continue data management activities for the collections catalogue, integrating data from differing sources; in particular:
    - align similar records from differing sources wherever possible
    - add additional identifiers, such as DOIs, GRID or ROR IDs as appropriate
    - consider expanding the data model to accommodate more flexibility where differing records need to be maintained for the same entity (e.g. "sameAs" relationships)

    - document clear guidelines for data managers to avoid unnecessary record duplication, with a focus on decisions affecting citation and linking data
- Establish a global editorial team formed by key stakeholders and authorities (including Index Herbariorum, iDigBio, ALA, NCBI Biocollections, DiSSCo, CETAF and GGBN) to agree on future data curation workflows, responsibilities, mandate and issue resolution mechanisms, and to guide development requirements
- Explore synchronization of content with the Consortium of European Taxonomic Facilities (CETAF) [https://cetaf.org/] Registry (under development)
- Pilot a profile of the TDWG Collection Descriptions to capture collection-level metadata; include taxa, geography, time and quantity dimensions as a minimum

2020 Participant contributions

- **Argentina**: Keep working with our catalog and collaborate with the GRBio / GRSciColl initiative presented at GBIF
- **Brazil**: Tutorial for publishing collection data has been made available on the platform SiBBr, in addition to campaigns with the various collections has been carried out
- **Cameroon**: Launch of a reflection on the creation of a sub-regional natural history museum with the collaboration of external partners.
- **Colombia**: Support the National Registry of Biological Collections RNC [http://rnc.humboldt.org.co/wp/]. Participate in the community consultation to GRSciColl iniciative.
- **Distributed System of Scientific Collections (DiSSCo)**: Participated in the consultation on a global collections catalogue, contributed with a DiSSCo vision.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to support TDWG, including representation in key areas such as the Natural Collections Description (NCD) group. iDigBio has been working with GBIF on the global collections registry with the goal of having a unified source for information about biodiversity collections. iDigBio's national list of collections has been test imported into the GBIF infrastructure.
- **Japan**: Evaluation of questionnaire to know/analyses the status done.
- **Korea, Republic of**: KBIF have started to support one institution for cataloguing their natural history collections from May 2020. It will be finished in December and the data will be shared with GBIF.
- **Netherlands**: NLBIF as DiSSCo-NL NN has inventoried the collection holdings of DiSSCo-NL partners and mobilized these data in the Dutch NHC dashboard [https://app.powerbi.com/view?r=eyJrIjoiNDQ1YmQzMzMtNmY5YS00MDQzLWI5M2YtNmRhOTM2MTg2NTU0IiwidCI6IjhjZDI0OTg0LTBhYTMtNGZjNS1iMDliLTRkNmVjZmFhNThmYiIsImMiOjl9] which is featured on the DiSSCo webpage [https://www.dissco.eu/nl/].
- **Poland**: The first step was done – thanks to the above mentioned IMBIO project a significant number of institutions began catalogue their assets in order to prepare themselves and identify relevant resources.
- **South Africa**: The Natural Science Collections Facility, Funded by the Department of Science and Technology plays a key role in the development of catalogues for collections

- **Spain**: The Spanish Registry of Biodiversity Collections and Biodiversity Databases [https://www.gbif.es/registro-colecciones/]is an strategic pìlar of our infrastructure and we work routinely to keep it updated and useful.
- **Sweden**:Text 2019-2020: Expanding the DINA web-based collection management system developed by a consortium of Swedish and international partners intendesd cover not only biological objects (including sequence data) but also paleontology and geology, will continue in 2020. Comment August 2020: DINA technically cancelled by December 2019, the data products achieved will live on and serve as described.
- **Switzerland**: Update and completion of GRSciColl Swiss institutional records. >800 collection entities are for now registered within the Swiss GBIF collection databank.
- **United States of America**: ADBC, iDigBio continue to work in advancing and facilitating sharing of catalogue collections.

2021 Participant plans

- **Argentina**: Keep working with our catalog and collaborate with the GRBio / GRSciColl initiative presented at GBIF.
- **Australia**: We plan to adopt the GBIF registry and hence further align with GBIF on metadata standards and tools for the maintenance of collection level metadata.
- **Brazil**: Add additional identifiers, such as DOIs and Continue data management activities integrating data from differing sources
- **Cameroon**: Continuation of the reflection on the creation of a sub-regional museum of natural history with the collaboration of external partners.
- **Colombia**: Support with review and metadata about Colombian Biological Collections to GRSciColl.
- **Distributed System of Scientific Collections (DiSSCo)**: Establish a proto-version of the future DiSSCo collections index jointly with CETAF and investigating to use GrSciColl for global collection identifiers. For the index a minimum information for collections specification (MICS) needs to be developed in conjunction with work on the TDWG CD standard and based on the work already done in ICEDIG and SYNTHESYS+. Investigate solutions to clean up GrSciColl records referring to DiSSCo collections.
- **iDigBio**: iDigBio will continue to support TDWG and the Natural Collections Description (NCD) group. iDigBio will continue to work with GBIF on the global collections registry.
- **Korea, Republic of**: KBIF will support other institution to catalogue their natural history collections, and share the data with GBIF.
- **Netherlands**: NLBIF will continue to support Dutch data publishers to catalogue their collections.
- **Nigeria**: We will continue to collate and publish biodiversity data from different sources and also avoid data duplication by providing clear GBIF's guidelines for data providers and managers, with a focus on decisions affecting citation and linking data.
- **Poland**: We hope that within next 2-3 years a general inventory of specimens will be estimated at least in the members of the project consortium.
- **South Africa**: The Natural Science Collections Facility, funded by the Department of Science and

Technology plays a key role in the development of catalogues for collections, and this will continue

- **Spain**: We plan to work in ways to synchronize our Registry and the GBIF Registry of Scientific Collections (GRSciColl) to make available the most complete, coherent and updated information through these two outlets.
- **Sweden**: Continued expansion of the DINA web products for use in SBDI and GBIF-Sweden. However, DINA in itself is not specifically an SBDI or GBIF-Sweden activity.
- **United States of America**: ADBC, iDigBio will continue to work in advancing and facilitating sharing of catalogue collections. iDigBio included in the effort to include persistent identifiers for specimens.

Priority 3: Fill Data Gaps

Prioritize and promote mobilization of new data resources which combine with existing resources to maximize the coverage, completeness and resolution of GBIF data, particularly with respect to taxonomy, geography and time.

Activity 3a: Identify priority gaps

Rationale

GBIF has a range of tools, including fitness-for-use groups, other community consultations, feedback channels, direct communication with authors of scientific studies, and societal demands, to identify and collect data needs. Addressing data gaps may require focus on gaining additional occurrence records, targeting data areas missing from published records, or getting additional metadata elements. By consolidating and prioritizing demands for data content, in the context of already accessible data and knowledge of resources which are not yet available as open data, GBIF will be positioned to inform collection and data holders, funding institutions and political decision makers of the most worthwhile and cost-effective ways to extend the available knowledge base.

2020 Progress

The Secretariat worked with the Knowledge and Data Task Force of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) [https://ipbes.net/knowledge-data] to design guidance and templates for assessment authors, capturing knowledge gaps including those caused by shortage of available biodiversity data. These gaps will be used to engage research funders and programmers, as well as data-holding organizations, to catalyse investment in priority research and data mobilization.

The data analyst working in the data products team at the Secretariat explored the species richness of available data and the taxon composition of occurrence data in a global comparison, with particular focus on the GBIF participant regions. The results were reported to the 2020 regional meetings and are documented in the GBIF data blog [https://data-blog.gbif.org/post/gbif-regional-statistics-2020/].

2021 work items

- Develop guidance on use of tools and approaches for targeted data mobilization to address priority data gaps

2020 Participant contributions

- **Argentina**: Continue with the publication of the national inventory of biodiversity and national lists of species. On the other hand, it is expected to feed the national portal with these national listings. (progress slower than expected).
- **Benin**: Many data gaps are being identified and will be filled in the framework of the master program in biodiversity informatics.
- **Brazil**: This theme was not prioritized in 2020.
- **Cameroon**:Identification of skills likely to help the national node in completing missing data on the GBIF network.
- **Colombia**: Mobilized data from Chocó hotspot, Caribbean and Pacific (marine data) and Protected Areas. Annual publication of biodiversity data in BIODIVERSITY 2019 about status and trends of colombian continental biodiversity [http://reporte.humboldt.org.co/biodiversidad/2019/]. Annual publication of biodiversity data in the Report on the State of the Environment and Renewable Natural Resources [http://documentacion.ideam.gov.co/openbiblio/bvirtual/023890/EstadoMedioAmbiente.pdf].
- **Denmark**: Development of the Danish national species portal [https://www.arter.dk/landing-page] not only will share species recordings in GBIF made by users of the portal, thereby contributing to current data coverage for Denmark through citizen science. Furthermore, data from the Danish government nature monitoring portal Danmarks Miljøportals Naturdatabase [https://naturdata.miljoeportal.dk/], will be published in GBIF. Potentially 12.5 mill. records, with species representing most higher taxon-groups, recorded from the terrestrial, marine and limnic environments in Denmark - Hence providing better data coverage for Denmnark with regard to biodiversity assessments made through GBIF.
- **France**: GBIF France is liaising with the French devlopment agency (AFD) who wish to feed the data collected along the projects they are funding into GBIF. AFD assesses they produced 30000 occurences records per year essentially in geographical and taxonomical areas that are not well covered in GBIF.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Advancing Biodiversity Informatics Capacities in the HKH- Regional Workshop (define data gap map for Asia) - **Need to explore possibilities of collaboration with GBIF, relevant institutions in HKH regional member countries, and Asian Node : We wanted to build this through CESP joint proposal among the four institutions CIB, KIB, IB in China and ICIMOD, but the proposal did not materialize. Also, given the current pandemic situation, regional workshop of such dimension and objective was difficult this year.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to expand its knowledge of what is contained within collections, which may help determine underrepresented taxa etc. iDigBio is working to determine what data exists in iDigBio but not GBIF in an effort to ensure all data is mobilized to GBIF.

- **Japan**: Gap analyses carried out for fungal collection in TNS as a model collections.
- **Korea, Republic of**: Data gap discovery has been carried out for the data from National Science Museum, a record of approx. 1.50 Mil.
- **LifeWatch ERIC**: LifeWatch ERIC has delivered a prototype on its LifeBlock platform, which can provide GBIF's platform with desirable attributes, such as security, immunity and accountability on data use.
- **NatureServe**: One of the key elements of NatureServe's strategy in Latin America and the Caribbean is the mobilization of information on biodiversity observations made during Environmental Impact Assessments. Since 2019, we have been working with our colleagues at the Inter-American Development Bank to develop proposals and concept papers that can support the mobilization of this type of biodiversity data.
- **Netherlands**: NLBIF is funding the ongoing project to mobilise biodiversity data from Ukraine [https://www.nlbif.nl/mobilization-of-biodiversity-data-from-ukraine-to-gbif/].
- **Nigeria**: The Node utilized available GBIF tools in its communication with other institutions.
- **Poland**: Poland has been suffering from a lack of substantial investments over last years that created a general "data gap" – low percentage of available data resources present in the digital form. The volume of 1,6 mln of occurrence records was achieved as long ago as in 2008 and never changed since then. Our priority thus is to mobilise as much data as possible and engage institutions and organisations in data publishing.
- **South Africa**: SANBI-GBIF has been elected to and works with the Knowledge and Data Task Force of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to design guidance and templates for assessment authors, capturing knowledge gaps including those caused by shortage of available biodiversity data. These gaps will be used to engage research funders and programmers, as well as data-holding organizations, to catalyse investment in priority research and data mobilization. Initiatives such as the Foundational Biodiversity Information Programme (FBIP) aims to support funding of data generation in line with identified priorities nationally
- **Spain**: We are mobilizing data from private sector in collaboration with Nodes from Norway, Portugal and Colombia through the CESP OpenPSD project, so far very successfully We are going in fluent communication with the Ministry for the Ecological Transition and Regional Governments, and working together to find and implement ways in which GBIF becomes more useful to them, and on how to publish the data they generate in GBIF in the best conditions.
- **Sweden**: Text 2019-20230: Among the collaborating institutions of the SBDI work will continue to develop and adapt systems for accepting and presenting new data types. Comment August 2020: As stated.
- **United States of America**: Work with the Global Ocean Observing System and GEO BON to identify priority datasets related to Essential Ocean and Essential Biodiversity Variables such as phytoplankton data and seagrass data.

2020 Participant plans

- **Argentina**: Continue with the publication of the national inventory of biodiversity and national lists of species. On the other hand, it is expected to feed the national portal with these national listings.

- **Australia**: Identifying priority gaps will become an area of active project activity for the ALA in 2020-21 under our strategic action 1.4 (Establish data priorities to ensure Australia has a nationally comprehensive, representative and adequate biodiversity data infrastructure). The work will commence with an initial review of possible approaches to assess national data priorities and we welcome the opportunity to collaborate with GBIF around this.
- **Benin**: Data gaps are identified every year and filled by students in the framework of their research works in the master program of biodiversity informatics
- **Brazil**: Develop guidance on use of tools and approaches for targeted data mobilization. to address priority data gaps.
- **Cameroon**: Organization of a consultation meeting with the identified skills.
- **Colombia**: Identify the species and regions with the greatest data gaps.
- **Distributed System of Scientific Collections (DiSSCo)**: Work on large scale digitisation plans will continue in DiSSCo-linked projects.
- **France**: AFD is setting up an initiative with GBIF call Data4nature. A first side event is programed in Marseille, France, in January 2021 during the next IUCN congress.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its work to expand knowledge of what is contained within collections. iDigBio will continue to work to ensure that all data ingested in iDigBio is also ingested in GBIF.
- **Japan**: Continuation of gap analyses to be carried out in some model collections.
- **Korea, Republic of**: Data gap discovery will be constantly carried out for the data from National Science Museum and some other KBIF data providers.
- **NatureServe**: The plan for 2021 is to get our concept paper published.
- **Netherlands**: NLBIF is willing to explore the opportunities to mobize data from Asia in general and Indonesia specifically. Naturalis has a long history in region through the Flora Malesiana project.
- **Nigeria**: The Node seeks to integrate new GBIF principles and guidelines in the use of tools and approaches for targeted data mobilization in an attempt to address priority data gaps.
- **Poland**: The goals of the IMBIO project include mobilisation of 2 million specimen records and 7,5 million occurrence records from other sources. In 2021 one third of that should be digitized and ready for publishing to GBIF.
- **South Africa**: Continued engagement of SANBI-GBIF on IPBES task force to support knowledge gaps. Also, the Node will continue efforts to mobilise data through stakeholder engagement. FBIP initiative to continue funding data generation and filling of knowledge and data gaps.
- **Spain**: Besides continuing the activities wih the private sector and enviromental administrations, we plan to recover and activate the participation of collections in the light of initiatives such as Synthesys+, DiSSCo and CETAF; and increase the involvement of the LTER Community in GBIF though our participation in the eLTER RI orojects (eLTER Plus and eLTER PPP).
- **Sweden**: The foremost, and eagerly requested information to include in the Bioatlas/GBIF-Sweden´s services relates to the geophysical, administrative and socio-economic layers available in the Spatial Portal. Hence preparation and addition of such tools for analysis is prioritized. From the user perspective the introduction of the Bioatlas based on the ALA stack and replacing the

older SLW Analysis Portal, rests upon the identification and installatiion of presently available and potentially added map layers to the Spatial Portal. The rapidly growing demand for structured data from monitoring programs (regular species occurrences and molecular/sequence/[meta]barcoding data) and tracking plus sensor data justifies prioritizing these as well.

- **United States of America**: USGS will continue to work with key stakeholders like the Global Ocean Observing System, GEO BON, and others to identify key datasets for mobilization.

Activity 3b: Expand data streams

Rationale

GBIF serves as an integration point for any source of evidence of the recorded occurrence of species in time and space. A primary role for the GBIF infrastructure is to serve as a comprehensive single point of access for discovery, access, use and curation of all such evidence. Several classes of data are already well-supported within the GBIF network.

These include collections data, observations from field research, and many categories of citizen science data. However, there are other new and developing streams of data which should be accommodated if GBIF is to serve as the platform for supporting comprehensive data assessment and modelling (e.g. for GEO BON Essential Biodiversity Variables, IPBES assessments, Red List assessments, etc.). These include efforts to mine historical data records from literature, genomics activities and particularly barcode-driven surveys, and potentially species-level data from remote-sensing systems. More work is also still needed to engage with the full spread of research activities delivering sampling event data of various kinds. GBIF needs to ensure that it provides simple, effective and beneficial ways for researchers to share these and other streams of Darwin Core compatible data.

2020 Progress

In collaboration with partners, the Secretariat developed a new guide on publishing sequence-derived data through biodiversity data platforms. With a growing volume of species occurrence data in GBIF.org derived from metadata associated with genetic sequences, the guide aims to establish best practices for exposing 'sequences with dates and coordinates' in the context of broader biodiversity data. Following an initial drafting phase with authors collaborating in a virtual workshop, the draft of the guide was released for community review, with a view to final publication later in 2020. The guide will inform workshop materials for joint training on barcoding and data mobilization skills (see Activity 1b). The Secretariat's Scientific Officer made a presentation on this guide to the GBIF Community Webinar [https://www.gbif.org/event/6Ad3mlTfVwkWo1bZNMO1d4/gbif-community-webinar-june-2020] in June 2020.

2021 Work items

- Scope and establish thematic data mobilization campaigns on zoonotic diseases, private sector data and sequenced-derived data, with calls supported by supplementary funding (see activities 1c, 3c, 5b)
- Continue linking and integration of sequence-derived data in GBIF.org. **Responds to**

recommendation 9 of the GBIF 20-year review

- Collaborate with long-term monitoring communities to generate more sampling-event datasets in GBIF.org, and to help fill current data gaps. This work will guide development of enhanced standards for ecological data (see activity 2a).

2020 Participant contributions

- **Argentina**: Continue with the promotion of the use of sampling event data model for ecological and monitoring datasets (progress slower than expected).
- **Biodiversity Heritage Library(BHL)**: Review options for transcribing from within BHL; implemented transcription ingest.
- **Brazil**: Review options for transcribing from within BHL. Added new version of transcription ingest.
- **Colombia**: Supported the citizen science community through iNaturalist platform. Linked a new citizen science initiative to invasive species in Colombia. Facilitated the publication of biodiversity data from the business sector. New datasets from vectors and hosts of human diseases and microorganism.
- **Distributed System of Scientific Collections (DiSSCo)**: Demonstrator provided [https://demo.nsidr.org] showing how expanded specimen data can be served using a Digital Object infrastructure and DarwinCore Archive pipeline.
- **Integrated Digitized Biocollections (iDigBio)**: Nothing to report. Expanded data streams are fringe scope relative to iDigBio's primary mission.
- **Japan**: Three seminars were given to senior high-school students.
- **NatureServe**: We took the initial steps to be able to mobilize data from Environmental Impact Assessments.
- **Netherlands**: In 2020 the Dutch Biodiversity Infrastructure ARISE (Authoritative and Rapid Identification System for Essential biodiversity information) got funded. This infrastructure will deliver new data streams to GBIF. NLBIF is partner in ARISE.
- **Norway**: Representatives for GBIF Norway contributed to documentation and implementation for new data streams for environmental DNA, and ecological data in GBIF (see also 2a).
- **South Africa**: iNaturalist platform being put in place for Southern Africa by SANBI. Also a Node of IBOL is being developed, by the South African community. This will facilitate the mobilisation of molecular data. SANBI-GBIF is also engaged in looking at mobilisation of genetic data.
- **Spain**: Planned Citizen Science activites have been affected by the Covid19 situation. However, works to integrate the national CS platform [https://natusfera.gbif.es/] into the global iNaturalist Community are progresing smoothly.
- **Sweden**: Text 2019-2020: GBIF-Sweden seeks to expand activities within the above mentioned fields of work in 2020. Comment August 2020: As stated: details below (2020-2021).
- **United States of America**: BISON project helped mobilize several new bee and bat datasets. USGS worked with international group of collaborators on examples for aligning biologging data to Darwin Core [https://github.com/tdwg/dwc-for-biologging].

2021 Participant plans

- **Argentina**: Continue with the promotion of the use of sampling event data model for ecological and monitoring datasets
- **Biodiversity Heritage Library (BHL)**: Expand ability to ingest transcriptions. Roll out more options for transcriptions and ingest.
- **Brazil**: Scope and establish thematic data mobilization campaigns on zoonotic diseases and private sector data. Enhance the data exchange standards for sampling-event data, collaborating with partners that generate data to provide sources for filling current gaps. This work aims to establish partnerships with long-term monitoring communities.
- **Colombia**: Continue to support the publication of data from the business sector and citizen science community. Promote the publication of sequence-derived data. Identify potencial dataset from monitoring communities.
- **Distributed System of Scientific Collections (DiSSCo)**: DiSSCo will further develop the nsidr.org demonstrator.
- **Japan**: Provide webinar on biodiversity data use in education for junior and senior high-school.
- **NatureServe**: We will continue our efforts to mobilize Environmental Impact Assessment data.
- **Netherlands**: NLBIF will maintain the connection between ARISE and GBIF to ensure FAIR data and data interoperability between infrastructures.
- **Nigeria**: We hope to publish event data that has followed strict guidelines and collaborate with partners that generate data useful for filling existing gaps.
- **Norway**: GBIF Norway will contribute to the documentation, training curriculum, and implementation for new data streams for environmental DNA, and ecological data in GBIF (see also 1b, and 2a).
- **Poland**: Mobilisation of occurrence records based on bibliography legacy sources is one of important aspects of the IMBIO project. The data will be connected with bibliography database. We expect GBIF to facilitate data filtering and linking this type of biodiversity data with bibliography resources. It will be possible to utilise this connection through our data portal and we think that GBIF Portal could also make it possible.
- **South Africa**: Engagement with citizen science community and molecular data community.
- **Spain**: Without amabdoning current and consolidated data strings, we plan to focus on LTER communities.
- **Sweden**: In 2021 within SBDI the following data streams and tools affecting GBIF and GBIF-Sweden will receive special attention (see also 2a above): The WRAM2 Data Broker (WDB) will be used to supply data to the Swedish instance of the SBDI/CAnMove-run ALA-ZoaTrack module. Additional data providers as ZoaTrack (Australia), EuroDeer & EuroBoar will be integrated into the WRAM Data Broker. The current MoveBank integration will be upgraded to fully support WRAM functionality. Easy submission and exploration of sequence biodiversity data and associated metadata in relevant international repositories (using Marine Data Archive and GeoMe) will be facilitated. A service will be set up for mapping metabarcoding data against relevant reference databases (BOLD, UNITE etc.). Operation of the database of reference MOTU:s for major Swedish biomes is expected. More attributes to published butterfly monitoring data than presently available, and increased frequency of reporting will be enabled. Bird monitoring data and

metadata in DwC-A format is being prepared for publication. Mobilization will be achieved of presence/absence vegetation data and metadata from systematic monitoring programs (in DwC-A format).

- **United States of America**: BISON will focus on invasive species, pollinator, and federal data for mobilization. USGS will continue to engage with terrestrial, marine, and aquatic eDNA data providers. USGS will also continue to work with biologging data aggregators to determine the best way to represent these data using Darwin Core.

Activity 3c: Engage data holders

Rationale

GBIF has tools and support mechanisms in place to enable publication of several categories of biodiversity data. The key requirement is for increased engagement with, and support for, the communities of institutions and individuals who hold these data. Such engagement is normally most effective at the national level, although international networks also have an important role to play.

2020 Progress

An initial mapping of collection codes for European institutions participating in the Distributed System of Scientific Collections (DiSSCo) [https://www.dissco.eu/] with datasets published through GBIF.org established a baseline for identifying potential targets for collaborative engagement of collections not yet sharing specimen data, including those in European countries that are not yet GBIF Participants.

The Secretariat continued to work with iNaturalist [https://www.inaturalist.org/] to improve collaboration on national citizen science initiatives, including the development of guiding examples for national GBIF nodes and a mapping of the growing network of iNaturalist national partners with the GBIF node network. Other citizen science initiatives mobilized through GBIF in 2020 included the India Biodiversity Portal [https://indiabiodiversity.org/], whose publication-grade dataset [https://www.gbif.org/dataset/c6b86c40-ff71-4e5e-902c-111f400d0d56] is now accessible through GBIF.org, including more than 28,000 images.

An important milestone in GBIF's engagement with the private sector was passed with the entry into force of the revised Equator Principles (EP4) [https://equator-principles.com/ep4/] in October, requiring financial institutions to encourage clients to share biodiversity data through GBIF and appropriate national and thematic platforms. The Secretariat worked with the Equator Principles Biodiversity Working Group to develop guidelines for implementing this requirement, and the Deputy Director took part in a webinar [https://www.gotostage.com/channel/4154d7790a894c7eba1cd52e21f4c96b/recording/782806a695ac45b58039a8b82752d509/watch] explaining the benefits and process of GBIF data publication to more than 170 banks, industry representatives and private consultants. Despite cancellation of the 2020 conference of the International Association for Impact Assessment (IAIA) [https://www.iaia.org/], the Secretariat continued to work with IAIA to update guidance on mobilizing data from the private sector, in conjunction with documentation generated by the OpenPSD project [https://www.gbif.org/project/2Zik1tfJoh3C92ZslvhDIr/openpsd-promoting-publication-and-use-of-private-sector-data-on-biodiversity] funded through the Capacity Enhancement Support Programme (CESP). Discussions were opened with Agence Française de Développement (AFD) [https://www.afd.fr/en] to collaborate on a global effort

to mobilize biodiversity data generated through projects supported by development agencies and development banks.

2021 Work items

- Launch data mobilization campaign for the private sector, building on guidance resources developed in 2020 (see Activities 1c and 3b)

2020 Participant contributions

- **Argentina**: Keep promoting the CNC and participate at the ECSA in Trieste with a researcher and member of the RICAP. Keep promoting the CC through RICAP and National Node.
- **Australia**: Work to promote and support use of the BioCollect platform across multiple communities. Involvement the international citizen science and standards communities on a global standard for project-based data exchange. Ongoing support for the federal Department of Environment and Energy (DoEE) via the MERIT application which is yielding increasingly hi-resolution and accurate rich data about Australian government investments in environmental interventions and outcomes. Implementation and release of iNaturalistAU with a membership agreement between the iNaturalist Network and the Atlas of Living Australia and CSIRO [https://inaturalist.ala.org.au/].
- **Benin**: Involve them more in project calls and in GBIF Benin activities.
- **Brazil**: An evaluation is being carried out on the best format for publishing citizen science data on the SiBBr platform.
- **Cameroon**: Setting up a project to mobilize the data necessary for the drafting of strategic documents on biodiversity to be submitted to GBIF / BID.
- **Colombia**: Facilitated the engagemet of new organizations from the business sector. ii) Facilitated the publication of the National Catalog of Plants and Lichens of Colombia.
- **France**: Data publishing support in projects : “OpenPSD - Engage and promote the private sector in open biodiversity data publication”, lead by GBIF Spain. “To use the CBD’s CHM infrastructure and network in order to strengthen biodiversity data acquisition and data sharing”, lead by the French Head of CHM focal point (Denis Duclos, DREI, MNHN, Paris).
- **International Centre for Integrated Mountain Development (ICIMOD)**: Publish ICIMOD programme based biodiversity data from different landscape initiatives: Published checklist from Apinampa Conservation Areas. Later, will also be publishing checklist of vascular plant diversity along an elevational gradient in the west Nepal, central Himalayas (from published literature). Proposal development support to partners in the HKH regional member countries- BIFA/ GBIF-YRA : Endorsed BIFA grantee from Nepal. Will be closely working and supporting two BIFA grantee from Nepal and Bhutan.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued its data mobilization efforts with the ultimate goal/vision of mobilizing ALL collections data in the United States.
- **Japan**: Engagement expanded through meeting occasions.
- **LifeWatch ERIC**: LifeWatch ERIC metadata makes sure data published can be harvested by GBIF.
- **Netherlands**: NLBIF launched a [new website]https://www.nlbif.nl to engage with data holders and citizen scientists. NLBIF has organised its annual meeting launched a call for Dutch data

holders resulting in 9 new financed projects to mobilize data to GBIF, to engage new stakeholders or to develop biodiversity infrastructures to mobilize new data types. The total budget of NLBIF-call 2020 was kEURO 218. The projects are listed on the NLBIF website [https://www.nlbif.nl/projecten/] listed on the NLBIF activities under DiSSCo-NL and the Dutch NHC dashboard new data holders are mobilising data to GBIF.

- **Nigeria**: The Nigerian Node ensured the involvement of institutions with all kinds of biodiversity data.
- **Norway**: The GBIF CESP OpenPSD project (developed by GBIF Nodes in Spain, Portugal, Norway, Colombia, and France) engaged with new data holders in the private sector (see also 1g).
- **Poland**: The IMBIO project engaged 18 data holding institutions. Other projects funded from the same financing stream pointing at GBIF as an obligatory “external repository” of the data (establishing repositories was one of the mandatory elements in the project assessment) will engage at least 5 additional important scientific institutions holding biodiversity information resources. Without any doubts, decision on choosing GBIF in all these projects was inspired by the KSIB network and earlier activities of the National Participant Node.
- **Portugal**: Contribution to the documentation on the guidance for private companies to become data publishers through GBIF, in the framework of OpenPSD project.
- **South Africa**: Engagements with data holders are an ongoing activity of the Node. This takes place through formal meetings, and one on one engagements.
- **Spain**: As CESP OpenPSD project coordinators, we are glad to see the high profile we are receiving en in the current GBIF Work Program.
- **Sweden**: By approaching citizen science groups, researchers and management practitioners substantially more data and data types are going to be published in the coming years. Comment August 2020: As stated.
- **Switzerland**: Continuation of efforts towards a partnership with collection holding and research institutions active in DNA sequencing (linkage of sequence data, DNA-samples and reference specimens). Collaboration with national biodiversity data centres in order to capture and use species trait data.

2021 Participant plans

- **Argentina**: Keep promoting the CNC. Keep promoting the CC through RICAP and National Node.
- **Australia**: Continued support for the BioCollect, iNaturalistAU and MERIT Platforms.
- **Benin**: Involve them more in project calls and in GBIF Benin activities.
- **Brazil**: Launch data mobilization campaign for the private sector, building on guidance resources developed in 2020 (see Activities 1b and 3b).
- **Cameroon**: Establishment of a memorandum of understanding between GBIF Cameroon and local biodiversity actors on the mobilization of available data.
- **Colombia**: Continue the campaign to involve more companies and biological collections. Establish an agreement with the National Environmental Licensing Authority to integrate data from EIA’s.
- **Distributed System of Scientific Collections (DiSSCo)**: DiSSCo is open to engage with natural

history collections in DiSSCo not yet publishing to GBIF to supply data to GBIF.

- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue its ongoing data mobilization efforts.
- **Netherlands**: NLBIF will launch NLBIF-call 2021 with a budget of kEURO 225.
- **Nigeria**: We plan to improve collaboration among data holders including those from private sectors, thereby increasing the diversity of data harnessed for publication.
- **Poland**: In 2021, at least some of the above mentioned projects should start publishing their data to GBIF.
- **South Africa**: ANBI-GBIF and the Systematics Division will implement the 2021 National Biodiversity Information Management and Foundational Biodiversity Information Management Forum (BIMF-FBIP Forum), which is a key event to engage the data holders in the community. SANBI-GBIF Training event will be conducted alongside the BIMF-FBIP Forum
- **Spain**: We plan to maintain connections made within OpenPSD and --building upon it-- expand participation of private sector in GBIF. Collaborating with other GBIF nodes and Secretariat is a given.
- **Sweden**: By approaching citizen science groups, researchers and management practitioners substantially more data and data types are going to be published in the coming years. Support will be given to data providers (both within SBDI and externally). This includes e.g. standarization/cleaning of data; IPT education; advice on harvesting routines etc. See also 4b below.
- **Zimbabwe**: Engage data holders that hold DNA sequence data and data from other Kingdoms other than Animalia and Plantae. Other data sources to be considered include Research Projects, Theses and Dessertations, EIA Reports.

Activity 3d: Rescue datasets

Rationale

Many researchers hold potentially valuable data which are not yet in a suitable digital format for integration into GBIF. Historical publications are a similar source of valuable data which remain inaccessible. This offers an opportunity to establish a community platform to capture information on such datasets where the researcher or owner lacks the time or capability to make the data available as a GBIF-compatible dataset, and to enable interested individuals to volunteer time to collaborate with the owner to publish a dataset, potentially in conjunction with a data paper credited to all parties. Such a model may address a key bottleneck in bringing valuable data online.

2020 Progress

Development on the suggest a dataset [https://www.gbif.org/suggest-dataset] tool, and uptake of proposed mobilization targets, was postponed during 2020 due to reduced staff capacity arising from home working constraints during the COVID-19 crisis.

2021 Work items

- Continue to implement workflow for prioritizing and drawing upon potential data sources reported through the ‘suggest a dataset’ tool, including involvement of nodes, mentors and crowdsourced solutions (carried over from 2020)
- Roll out a workflow for processing data mobilization requests arising from the ‘suggest a dataset’ tool

2020 Participant contributions

- **Cameroon**: Submission of a capacity building project on the use of GBIF publication standards and tools of national biodiversity data holders.
- **Colombia**: Rescue of datasets from EIA’s and biological collections.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio continues to provide digitization and workforce development activities and events that are open to all. iDigBio also provides assistance with digitization, data standardization, and data mobilization within the scope of its mission.
- **Spain**: We are making a special effort in updating our National Registry of Biodiversity Collections and Databases to have sound basis for identifying datasets that potentially may be published in GBIF
- **Sweden**: Text 2019-2020: As in 3c. Comment August 2020: As stated (but see 4b below).
- **United States of America**: USGS participated in a town hall at Ocean Sciences focusing on data rescue.

2021 Participant plans

- **Brazil**: Implementation of a workflow to process data mobilization requests arising from the "suggest a data set" tool.
- **Cameroon**: Submission of a new capacity building project for national biodiversity data holders on the use of GBIF standards and publication tools.
- **Colombia**: Continue the campaign to involve historical data from environmental impact assessments. ii) Rescue of research data in protected areas.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to provide digitization and workforce development activities and events that are open to all. iDigBio will also continue to provide assistance with digitization, data standardization, and data mobilization within the scope of its mission.
- **Japan**: To be included in other activity “natural history collection safety net”.
- **Nigeria**: The Node plans to support researchers with potentially valuable data who for one reason or the other are unable to put such data in digital formats. We would ensure the integration of such data into GBIF platform.
- **Poland**: An important element for increasing a number of valuable datasets available online would be tools for their easy processing and import. The IMBIO project includes creating a number of such tools, including crowd sourcing mechanisms.
- **Spain**: Using our National Registry of Biodiversity Collections and Databases, we plan to review,

check and help those not publishing data, or that published long time ago to update their participation in GBIF.

- **Sweden**: Planned collections management systems development outside of SBDI (but within consortium partners) will help rescue otherwise endangered environmental data hosted at administrative and research units.
- **United States of America**: USGS will collaborate with MBON, NOAA, IOOS and others to find possible resources for data rescue efforts.

Activity 3e: Liaise with journals

Rationale

Journals are the traditional established avenues for scientific communication. They not only disseminate research findings and other scholarly communications but are increasingly helping to disseminate research data. These data may be provided as supplementary materials or deposited in biodiversity data repositories as a precondition for publication of the paper. However, such data publishing data does not necessarily facilitate its integration with other related data or make the data discoverable and reusable. In order to benefit from data disseminated through journals, the Secretariat will lead or coordinate activity to engage directly with publishing houses, journal editors and authors to promote GBIF-compatible approaches to publication and the use of GBIF-operated repositories as accepted or preferred destinations for supporting data.

2020 Progress

The Secretariat continued to engage research authors, academic publishers and third-party tool developers to encourage better citation practices making use of the Digital Object Identifiers (DOIs) generated for downloads from GBIF.org. As a result of direct contact with authors, more than 600 uncited downloads were 'recovered' in 2020 as of July, enabling them to be associated with specific research outcomes and added to the citations listed for the contributing datasets. Another development during 2020 was the identification of more than 300 Chinese research publications citing use of GBIF.org which had not been picked up through previous literature tracking.

2021 Work items

- Explore strengthening of data paper model as a means of promoting data mobilization and quality control, through clear workflow, associated training and guidance, continue experiment of sponsored Article Processing Charges (APCs). May be integrated as a component of existing and future capacity enhancement and data mobilization programmes (see activity 1g)
- Continue engagement with academic journal publishers to improve data citation and data publication practice; explore interest in publisher-administered, hosted IPT solutions for primary data uploads related to journal articles

2020 Participant contributions

- **Argentina**: We began to dialogue with Argentine journals to start encouraging the publication of data papers.

- **Biodiversity Heritage Library, Biodiversity Heritage Library**: Open and work discussions with Pensoft for article ingest.
- **Colombia**: Continued support to Biota Colombiana Journal with the data paper model [http://revistas.humboldt.org.co/index.php/biota].
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has been refining its citation guidance in an effort to improve attribution.
- **Korea, Republic of**: Biodiversity research paper using the mobilized KBIF data has published in JAPB journal published by National Science Museum and Korea National Arboretum.
- **Spain**: Without dedicating special efforts in this regard in our work plan, we fully support the rational and approach of this work Program item, and are eager to collaborate with fellow nodes and Secretariat in this area.
- **Sweden**: Technical and economical support has been given to researchers publishing research datasets through GBIF.

2020 Participant plans

- **Argentina**: Continue promoting the publication of data papers in Argentine journals.
- **Biodiversity Heritage Library (BHL)**: Complete Pensoft prototype and expand to other born digital publications. Bring Pensoft ingest to scale and look at other born digital publications.
- **Brazil**: Will be explored strengthening of data paper model as a means of promoting data mobilization and quality control, through clear workflow, associated training and guidance, continue experiment of sponsored Article Processing Charges (APCs). May be integrated as a component of existing and future capacity enhancement and data mobilization programmes (see activity 1g).
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to refine its citation guidance in response to feedback.
- **Nigeria**: The Nigerian node plans to explore the strengthening of data paper models as a means of promoting mobilization of biodiversity data and quality control following standard workflows.
- **Poland**: Linking publishing of primary data with GBIF was in the scope of the Polish National Node for years, unfortunately all attempts to convince editors of journals to engage in direct publishing to GBIF failed. However, some of the contacts remain active and there is a chance to create at least pilot mechanisms of synchronous publishing of data as a traditional paper and a GBIF dataset.
- **Spain**: Idem 2020
- **Sweden**: Technical and economical support will be given to researchers willing to publish research datasets through GBIF.

Priority 4: Improve Data Quality

Activity 4a: Ensure data persistence

Rationale

There exists a significant portion of data available through GBIF.org that is not actively curated by a data host. In some cases, there are no resources or desire to make further edits to the datasets. These datasets are effectively orphaned and the GBIF.org version of the dataset is often the last remaining version available on the internet. As GBIF develops mechanisms to provide feedback to data publishers and support curation of datasets, we need to consider that these orphaned datasets will not be updated with corrections or migrated to adhere to modern data standards.

2020 Progress

All datasets that were observed as offline have been migrated to https://orphans.gbif.org/. A periodic process is run to catch recently-orphaned datasets to help ensure long term persistence.

2021 Work items

- Following open discussion on the Community Forum [https://discourse.gbif.org/t/gbif-exports-as-public-datasets-in-cloud-environments/1835], explore preserving periodic copies of GBIF-mediated data on open public and research cloud infrastructures to both ensure persistence and promote wider and easier use of GBIF; develop recommendations and tools to support best-practice citation of GBIF-mediated data accessed through external cloud environments

2020 Participant contributions

- **Australia**: The Atlas has commenced work on a project focussed on data quality. This includes communications and engagement activities; software development; and data management activities.
- **Biodiversity Heritage Library (BHL)**: Implement the plan for rapid ingest of BHL Europe materials.
- **Distributed System of Scientific Collections (DiSSCo)**: A mapping of DiSSCo institutions GRID and ROR identifiers was carried out against GBIF dataproviders and GrSciColl institutions.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continually refined its data mobilization efforts and workflows, including moving towards IPT as the preferred publishing mechanism. iDigBio has also recently upgraded its data infrastructure. iDigBio has continued to provide guidance to the community on long-term data storage solutions and strategies.
- **NatureServe**: NatureServe as the information broker between NatureServe network members and the GBIF portal has the mission of managing and maintaining the quality of this information. This model adds a level of complexity to the system but ensures not only institutional support for this published data but also technological support. In our organization we are constantly concerned about the quality and persistence of the information so that our data is defensible in a court of law and in 2020 the quality and persistence of the information has been one of our priorities as an organization.
- **Poland**: So far, because of relatively low volume of data published by KSIB members to GBIF, we have not faced the problem of orphaned datasets. We are aware that this is a matter of time and there have to be proper procedures ready to use once the such cases arise.
- **Portugal**: Engage with data publishers to offer support, specially to publishers with orphan

datasets.

- **Spain**: GBIF Spain has embarked in dataset rescuing exercises in the past. We have learned a few lesson inn the hard way. We are restructuring our way to approach to recovering "orphan" datasets. Now we are much more careful and try to do a better job in contacting responsible parties, and better taking into account they situation and concerns
- **Sweden**: Bioatlas components have addressed the data persistence issue (see below).
- **United Kingdom of Great Britain and Northern Ireland**: Nicky Nicolson, a member of RBG Kew staff, will work with GBIF on strengthening linkages between data on related objects, building on her work from here 2019 GBIF young researcher award. This work was delayed due to COVID but will begin in September

2021 Participant plans

- **Australia**: Continue the work of the data quality project, collaborate with GBIF on the development of data quality test routines based on the GBIF data pipelines platform.
- **Distributed System of Scientific Collections (DiSSCo)**: Persistent identifiers for institutions and their facilities will be implemented in ELViS.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to refine its data mobilization efforts and workflows. iDigBio will continue it work with the community on long-term data storage solutions and strategies.
- **NatureServe**: We plan to continue in this trajectory offering the same level of support to our network members.
- **Nigeria**: We will avoid orphaned datasets. We all ensure that all data are actively curated by the providers and metadata are updated when necessary.
- **Poland**: Within two years we should scrutinize all datasets published by GBIF Poland in order to update their metadata, and to detect possible orphan cases.
- **Spain**: We will reactivate this activity set taking into account the lessons learned.
- **Sweden**: SBDI/GBIF-Sweden will operate and maintain existing data services (including bug fixes and minor upgrades of web services and mobilization tools). Setting up Bioatlas web services ensures high availablility using the SafeSpring cloud as an Infrastructure-as-a-Service (IaaS) provider. Support to providers internally - externally includes standardization/cleaning of data, IPT education, advicing on harvesting routines etc.
- **United Kingdom of Great Britain and Northern Ireland**: Nicky's work will continue until March. Hopefully she will be able to spend time in Copenhagen with the GBIF team.

Activity 4b: Assess data quality

Rationale

Assessing data quality includes applying data validation tools to capture and monitor suspected and confirmed errors and ambiguities in data, highlighting useful areas for additional information (metadata and qualifiers) that would improve usability and enhance processing options, and documenting completeness and standardization of information both within a dataset and within

aggregated data. A number of validation tools exist in the wider community, and should be brought together to mutually profit from investments and to more efficiently plan future distributed development efforts. This will benefit data publication frameworks as well as individual data holders, giving concrete feedback on best gains in data management.

2020 Progress

In 2020, the analytics explorations from 2019, documented in the GBIF data blog [https://data-blog.gbif.org/categories/gbif/], moved towards closer integration with data indexing workflows and flagging routines. With the processing pipelines in production, allowing for more flexibility in the integration of additional tests and highlighting, the research done earlier is now crossing over into implementation. This concerns records identified as georeferenced to country or other unit centroids, locations of institutions such as museums and herbaria, data coming from gridded datasets, or suspected to be geographical outliers.

Early explorations started around possibilities for the integration of known species distribution information (native ranges) into outlier detection routines, in particular in communication with the Macroecology and Society Lab [https://www.idiv.de/en/groups_and_people/core_groups/macroecosocial.html] at the German Centre for Integrative Biodiversity Research (iDiv) in Leipzig.

Documentation to support better and more targeted interpretation of issue labels is under way and will be continued into 2021. This will provide both clearer explanation on the interpretation of issue labels, as well as prioritize and highlight these issues in relevant places (data downloads, dataset pages) depending on their relevance especially to data publishers and users.

2021 Work items

- Supply clear indicator measures for the completeness and usability of data as part of GBIF.org dataset pages, based on examples such as the GEOLabel data branding model: explore DiSSCo's MIDS standard (minimum information for digital specimen) (carried over from 2020)
- Ensure that users of data are able to identify datasets or records that do not fulfil their criteria for geo-accuracy, whether they are accessing data through facets in the GBIF.org, via the API or in downloads (carried over from 2020)
- Continue the work started in 2020 to identify and mark records suspected to be geographic outliers, and report to data users and publishers in suitable formats
- Extend the documentation, prioritization and presentation of data issues identified during data processing, with particular focus on actionable items for data publishers and alerts to data users

2020 Participant contributions

- **Argentina**: Training workshops in different areas of the country for data providers. Permanent help desk in the publication and data quality. Develop regular data set reports for data publishers and nodes. Participation on a CESP project of Data Quality.
- **Benin**: Data quality are assessed and improved every year by students in the framework of their research works in the master program of biodiversity informatics.
- **Brazil**: There is a curatorial work in progress, whenever suspicious records, geographic outliers are identified, publishers are not informed at the time of publication.

- **Cameroon**: Revision of the decision establishing the steering committee of the biodiversity information clearinghouse. This committee is composed of a scientific committee of a data validation commission published by GBIF Cameroon.
- **Colombia**: Optimization of data validation and cleaning processes before being published with OpenRefine and Python.
- **France**: GBIF France help to run data quality tests before publishing datasets through GBIF and organised data quality workshops.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Continue providing technical services to data publishers in the HKH countries as required- in relation to data publishing in HKH-BIF: ICIMOD supported participation of a young researcher in BID biodiversity mobilization workshop. This strengthens our in-house capacities to provide technical assistance to data publishers.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio validates data sets at the point of ingestion. iDigBio also standardized various fields to enable indexing and searching. iDigBio participates in TDWG in various key areas, including the data quality group.
- **Japan**: Assessment of data duplication and missing data carried out.
- **Korea, Republic of**: Data gap discovery has been carried out for the data from National Science Museum, a record of approx. 1.50 Mil.
- **NatureServe**: Similar to 4A 2020 Progress.
- **Portugal**: Support data publishers in data quality review of draft dataset.
- **Spain**: Enable Darwin Test software (https://www.gbif.es/en/software/darwin-test/) to validate checklist datasets and sampling event data datasets. On-line Workshop planned for November: GBIF.ES online workshop: Biodiversity data quality.
- **Sweden**: Text 2019-2020: Additional metadata will be covered in the above mentioned system for data validation. Comment August 2020:Se below - started before 2019-2020.
- **Switzerland**: Engage collection holding institutions to complete the Swiss collector's registry: The identities of 650 person names have been underpinned with biographic information. 331 entries have been linked to wikidata and/ or VIAF.

2020 Participant plans

- **Argentina**: Training workshops in different areas of the country for data providers. Permanent help desk in the publication and data quality. Participation on a CESP project of Data Quality.
- **Benin**: Data quality are assessed and improved every year by students in the framework of their research works in the master program of biodiversity informatics.
- **Brazil**: Clear indicator measures for data integrity and usability will be provided as part of the GBIF.org data set pages, based on examples such as the GEOLabel data tag model: explore the DiSSCo MIDS standard (minimum information for digital specimen) (transported from 2020). It will be checked whether data users are able to identify data sets or records that do not meet their geographic accuracy criteria, whether they are accessing data through GBIF.org, via the API or in downloads (transported from 2020).
- **Cameroon**: Capacity building of the steering committee on data validation techniques.

- **Colombia**: Validate the data with the new reference cheklists.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has a vision of integrating with other data validation tools. iDigBio will continue its participation with TDWG.
- **Japan**: Improvement of checking process when data received from providers.
- **Korea, Republic of**: Data gap discovery will be carried out, and constantly updating and correcting the KBIF data.
- **NatureServe**: We plan to continue in this trajectory offering the same level of support to our network members.
- **Netherlands**: NLBIF aims to broader communicate the different MIDS-levels and link MIDS-level requirements to DwC terms in the communication with data holders.
- **Nigeria**: We will attempt to identify and mark records suspected to be geographic outliers, make corrections where necessary and notify data users of such changes.
- **Poland**: As our data management system and portal is under construction, there will be a need to improve data quality of existing datasets presented by GBIF Poland in order to harmonize them with new ones that will result from the IMBIO project. In 2021 we will should review existing tools improving data quality available in GBIF community. All means of pipelining and automatic flagging issues in data that could help us would be highly appreciated.
- **Spain**: Continuing with the Darwin-Test checking of datasets and training workshops ans the normal operations of the Spanish Node.
- **Sweden**: Major data providers to GBIF-Sweden employ internal systems for data validation (e.g. Artportalen, where data are collated by groups of volunteers), and by adding a national instance of iNaturalist in 2021 using similar practices, additional security is brought to citizen science initiatives. This refers also to georeferences, for which an automated system checking/altering place names and coordinates is introduced by certain providers.
- **United States of America**: University of Kansas will seek funding from NSF for a workshop to assess and improve geolocation quality of specimen data for North America.

Activity 4c: Enable data curation

Rationale

In a global network, curation of the shared data pool is increasingly becoming a joint responsibility of aggregators, publishers, experts and data users. The goal is to integrate corrections, improvements, additional information and analysis results in a timely manner, with better visibility to all network participants and data users. Expanding the existing knowledge base requires improved communication channels and workflows for collaboration between all actors, tools to capture and rapidly display new or improved information, commentary and data, and not least tools, credit systems and support to engage expert activities.

2020 Progress

Engaged with multiple global partners to place GBIF in the data curation landscape and pursued collaborative external funding for global consultation for development for a global annotation

system. Continued explorartion of GBIF data index to support stable persistent resolvable identifiers with potential partners and interested parties. Other work in this activity planned for 2020 was postponed due to the constraints of home working during the COVID-19 crisis.

2021 Work items

- Continue to explore the use of the GBIF data index to support stable persistent resolvable identifiers for all specimens and occurrence records (see Activity 2a)
- Continue working with global community via the *alliance for biodiversity knowledge* to explore bidirectional data linking and synchronization with data management systems and publishers, to achieve faster and more accurate mutual updates on data improvements and annotations (see Activity 2a)

2020 Participant contributions

- **Argentina**: Develop strategy and support mechanisms for expert communities to curate sections of GBIF data (slower development than expected).
- **Benin**: Data quality are assessed and improved every year by students in the framework of their research works in the master program of biodiversity informatics.
- **Colombia**: Data curation of large percentage of data published with an emphasis on taxonomic and geographic names. Quality reports for top organization publishers.
- **International Centre for Integrated Mountain Development (ICIMOD)**: Enhancing data quality of Herbarium Specimens and museum collections- regional training for HKH member countries. Need to explore possible collaborations with Chinese Academy of Science and other Asian Node member countries.The regional scale activities was not possible this year, especially through linkages with institutions in China.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio has continued to streamline its data mobilization workflows. iDigBio is working with GBIF to transfer its national collections catalog to the global collections registry.
- **NatureServe**: NatureServe's dynamic model of curating information on biodiversity observations allows experts to relate relevant updates to our database that reverberate in the data we publish to GBIF. This model has been maintained through 2020.
- **Norway**: GBIF Norway maintains a machine-readable persistent identifier (PID) resolver for entities in the Norwegian data streams to GBIF (see also 2a, 3b, and 4b).
- **Spain**: Providing training on stable persistent resolvable identifiers for occurrence records and promoting their use. Continue to provide support, helpdesk, and development of software for management collection [https://www.gbif.es/en/software/elysia/] that generates stable persistent resolvable identifiers, and is compliant with GBIF's IPT and Darwin Core.
- **Sweden**: Part of SYNTHESYS+ activities 2020-2023 will cover this issue.

2020 Participant plans

- **Argentina**: Develop strategy and support mechanisms for expert communities to curate sections of GBIF data.

- **Benin**: Data quality are assessed and improved every year by students in the framework of their research works in the master program of biodiversity informatics.
- **Brazil**: The use of the GBIF data index to support stable persistent resolvable identifiers for all samples and occurrence records will be explored. Closer work will be done with the global community through the Biodiversity Knowledge Alliance to explore bidirectional data linking and synchronization with data management systems and editors for faster and more accurate mutual updates on data and annotation improvements.
- **Distributed System of Scientific Collections (DiSSCo)**: ELViS development (aligned with development of a CETAF registry) to harmonize data curation in collections for loans, visits and digitisation on demand in DiSSCo.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to streamline its data mobilization workflows and will continue to work with GBIF on the global collections registry.
- **Japan**: Improve the process for checking / updating the previous data. Provide guide for checking the error to the data providers.
- **NatureServe**: We will continue supporting the dynamic model trough 2021.
- **Nigeria**: The Nigerian Node will also continue to explore the use of the GBIF data index to support stable persistent resolvable identifiers for all specimens and occurrence datasets. We will also continue to collaborate with the global community to explore more biodiversity data management approaches.
- **Poland**: This is almost the same case as in the point 4c – ensuring data quality needs proper data curation and benefits from cooperation and collectively used tools, including annotation. Any efficient annotation mechanisms for data published in GBIF would be of help for GBIF Poland.
- **Spain**: Continuing 2020 activities in this area.
- **Sweden**: Part of SYNTHESYS+ activities 2020-2023 will cover this issue.
- **United States of America**: USGS will work to link the persistent identifier geo-community in the US with the international specimen persistent identifier community.

Priority 5: Deliver Relevant Data

Activity 5a: Engage academia

Rationale

The most significant user community for GBIF is academic researchers. Even policy-related uses of GBIF often derive from the work of such individuals. It is accordingly important for GBIF to understand the needs of researchers and academic societies and to communicate clearly regarding the tools and services GBIF can deliver. Communication should include information and support materials for students and early-career researchers, on both publication and use of data, including citation, use tracking and data papers. University faculties and libraries may be important channels for this information. In addition, GBIF needs to engage more closely with taxonomic societies and other academic bodies which could be key collaborators in curating and improving data. Achieving such an outcome depends on understanding how GBIF can become a more central tool for their

work, so that work on digital knowledge directly benefits those who contribute

2020 Progress

A citation widget was developed to allow data providers to embed their citations feeds into their institution webpages. A social media strategy was employed to notify potential users. A demonstration project was initiated in the legume researcher community to build a community around researcher based data annotation. This includes connections with World FLora Online, OpenTree of Life (OToL) and dozens of researchers.

2021 Work items

- In collaboration with nodes, develop re-usable materials for supporting use of GBIF-mediated data, as well as best practices on data citation and publication of research data, in academic curricula, especially graduate programmes
- Equip Biodiversity Open Data Ambassadors with updated resources, scale up thematic and geographic coverage
- Engage with academic-based projects that could use GBIF-mediated data better in their pipelines and protocols, through collaborative external funding opportunities
- Engage with professional societies to advance knowledge of GBIF functionalities in these user communities

2020 Participant contributions

- **Argentina**: Keep continue attending scientific meetings to continue promoting the national biological data system and GBIF.
- **Australia**: Comment from last year – "Further work on Collaborative Species Distribution Modelling (CSDM) and delivery of components and enhancements to support CSDM." 2020 Progress - Ongoing development work to support CSDM, working with Biodiversity and Climate Change Virtual Laboratory BCCVL [http://bccvl.org.au/].
- **Benin**: In the framework of their research works students in the master program of biodiversity informatics are working in fields of public health, threatened species, and invasive alien species. Data are more and more delivered in those thematic fields.
- **Brazil**: Work has been carried out with the academic community, both supporting the publication and providing data analysis tools.
- **Cameroon**: Re-mobilization of researchers and teachers who are members of the scientific committee and the validation committee of the biodiversity information exchange center.
- **Colombia**: Report of data use from academia [http://reporte.humboldt.org.co/biodiversidad/2019/cap3/303/] Participation in national scentific meetings to egage academia.
- **France**: Contributions to modules in Biology and Systematics master and doctoral modules at MNHN and Sorbonne University.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio hosted the 2020 Digital Data conference in collaboration with Indiana University, Bloomington. The conference was changed to online due to the global pandemic and was a great success. iDigBio promotes biodiversity education via its

monthly Biodiversity Spotlight written collaboratively by the iDigBio team, researchers, and photographers. Each spotlight includes natural history information, current research, and links to relevant specimens in the iDigBio portal. iDigBio promotes use of specimen data in research via its monthly Research Spotlight, which are often contributed by guest researchers.

- **International Centre for Integrated Mountain Development (ICIMOD)**: Publication of Data Paper / Use of GBIF-mediated biodiversity data – with partners. (Birds diversity in the HKH) : The work in Birds of Far-eastern Himalayan Landscape is in progress. However, it is not a data paper generated through use of GBIF mediated datasets for now. This would be a literature based resource dataset.
- **Japan**: Numbers of data from Japan increased.
- **Netherlands**: NLBIF presented the added value of open and FAIR biodiversity data at NAEM (Netherland Annual Ecology Meeting).
- **Poland**: KSIB has a status of a scientific network and all official members represent academic community. Therefore the need for close cooperation with this group of stakeholders is well understood. In current circumstances of scientific life in Poland (and most probably elsewhere) there is a strong need of linking GBIF datasets with standard crediting mechanisms as with traditional scientific papers. We find data papers a step in this direction although it is suitable only for a small portion of scientific work. The expected system should directly link scientific papers and undrlying databases with existing systems of rewarding (impact factors and other widely adopted measures of scientific quality). This is just to describe the current attitude and opinion of the National Node and its cooperators. With regard to ongoing activities in this field, the main achievement is maintaining interest of the local scientific community in GBIF, which is evident in numbers of institutions participating in digitization projects (mentioned above in point 3c).
- **South Africa**: SANBI-GBIF is engaging universities to support biodiversity informatics curriculum implementation. Here the Node has appointed a postdoc to develop curriculum in biodiversity data science. Also two Masters student bursaries have been awarded with a focus on supporting research, as well as data mobilisation and publishing of biodiversity data (sponges and amphipods). The SANBI-GBIF e-learning platform will be used to as a platform to engage the community with relevant documentation and capacity enhancement materials in biodiversity informatics areas.
- **Spain**: Continue engaging academia. Make an inventory of masters and university degrees that promote GBIF data in classrooms.
- **Sweden**: Text 2019-2020: GBIF-Sweden participates, alongside consortium partners in the Swedish Biodiversity data Infrastructure, in a great number of activitie directed towards educational and research institutes. Comment August 2020: As stated.
- **Zimbabwe**: Held a Data Access and Use Workshop for academia in Zimbabwe in March 2020.

2021 Participant plans

- **Argentina**: Keep continue attending scientific meetings to continue promoting the national biological data system and GBIF.
- **Australia**: Later this year the ALA will complete a scoping study that will provide recommendations for how best to engage with the higher education sector and this work could

offer important learnings for activity 5A. Further development work to operationalise CSDM. The Atlas is working in partnership with the EcoCommons Australia project [https://ardc.edu.au/project/ecocommons-australia/].

- **Benin**: In the framework of their research works students in the master program of biodiversity informatics are working in fields of public health, threatened species, and invasive alien species. Data are more and more delivered in those thematic fields.
- **Brazil**: An effort will be made to make GBIF tools available to the academic community.
- **Cameroon**: Relaunch of meetings with the scientific committee and the validation commission of the biodiversity information exchange center.
- **Colombia**: Promove the GBIF network in national scentific meetings to engage universities.
- **France**: Participations to master and doctoral modules to be continued
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio is currently planning the 2021 Digital Data conference, which will include expanded online participation based on the success of the 2020 conference. iDigBio is planning a Biodiversity Summit in 2021, which will ideally be a collaborative meeting of the ADBC community, GBIF governing board, TDWG, and the National Museum of Natural History (Smithsonian). The meeting will feature the evolution and accomplishments of specimen-based science and the impact of digitization. iDigBio will continue to publish newsletters, including Biodiversity Spotlight and Research Spotlight articles.
- **Japan**: Continue to increase numbers of data from Japan.
- **LifeWatch ERIC**: GBIF will be asked to join LifeWatch ERIC supported MSc curriculum on e-Biodiversity and Ecosystem Sciences (EBES)
- **Netherlands**: NLBIF aims to introduce the manifold uses of GBIF data in university curricula in the Netherlands.
- **Nigeria**: We plan to initiate the incorporation of GBIF programmers into school curricula and further provide support materials for student projects and those of early-career researchers.
- **Poland**: We expect growing interest in GBIF as a result of current engagement of scientific community in digitization projects. It should be more pronounced once data being digitized become visible in GBIF and individuals and owner institutions start track their datasets and understand better the role and potential in GBIF community and tools.
- **South Africa**: Work will continue to appoint a BDI Research Chair. SANBI-GBIF is engaging the Department of Science and Innovation, previous Department of Science and Technology, to support a Priority Research Chair.
- **Spain**: Engaging with professional societies: specially with the Spanish-Portuguese Botanical Collections Association, and with the Spanish LTER network.
- **Sweden**: According to the SBDI Communications Plan established (public and internal presence) the old BAS (Biodiversity Atlas Sweden) and SLW (Swedish LifeWatch) web will be continued (news-blog, posters, presentations, teaching events, meeetings and conferences) until eventually by 2021 being replaced by the new SBDI web primarily directed to the research community. To satisfy the needs of academia - but also management officials - we develop adaptive models for species distribution presentation, used for generating map layers with probability values for species occurrence and probable species lists as support for inventorying/reporting, verifying uploaded reports etc. By adding R-tools for calculating Essential Biodiversity Variables (EBVs), and

biodiversity indicators and indices, such as Species richness, Shannon-Wiener index, Redlist-index and core SE BI 2020 vindicators, partly through integration with the Biological Index Calculation Tool (BICT), GBIF-Sweden participates very actively in providing requested services. Lending support and maintenance of Mirroreum (web-based front-end for reproducible research), by ther initial release of visualisation tools for long-distance movements and sensor data and by the continuous addition of relevant R packages and tools the benefit of GBIF-Sweden´s activities in 2021 are clearly demonstrated.

- **Switzerland**: Promote GBIF data use and data sharing at Swiss universities and research institutions.
- **Zimbabwe**: Continue to engage academia and projects that could use GBIF-mediated data.

Activity 5b: Document needs

Rationale

GBIF-mediated data are aggregated from many sources and are consequently heterogeneous, varying in fitness for various uses. During 2015–2016, GBIF established three task groups on data fitness-for-use, in agrobiodiversity research, in distribution modelling and in research on invasive alien species, to document how these communities use GBIF data and to understand their data quality demands. The resulting reports inform data mobilization, data processing and improvements to GBIF.org. Further expert groups are considered during the current Strategic Plan period. Depending on resources, these groups will operate through a combination of face-to-face meetings and online or remote collaboration.

2020 Progress

The Secretariat established an expert group on mobilization and use of data on zoonotic diseases, an activity planned before the COVID-19 crisis but acquiring added relevance due to greatly-increased awareness of the connections between biodiversity and human health. The aim of this group will be to improve the coverage and representation in GBIF of data relating to species that are pathogens, hosts, vectors or reservoirs of human diseases. Budget originally intended to host face to face meetings of this group in 2020 was deferred to 2021, with early work carried out virtually and focussed on establishing the scope and work plan of the group, with an initial report scheduled for the end of 2020.

Recommendations of the previous expert group on invasive alien species [https://www.gbif.org/document/82958/data-fitness-for-use-in-research-on-alien-and-invasive-species] were followed up with publication of nearly 300 validated checklists in GBIF.org [https://www.gbif.org/publisher/cdef28b1-db4e-4c58-aa71-3c5238c2d0b5] from the Global Register of Introduced and Invasive species (GRIIS) covering almost all countries, as well as sub-national islands, overseas territories and selected protected areas. The GRIIS publication effort was supported by core GBIF funds under a contract with the deputy chair of the IUCN Invasive Species Specialist Group, reported in the 2019 Work Programme and successfully completed in March 2020. The national checklists are linked from the country profile pages on the Convention on Biological Diversity (CBD) website [https://www.cbd.int/countries/].

2021 Work items

- Coordinate work of the expert group on mobilization and use of data on zoonotic diseases (funding of face to face meetings dependent on 2021 budget evaluation). **Responds to recommendation 10a of the GBIF 20-year review**

2020 Participant contributions

- **Benin**: Needs of information to support decisions are identified and reported back by students (in the master program of biodiversity informatics) in the framework of their internships in institutions so that their research topics are based on them.
- **Integrated Digitized Biocollections (iDigBio)**: In FY20, iDigBio sponsored the attendance of 1,860 participants from 323 institutions to 49 distinct workshops, webinars, symposia, and other events that targeted digitization and research related topics. These community-driven activities have led to improved digitization practices, increased involvement in digitization and training, and adoption of instruments and informatics tools that improve the efficiency and scalability of digitization and research workflows in all types of biodiversity collections.
- **Japan**: Periodical review of documents and administrative process carried out.
- **NatureServe**: During 2020 we have worked on the development of a concept paper that brings to discussion the possibility of using biodiversity data from Environmental Impact Assessments that we intend to publish in 2021.
- **Netherlands**: The NLBIF node manager as Open Biodiversity Data Ambassador will document user needs for GBIF data wherever relevant.
- **Spain**: Not really on progress: We disagree from the approach taken by GBIF of linking GRIIS datasets to the Spain country pages. These datasets are not compiled following the official procedures and quality checks, and are not endorsed by the Ministry. We aim to engage in a productive discussion with Secretariat to redirect these efforts, so these datasets are publishing in a less confusing way.

2021 Participant plans

- **Benin**: Needs of information to support decisions are identified and reported back by students (in the master program of biodiversity informatics) in the framework of their internships in institutions so that their research topics are based on them
- **Brazil**: Follow the process of the expert group on mobilization and use of data on zoonotic diseases.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio currently has at least 27 distinct workshops, webinars, symposia, and other events planned through the end of 2020.
- **Japan**: Provide “guidebook” to data providers (and potential data providers) to show the process from data provision to incorporation to GBIF and data use.
- **NatureServe**: Provide further guidance on how to go about publishing Environmental Impact Assessment data to GBIF.
- **Poland**: Understanding needs of end users and target audiences is an important element of work on the portal and data management system that is under construction now. In 2021, we plan to

prepare questionnaires and surveys and better know expectations of our users, in order to create as many useful tools as possible.

- **Spain**: Exploring ways on how to engage in these activities in a productive way.
- **Sweden**: We expect to provide an action list for data flows relevant to media content as a to do-list supporting LA community development.

Activity 5c: Support biodiversity assessment

Rationale

One of GBIF's key roles is as organizer or global evidence for species distribution, based on point records for species in time and space. Expansion of data publishing to accommodate sampling event data enables this evidence base also to mobilize and organize basic data on species populations and abundance. As a result, GBIF is positioned to serve as a critical resource for supporting biodiversity assessment at all scales. In particular, GBIF should serve as the data foundation for GEO BON to deliver Essential Biodiversity Variables (EBVs) for species distribution and population abundance. These EBVs represent a continuum from modelled representation of species occupancy (presence-only) in defined units of space and time through to richer assessment of species abundance in those units. GEO BON should serve as a forum for addressing the challenges of modelling such variables and interpolating sensibly between existing data points. This includes determination of appropriate scale at which modelled variables are adequately supported by current data. GBIF needs to ensure that it delivers the data foundations required for these activities, thereby supporting the requirements of IPBES, species Red Listing through IUCN and national authorities, the CBD and the Aichi Targets and Sustainable Development Goals.

2020 Progress

After a competitive call for proposals [https://www.gbif.org/news/1TMjgXqZ3LRynaCICIQr09/call-for-proposals-analysis-of-biodiversity-data-needs-in-the-post-2020-framework], the Secretariat commissioned the VertNet consortium to carry out an analysis of primary data needs for the post-2020 Global Biodiversity Framework. Because of the delays in the CBD timetable for negotiating the post-2020 goals and targets, this work was only beginning in September 2020 with an interim report on progress due by the end of 2020.

Discussions continued with the IUCN Red List Committee on the visualization and use of species range maps for Red Listed species on GBIF.org, on the identification of data outliers, and on development of feedback mechanisms for species assessments. A proposal was expected in late 2020 or early 2021 for the use of spatial data in the assessment process to ensure buy-in from Red List partners. In parallel, the Secretariat has been developing an automated process for updating the checklist dataset comprising the latest IUCN Red List, expected to be implemented by 2021.

GBIF has been collaborating with the national ecosystem assessments project [https://www.unep-wcmc.org/featured-projects/national-ecosystem-assessments], led by UN Environment World Conservation Monitoring Centre (UNEP-WCMC), funded by the German government's International Climate Initiative (IKI). The project aims to build capacity at national level to carry out ecosystem assessments in support of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The project is currently supporting assessments in 12 countries in Latin America, Africa,

Eastern Europe and Asia, and GBIF is developing guidance on the use of primary biodiversity data in such assessments.

2021 Work items

- Publish outcomes of the analysis of primary data needs for the post-2020 Global Biodiversity Framework, promote at relevant fora including the COP15 meeting of the CBD in Kunming, China
- Showcase tools and practices for use of GBIF in Red Listing and other species assessment processes including Key Biodiversity Areas (KBAs), as well as in science-policy processes such as national ecosystem assessments

2020 Participant contributions

- **Australia**: This activity is well aligned with ALAs strategy, particularly in the context of Strategic Action 4.2 (support major national biodiversity assessment, reporting and monitoring programs). The ALA are actively partnering with the Australian State of the Environment Reporting program and the analysis methods this work will develop could be useful in a global context.
- **Belgium**: Explore and prototype a tool, based on occurrences API, that will return a species list from a user-defined polygon.
- **Benin**: In light of the research products achieved in using data we will contribute to update biodiversity assessment.
- **Brazil**: Through the customization of the Living Atlas tool, Brazil has provided analysis tools to support the process of assessing endangered species. The lists of endangered species published in the country were also made available in SiBBr.
- **Colombia**: Analysis of primary data to the VI National Report on Biodiversity and OCDE Environmental Report.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio supported and participated in the annual WeDigBio event, which mobilizes participants to create digital data about biodiversity specimens. In addition, WeDigBio held a mid-year virtual event to engage participants during the safer-at-home period.
- **NatureServe**: During 2020 we have supported the development of the IPBES Alien Invasive Species Assessment First Order draft. And we have also produce all the analysis for the first IUCN Global Reptile Assessment.
- **Nigeria**: The Node plan to utilize new working documents and also implement new tools in the assessment of conservation status of Nigerian species
- **South Africa**: SANBI-GBIF supported the evaluation of proposals commissioned by the Secretariat, to carry out an analysis of primary data needs for the post-2020 Global Biodiversity Framework.
- **Sweden**: As stated.
- **Switzerland**: Publication of annotated national checklists for selected beetle families, with sharing of the underlying occurrence data on GBIF prior to publication 1 [https://doi.org/10.15468/dl.ia9yaj] and 2 [https://doi.org/10.15468/dl.tryac2].

2021 Participant plans

- **Benin**: In light of the research products achieved in using data we will contribute to update biodiversity assessment
- **Brazil**: Monitor the activities and tools available at GBIF to support biodiversity assessments.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio will continue to support and participate in the annual and virtual WeDigBio events.
- **LifeWatch ERIC**: The Workflows developed by LifeWatch ERIC within its technical composability layer on the assessment of invasive species will make extensive use of GBIF data.
- **NatureServe**: Continue the work in the IPBES Alien Invasive Species Assessment.
- **Netherlands**: NLBIF will engage with the Dutch ecological community to start mobilizing EBV ready datasets.
- **Poland**: Providing support fo biodiversity assessment and use of data in fields of environmental biology, phylogeography, ecology etc. remains one of the basic goals of activities of KSIB. As GBIF in Poland stems from the scientific community, we see the fitness of data for scientific use as a immanent aspect of data we produce. Plans for 2021 cover also creating tools for data analysis and facilitating biodiversity assessments.
- **South Africa**: SANBI-GBIF will support biodiversity assessment efforts through work on the IPBES knowledge and data task force.
- **Spain**: Exploring ways on how to engage in these activities in a productive way.
- **Sweden**: Investigating the establishment of a formal SBDI User Reference Group and its interaction with the Support Service Centre and a digital user forum.
- **Switzerland**: Continuation of data digitization activities in relation with running programs of the Federal Office of Environment.

Activity 5d: Assess impact

Rationale

GBIF Participants require clear evidence of the benefits arising from investments in national- scale content mobilization and from GBIF global activity. At present, the main source of evidence presented derives from monitoring of published literature to identify uses of GBIF within research. This activity has been reported through annual GBIF Science Reviews and clearly demonstrates growing use of GBIF in research. Monitoring the literature in this way is time-consuming, and becomes more so as the relevant literature increases. A sustainable approach is required for future monitoring of this kind. GBIF now issues and promotes Digital Object Identifiers for data downloads and expects that these can be used both to simplify discovery and to improve the detail offered to Participants and data publishers on some uses of data. Participants also require more information on non-research uses of GBIF infrastructure, particularly in various kinds of government or industry assessments. A broader review of costs and benefits arising from GBIF investment would be valuable for Participants arguing continued engagement within GBIF and other countries considering Participation.

2020 Progress

The final version of the GBIF 20-year review [https://www.gbif.org/news/1QfpUlGByxjqBktiYAfyIK/twenty-years-of-gbif-independent-review-charts-successes-and-challenges], carried out by the International Science Council's Committee on Data (CODATA) [https://codata.org/] was published in May. The Executive Committee agreed a process for considering and acting on its short-term and long-term recommendations, including through regional nodes meetings, through specific measures in this Work Programme, and through longer-term strategic discussions of the Governing Board.

Following a competitive call, the Secretariat commissioned a consultant, Mason Heberling of the Carnegie Museum of Natural History, to conduct a systematic review of research enabled by access to GBIF-mediated data. The review was due to be completed in August and subsequently submitted to an academic journal.

2021 Work items

- Launch Ebbe Nielsen Challenge and Young Researchers Awards competitions for 2021 (€25,000)
- Explore opportunites to respond to systematic review of research enabled by access to GBIF-mediated data
- Expore options for using supplementary funds to support a Grand Challenge competition, targeting data mobilization and analysis to address a high-profile challenge for research and/or policy. **Responds to recommendation 4b of the GBIF 20-year review**

2020 Participant contributions

- **Benin**: We advise GBIF to create a prize to reward best achievements in data mobilization and data uses.
- **Brazil**: Report templates related to data uses and download have been improved in SiBBr.
- **Integrated Digitized Biocollections (iDigBio)**: iDigBio tracks and publishes statistics for its website, data portal, data use, and events. These statistics are reviewed regularly at the monthly Steering Committee meetings.
- **South Africa**: SANBI-GBIF will develop a guiding example of the data mobilisation activities of the Node.
- **Spain**:Assessing the recommendations of the GBIF 20-year review, in the light of the country's needs and priorities and defining ways in implementing those found relevant and feasible in the national context.
- **Sweden**: As stated. Automated user statistics are employed by SBDI.

2021 Participant plans

- **Benin**: We advise GBIF to create a prize to reward best achievements in data mobilization and data uses.
- **Brazil**: Assessment of the tools available at GBIF on data tracking.
- **Colombia**: Tracking of data use in national scenarios diferent to scientific publications.
- **Integrated Digitized Biocollections (iDigBio)**: "iDigBio plans to conduct a community survey in

early 2021 to assess the impact of its efforts and to gather community input. iDigBio will continue to track and publish statistics for its website, data portal, data use, and events.

- **Japan**: Monitor access to JBIF website [http://www.gbif.jp/v2/] and Science museum net website [http://science-net.kahaku.go.jp/].
- **LifeWatch ERIC**: The Workflows developed by LifeWatch ERIC within its technical composability layer on the impact of invasive species on the native European Biodiversity and Ecosystems will make extensive use of GBIF data.
- **Nigeria**: In 2021, we would design a sustainable method for monitoring the published literature utilized by researchers and identify those emanating from NgBIF publications. We will also encourage young researchers to compete for GBIF's prices.
- **South Africa**: The efforts to reinforce the data-science-policy value chain through initiatives like the Foundational Biodiversity Information Programme of SANBI, will continue into 2021.
- **Spain**: Implementing the conclusion drawn from the activities mentioned for 2020 in the Nodes' plans.
- **Sweden**: Key Performance indicators are reported annually to the funding agencies of SBDI (Sw. Resarch Council + co-funding consortium members).

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