



SANBI

Biodiversity for Life

South African National Biodiversity Institute



Joint Forum Biodiversity Information Management & Foundational Biodiversity Information Programme

14–17 August 2017
Salt Rock Hotel and Beach Resort, Durban



2009



2010



2012



2013

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PROGRAMME

Monday, 14 August 2017

Main Room, Salt Rock Hotel and Beach Resort, KZN

Objectives:

Understanding the data–science–policy landscape through exploring the global, regional and national agendas for biodiversity information:
What are the major projects/initiatives that have biodiversity information needs?

12:00–13:00 ARRIVAL & REGISTRATION; COFFEE/TEA
13:00–14:00 LUNCH

Opening and Welcome

Facilitator: Kristal Maze

Time	Session title	Presenters
14:00–14:30	Official welcome and introduction by SANBI CEO	Tanya Abrahamse
14:30–14:50	Opening address by the Department of Science and Technology	Yonah Seleti
14:50–15:30	Keynote address: Specimens to pixels to actions: Creating, managing and exploiting digital collections	Vince Smith
15:30–16:00	TEA & GROUP PHOTO	

Data–Science–Policy Interface: Understanding the national agendas in support of sustainable development (short presentations)

Facilitator: Kristal Maze

Time	Session title	Presenters
16:00–17:00	Talk 1: The Cape Town Global Action Plan for Sustainable Development Data – Bridging the data to policy chasm	Selwyn Willoughby
	Talk 2: Sustainable Development Goals (SDGs) and implications for South Africa	Wadzi Mandivenyi
	Talk 3: Mining microbial diversity	Gwynneth Matcher
	Questions and discussion	
17:00–18:00	Poster and networking session	

Tuesday, 15 August 2017

Main Room, Salt Rock Hotel and Beach Resort, KZN

Objectives:

1. Investigating the FBIP as a funding mechanism to provide foundational biodiversity information to address priority needs.
2. The Role of the Natural Science Collections Facility and the museum community.
3. Exploring the use and application of data.
4. Exploring the details of biodiversity information management.

8:45–9:00 ARRIVAL; TEA/COFFEE

Foundational Biodiversity Information Programme (FBIP) & Lessons learnt from large FBIP integrated projects

Facilitator: Michelle Hamer

Time	Session title	Presenters
9:00–10:30	Foundational Biodiversity Information Programme (FBIP)	
	Talk 1: FBIP funding approach and themes	Michelle Hamer
	Talk 2: Key elements for successful proposals and analyses of funded projects	Lita Pauw
	Lessons learnt from large FBIP integrated projects	
	Talk 3: SeaKeys: Lessons from the first large FBIP project	Wayne Florence
	Talk 4: Biogaps: Overview of the project: challenges and lessons learnt	Theresa Sethusa
	Questions and discussion	
10:30–11:00	TEA/COFFEE	

The Natural Science Collection Facility (short presentations)

Facilitator: Wayne Florence

Time	Session title	Presenters
11:00–12:00	Talk 1: The Natural Science Collections Facility: Specimen Data Objectives	Michelle Hamer
	Talk 2: Update on the digitising of the Killick Herbarium: feedback on the vision, progress and challenges	Boyd Escott
	Talk 3: The National Collections of Fungi: The portal for phytopathogenic fungi from South Africa	Adriana Jacobs-Venter
	Questions and discussion	

Use, application and impact of biodiversity data: Challenges and opportunities (short presentations)

Facilitator: Michelle Hamer

Time	Session title	Presenters
12:00–13:00	Talk 1: Biodiversity informatics: Meeting sustainable development challenges for fisheries in the face of climate change in southern Africa	Fatima Parker-Allie
	Talk 2: Towards expanding the South African Rhizobium Culture Collection (SARCC) as a genetic resource and its application in sustainable agriculture.	Ahmed Idris Hassen
	Talk 3: Bridging the gap: Making amphibian biodiversity data relatable in South Africa	Fortunate M. Phaka
	Questions and discussion	
13:00–13:45	LUNCH	

Assessments, monitoring frameworks and indicator development (short presentations)

Facilitator: Selwyn Willoughby

Time	Session title	Presenters
13:45–15:00	Talk 1: The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES): The importance and relevance of data in the Africa Regional Assessment Talk 2: Data needs for high-level biodiversity indicators: Is there a gap? Talk 3: A quarter of a century of taking databases from paper to cloud Talk 4: South Africa's first national status report on biological invasions Questions and discussion	Anicia Malebajoa Maoela Jeff Manuel Les Powrie Heather Terrapon
15:00–16:00	TEA/COFFEE	

Data sharing between SANBI and partners & Information systems and architecture

Facilitator: Jeff Manuel

Time	Session title	Presenters
16:00–16:30	Data Sharing between SANBI and partners Talk 1: FBIP data sharing Talk 2: SANBI's data sharing agreement – key principles Questions and discussion	Lita Pauw Fatima Parker-Allie
16:30–17:00	Information systems and architecture Update on the National Biodiversity Information System (NBIS) Questions and discussion	Brenda Daly

Wednesday, 16 August 2017

Main Room, Salt Rock Hotel and Beach Resort, KZN

Objectives:

1. Implementing national systems for biodiversity data management
2. Understanding advances in Data Science and Information Management and how this supports biodiversity management
3. Building the Biodiversity Informatics (BI) Africa agenda

8:15–8:30 ARRIVAL; TEA/COFFEE

Advances in data science and information management: Data analytics, big data, data mining & data visualisation (short presentations)

Facilitator: Jeff Manuel

Time	Session title	Presenters
8:30–9:30	Talk 1: Power to the people: Citizen science setting collections data free	Vince Smith
	Talk 2: Virtual safaris mobilising biodiversity information in African countries	Les Powrie
	Talk 3: Toward next generation biodiversity research	Morne du Plessis
	Talk 4: The NZG Biobank information and information systems: Analysis and improvement	Kim Labuschagne
	Questions and discussion	
9:30–10:30	Talk 5: Turning the Animal Demography Unit databases inside out with modern application architectures	Ian Engelbrecht
	Talk 6: A system to automatically generate annotated checklists	Willem Coetzer
	Talk 7: Validating records georeferenced for the BioGaps Project	Willem Coetzer
	Talk 8: The Namibia Biodiversity Database – content, capabilities and current status	John Irish
	Questions and discussion	
10:30–11:00	TEA/COFFEE	

Existing data management systems for species data

Facilitators: Rukaya Johaadien & Brenda Daly

Time	Session title
11:00–12:00	<ul style="list-style-type: none"> • SPECIFY (Animal Data Management System): SPECIFY introduction (overview); the current status and future plans • BRAHMS (Plants Data Management System): Where are we with BRAHMS, BRAHMS online? • The Red List Database

Building the Biodiversity Informatics (BDI) Africa agenda: supporting the mobilisation of biodiversity information in African countries (short presentations)

Facilitator: Fatima Parker-Allie

Time	Session title	Presenters
12:00–13:15	Talk 1: The SANBI Regional Engagement Strategy	Fatima Parker-Allie
	Talk 2: The African Biodiversity Challenge: An incentive-driven approach to mobilising biodiversity data	Matthew Child
	Talk 3: Wildlife biodiversity for sustainable socio-economic development	Kenneth Uiseb
	Talk 4: An online resource for the flora of the western Indian Ocean region	Benny Bytebier
	Talk 5: Microbes are biodiversity too: the African Soil Microbiology project	Don Cowan
	Questions and discussion	

Key outcomes, reflections and closure of Forum

Time	Presenter
13:15–13:30	Jeff Manuel
13:30–14:30	LUNCH

Postgraduate Student Forum

Facilitator: Leigh Richards

Time	Session title
14:30–17:00	<p>The Postgraduate Forum will include:</p> <ol style="list-style-type: none">1. Presentations & discussions:<ul style="list-style-type: none">• Collection permits (Karin Behr)• Science communication (Dane McDonald)2. Speed presentations by students to showcase their research projects and share experiences3. Other activities such as the election of a representative body for the FBIP Postgraduate Student Association, planning of future activities, etc.

NSCF Workshop

Facilitator: Michelle Hamer

Time	Session title
14:30–17:00	Data Working Group for the Natural Science Collections Facility (by invitation only)

Thursday, 17 August 2017

Venue – Salt Rock Hotel and Beach Resort, KZN

08:45–9:00 ARRIVAL; TEA/COFFEE

FBIP proposal development and evaluation

The number of proposals submitted to the FBIP for funding is steadily increasing, meaning that the awarding of grants is becoming more competitive. At the same time the funding agency is requiring that the investment into the FBIP results in deliverables that make a real contribution to decision-making or that unlock economic opportunities. This workshop will use a hands-on approach to illustrate the attributes of successful and unsuccessful proposals so that participants gain an understanding of the key requirements for both large and small project proposals and the evaluation process.

Time	Session title	Presenters
9:00–13:00	Topics to be covered in training: <ul style="list-style-type: none"> Aligning with the FBIP requirements for outputs/themes Identifying need for outputs and their impacts Feasibility and planning Proposal evaluation 	Michelle Hamer & Lita Pauw

LUNCH WILL BE PROVIDED.

SANBI-GBIF Georeferencing Training

SANBI-GBIF will be hosting a Georeferencing training event to build skills in improving data quality. The training will be presented by SANBI team member Fhatani Ranwashe, and will be co-hosted by Albe Bosman (Iziko Museums), Burgert Muller (National Museum of Bloemfontein) and Sherwyn Mack (Eastern Cape Parks and Tourism Agency). Our trainers are committed to developing the community of practice in georeferencing skills in the country, after learning from John Wiczorek and his team of experts in previous SANBI-GBIF training offered.

Time	Session title	Presenters
9:00–13:00	Topics to be covered in training: <ul style="list-style-type: none"> Introduction to georeferencing Georeferencing tools Uncertainty in georeferencing Online resources overview Good and bad localities The Georeferencing calculator Geolocate and Specify Projections 	Fhatani Ranwashe, Burgert Muller, Sherwyn Mack & Albe Bosman

LUNCH WILL BE PROVIDED.



ABSTRACTS

Monday, 14 August 2017

KEYNOTE ADDRESS: Specimens to pixels to actions: Creating, managing and exploiting digital collections

Vince Smith, Natural History Museum, London; e-mail: vince@vsmith.info

Digital technologies are having a profound impact on how we manage, access and use natural science collections. Increasing reliance on digital services has the potential to generate efficiencies that can transform institutions and create opportunities to integrate our work, within and across national boundaries. This transformation comes at a cost as organisations create new roles, systems and policies to support digital representations of our collections. In this presentation, I will provide an overview of how London's Natural History Museum's (NHM's) Digital Collections Programme is effecting this change, and how we are internationalising this work through European and global programmes. I will highlight some of the challenges within our institution, and some of the resource implications as we shift the intellectual business model of the NHM from one focused exclusively on physical collections, to one that places increasing emphasis on their digital surrogates.

Data–Science–Policy Interface: Understanding the national agendas in support of sustainable development

The Cape Town Global Action Plan for Sustainable Development Data - Bridging the data to policy chasm

Selwyn Willoughby, Refleqt Information Management Services; e-mail: selwyn@refleqt.co.za

How do we make sure that policy decisions are based on sound evidence? How do we take our data and transform it into information that is used in an accountable, responsible and transparent manner? Also, how do we ensure that the data is used in the first place? These questions are increasingly being asked as the gulf between the data and policy extremes is difficult to navigate and fraught with many, often foreseen, hazards.

Earlier this year the inaugural United Nations World Data (UNWDF) Forum took place in Cape Town, South Africa, to address how data can be used to achieve the objectives of the 2030 Agenda for Sustainable Development. This acknowledgement of the data to policy chasm resulted in the drafting of the Cape Town Global Action Plan for Sustainable Development Data. The plan not only recognises the challenges of the data to policy continuum, but also the underlying challenges of collecting, managing and disseminating data.

The plan itself can be seen as creating an enabling environment and a pathway for data to be policy relevant. Biodiversity data is an integral part of the sustainable development data mix. The challenge is therefore to ensure that biodiversity data is accounted for and used in the national data accounting system to report against the progress of addressing the Sustainable Development Goals.

Mining microbial diversity

Gwynneth Matcher, Department of Biochemistry and Microbiology, Rhodes University; e-mail: g.matcher@ru.ac.za

Ecosystems are a delicate and perfect balance between the biological community and their physical environment. Despite the fact that microorganisms are critical components of ecosystem functioning and are present in every ecological niche, microbes are an oft overlooked component of ecosystems. Metagenomics, which is the study of the genetic material of an entire population within a given environmental sample, has come to the fore in the study of microorganisms in recent years. This approach allows for rapid identification of diverse

microbes and their functionality without limiting the study to a few isolated individuals. This powerful tool not only allows characterisation of microbiomes, but can also be applied to economically relevant research foci in the bioeconomy sector. This presentation will cover a brief background on microbes and their ecological and economic importance (e.g. natural products discovery, bioremediation, food industry, etc.) as well as the application of metagenomics for the mining of microbial diversity for the purposes of biodiversity surveys as well as bioeconomical applications.

Tuesday, 15 August 2017

Foundational Biodiversity Information Programme (FBIP)

FBIP funding approach and themes

Michelle Hamer & Lita Pauw, South African National Biodiversity Institute (SANBI); e-mails: M.hamer@sanbi.org.za, l.pauw@sanbi.org.za

The Foundational Biodiversity Information Programme (FBIP) was established by the Department of Science & Technology (DST) in 2013 in recognition that sustainable use and management of South Africa's biodiversity require a solid knowledge base and access to relevant information. However, a number of challenges have limited the use of the data and knowledge generated through research for decision-making. The mandate of the FBIP therefore is to fill the large gaps in our knowledge by means of a strategic approach and to unblock the value chain for foundational biodiversity data generation.

The FBIP provides grants for the generation of knowledge related to documenting South Africa's biodiversity, mobilisation of species occurrence or distribution data, generation of DNA barcode data that will allow identification of biological material, and compilation of descriptive information on species. The National Research Foundation (NRF) manages the proposal review and grant allocation process through a competitive process. SANBI is responsible for the implementation of the programme. The grants must result in the release of data to the FBIP/SANBI for archiving, integration, management and dissemination. This presentation will explain the FBIP funding approach and themes, outline the key elements for successful proposals and give an analysis of funded projects.

Lessons learn from large FBIP integrated projects

SeaKeys: Lessons from the first large FBIP project

Presenter: *Wayne Florence, Iziko Museums of South Africa; e-mail: wflorence@iziko.org.za*

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Dylan Clarke, Iziko Museums of South Africa, P.O. Box 61, Cape Town, 8000 Western Cape, South Africa; e-mail: dclarke@iziko.org.za

The state of biodiversity informatics in South Africa lags behind global best practice with respect to adoption of protocols, workflows and practices based on international standards. The SeaKeys project aimed to mobilise and generate fit-for-purpose marine biodiversity information for uptake through the coordinated digitisation and dissemination of foundational biodiversity information. Additional aims included stimulation of taxonomic research, capacity building and adoption of new workflows and practices. A total of 26 national species checklists were generated, of which 17 are new for South Africa. Newly digitised occurrence records totalled 143 011, and 260 species pages were compiled. Some project successes are: new genera and species, bioprospecting discoveries, use of data in sensitive area mapping, collation and mapping of monitoring efforts and application in policy advice. Genetic barcoding efforts need improvement, but mutually beneficial collaborations with molecular researchers can help.

In this talk we demonstrate that SeaKeys has been an effective vehicle for testing collaborative desire to adopt standards that render the data interoperable for online dissemination, and the utilisation of automated data cleaning and enrichment methodologies for improving data fitness-for-purpose. Generally, however, many institutions grappled with standards and agreement on the taxonomic backbone to support integrated biodiversity databases, national species checklists and collation of very large distribution data sets for applied research.

BioGaps: Overview of the project: challenges and lessons learnt

Theresa Sethusa¹, Carol Poole¹, Domitilla Raimondo¹, Brenda Daly¹ & Silvia Kirkman²,*

¹South African National Biodiversity Institute; *e-mail: T.Sethusa@sanbi.org.za

²Independent Contractor (Scientific coordination)

The South African National Biodiversity Institute (SANBI) is responsible for the biodiversity component of the Shale Gas Development (SDG) Strategic Environmental Assessment (SEA). Biodiversity data gaps for the Karoo were identified at the outset of this SEA and the need for rapid biodiversity recordal and assessment as part of the project. During the process of accumulating and assessing existing biodiversity data for the SEA, a more nuanced understanding of the information gaps and biases was developed for Karoo plants and animals. SANBI led a consortium of institutions in securing funding from the National Research Foundation's (NRF's) Foundational Biodiversity Information Programme (FBIP) for a three-year project entitled 'BioGaps: Filling biodiversity information gaps to support development decision making in the Karoo' (commonly referred to as the Karoo BioGaps Project). This project is aimed at comprehensively surveying the area to ensure increased geographic and taxonomic coverage that will allow for the mapping of species ranges, identification of important habitats, and classification of wetlands and rivers. The project involves a consortium of researchers and institutions, provides research opportunities for 11 young scientists, and is training 8 students towards post graduate qualifications. It also pilots novel approaches to engaging and developing citizen scientists. The project will mobilise 200 000 new primary occurrence records, which will inform species occupancy and habitat richness models, and which, along with 300 Red List assessments of species of conservation concern, will be served to decision makers via SANBI's Land Use Decision Support (LUDS) tool. We report on lessons learnt to date and mitigating actions taken to ensure the smooth running and success of the project.

The Natural Science Collection Facility

The Natural Science Collections Facility: Specimen Data Objectives

Michelle Hamer, South Africa National Biodiversity Institute; e-mail: M.Hamer@sanbi.org.za

The Natural Science Collections Facility is a national research infrastructure project selected by the Department of Science & Technology for implementation in 2017. This is a distributed network of institutions, which together hold over 30 million natural science specimens collected over more than 100 years. The NSCF will focus on making the collections and associated data accessible for research and decision-making that addresses the needs of society. An assessment of collections carried out in 2009 and 2010 highlighted the need for common software for data and specimen management, improved and common standards for data and for increased access to data. The need for online images of priority (e.g. type) specimens is also

becoming urgent as the risks and restrictions associated with sending material out on loans increase. Over the next three years the focus will be on upgrading vertebrate, macrofungi, priority plant and Karoo fossil specimen data, and imaging selected type specimens and making these accessible online.

Update on the digitising of the Killick Herbarium: Feedback on the vision, progress and challenges

Boyd Escott & Clinton Carbutt, Ezemvelo KZN Wildlife; *e-mail: Boyd.Escott@kznwildlife.com*

This Killick Herbarium Plant Specimen Digitising Project represents a collaborative initiative between SANBI (through the Foundational Biodiversity Information Programme) and Ezemvelo KZN Wildlife (EKZNW), which serves to bolster the resources available to enable Ezemvelo to digitally capture, verify and share (via BRAHMS) the c. 33 000 vouchers in the Killick Herbarium currently housed at EKZNW's head office at Queen Elizabeth Park, Pietermaritzburg. The work is being carried out with the kind technical assistance of the BEWS Herbarium staff based at the University of KwaZulu-Natal, Pietermaritzburg campus. I will discuss the current progress to date, some of the challenges experienced, and more importantly, some of the lessons learnt, as well as the way forward for the project as a whole.

The National Collections of Fungi: The portal for phytopathogenic fungi from South Africa

Adriana Jacobs-Venter, ARC-Plant Protection Research Institute; e-mail: JacobsR@arc.agric.za

The Mycology unit of the Biosystematics Programme ARC-Plant Protection Research serves as the custodian of South Africa's National Collections of Fungi (NCF). The NCF comprises two major collections as well as several smaller collections. The live culture collection (PPRI) houses 23 000 specimens and is affiliated with the World Federation of Culture Collections. The herbarium collection (PREM) traces its origin back 111 years and currently accommodates more than 61 000 specimens, including ca. 3 000 type specimens. These specimens represent not only South African, but African fungal diversity. The mobilisation of collection data associated with PREM specimen holdings and literature, as well as the generation of DNA barcodes for all species represented in the PPRI collection, has led to the establishment of a portal for South African phytopathogenic fungi on the MycoBank website: www.mycobank.com/.

Use, application and impact of biodiversity data: Challenges and opportunities

Biodiversity informatics: Meeting sustainable development challenges for fisheries in the face of climate change in southern Africa

Fatima Parker-Allie¹, Mark Gibbons² & Andrew Townsend Peterson³

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²University of the Western Cape, Biodiversity and Conservation Biology Department, Bellville

³University of Kansas, Biodiversity Institute, Department of Ecology and Evolutionary Biology

Target 19 of the 2020 Convention on Biological Diversity indicates that, by 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, as well as the consequences of its loss, will be improved, widely shared and transferred, and applied. This goal can realistically be achieved only through broad implementation of biodiversity informatics, which in South Africa, as in other parts of the world, is a young and dynamic field of science. Here I present an overview of biodiversity informatics and discuss ways that SANBI-GBIF aims to assist South Africa in reaching its target, through both human capital development and informatics platforms.

SANBI presently supports a knowledge-management platform, and is a major publisher of biodiversity data, making millions of data records available to the global community. Because it is important that the data have direct relevance to science and key policy issues related to biodiversity, I illustrate ideas via examples of how digital accessible knowledge (DAK) can be relevant to current research questions. In particular, I assess impacts of climate change on the distribution, diversity, and species richness of fish faunas off the coast of South Africa, exploring implications for fisheries and food security. I will use ecological niche models to characterise current, past and likely future geographic ranges, thereby permitting identification of range contractions and

expansions under different climatic scenarios. This project will involve the entire life cycle of the data to improve fitness-for-use of data, for analysis, interpretation and assessment. This work is novel, as the biodiversity informatics techniques used have not been largely applied to the marine environment in South Africa and few studies have been done globally.

Towards expanding the South African Rhizobium Culture Collection (SARCC) as a genetic resource and its application in sustainable agriculture

Ahmed Idris Hassen, F.L. Bopape, K. Mashau & D.M. Sibanyoni, Agricultural Research Council, Plant Protection Research Institute (ARC-PPRI); *e-mail: HassenA@arc.agric.za*

The South African Rhizobium Culture Collection (SARCC) is one of South Africa's public good assets hosted by the ARC-Plant Protection Research Institute. The collection hosts a wide range of strains of *Rhizobia* that are of paramount importance in the inoculation of legumes. The cultures are preserved in lyophilised form as well as frozen at ultralow temperatures, and are regularly maintained and checked for purity and viability. Demand on culture collections to supply authenticated, reliable biological material and associated information is on the rise. One of the strategies to ensure optimal microbial resource utilisation involves proper maintenance and identification, as well as database management systems that enhance the development of culture collections. There was a considerable gap in the past in terms of data management and utilisation of the rhizobium cultures due to lack of technical expertise in molecular identification techniques as well as in modern microbial database management and utilisation. Recently an initiative has been started towards expanding the SARCC as a genetic resource by identifying the strains up to species levels and by establishing a new catalogue system, which links the collection with the Global Catalogue of Microorganisms (GCM).

Bridging the gap: Making amphibian biodiversity data relatable in South Africa

Fortunate M. Phaka, Edward C. Netherlands & Louis H. Du Preez, University of KwaZulu-Natal; *e-mail: mafetap@gmail.com*

Amphibians are vital to ecosystem wellbeing, and incorporating them in conservation planning is of utmost importance. However, amphibians remain largely understudied or misunderstood. Their conservation, as with other conservation initiatives, is not relatable to people and thus often ignored. This study pilots methods of increasing knowledge and understanding of amphibians along with the importance of their conservation in the South African context. Local communities and the tourism industry are impacted the most by the outcomes of conservation initiatives, thus their buy-in is vital to the success of such initiatives. Making amphibian biodiversity data accessible and appealing to these stakeholders lays the foundation for increased success of conservation initiatives. The study aims to do so through presenting frogs as a tourist attraction and investigating frog-related indigenous knowledge. Outcomes of this pilot are in the form of an amphibian diversity workshops and a bilingual book for Zululand, and integration of frogs into the list of tourist attractions at Ndumo Game Reserve. Lessons learnt from this study will inform the design of a new, large-scale project focused on making amphibian biodiversity relatable to non-scientists across South Africa.

Assessments, monitoring frameworks and indicator development

The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES): The importance and relevance of data in the Africa Regional Assessment

Anicia Malebajoa Maoela, Council for Scientific and Industrial Research; e-mail: MMaoela@csir.co.za

The Intergovernmental Science–Policy Platform for Biodiversity and Ecosystem Services (IPBES) is geared towards strengthening the capacity and knowledge foundations of the science–policy interface in relation to biodiversity and ecosystem services at both global and regional level. IPBES identified the improvement of access to data, information and knowledge as key toward achieving its mandate. In this regard the platform established partnerships with data mines such as GBIF and IUCN, to enable access to data sharing infrastructure and to facilitate the interpretation of biodiversity data in the assessment of status and trends of biodiversity and nature's value to people.

Despite numerous efforts by IPBES to improve on access to information there are still challenges. To be discussed in this talk are the progress and challenges of addressing (i) capacity building interventions and (ii) inclusion of research institutes in Africa to partner solidly with IPBES on promotion of shared interests. Such common interests include, but are not limited to, data standards and exchange formats, and provision of free-to-use tools and information resources on data mobilisation, publication, access and use.

Data needs for high level biodiversity indicators: Is there a gap?

Andrew Skowno^{1*}, Stephen Holness² & Jeff Manuel¹,

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²Nelson Mandela Metropolitan University

The South African National Biodiversity Institute (SANBI) is mandated to monitor and report on the status of biodiversity in South Africa. SANBI meets part of this mandate through the National Biodiversity Assessment (NBA), which reports on the status and trends of biodiversity and ecosystems on a 5–7 year cycle. The NBA focusses specifically on high-level indicators such as threat status and protection level for species and ecosystems.

SANBI and DEA have started a process of aligning the biodiversity indicators used in national and international reporting processes linked to the NBA, South Africa's Environmental Outlook (SAEO), the Convention on Biological Diversity (CBD) (including the Aichi targets), the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) and the Sustainable Development Goals (SDGs).

But what are the data needs linked to these indicators? Is there a data gap? Using the Sustainable Development Goal (SDG) Indicators and South Africa's National Biodiversity Assessment we illustrate the kind of information required to populate these high-level indicators. We highlight the importance of working collectively to ensure that appropriate national datasets are used in these national and international monitoring processes, and address some of the risks in using standard global datasets (often recommended).

A quarter of a century of taking databases from paper to cloud

Leslie W. Powrie¹, Anisha Dayaram¹ & Andrew J. Skowno¹, ¹South African National Biodiversity Institute; *e-mail: l.powrie@sanbi.org.za

This is the story of what was done, and some lessons learnt as we bumped our heads on a very rough road. Banging our heads was worth it to help making it feasible for many users to travel a smooth data sharing road. A big focus of work at SANBI involves linking biodiversity assessment and monitoring with good biodiversity information management – this involves taking data from different toolboxes and workshops and putting them into a single toolbox in a single workshop. A good example of this experience is that over the last 25 years multiple data sources were combined. Observation data from vegetation surveys (plot data and Acocks samples), Protea Atlas, Millennium Seedbank, SAPIA (Southern African Plant Invaders Atlas), CREW (Custodians of Rare and Endangered Wildflowers) and other plant species distribution data were combined with herbarium specimen data in an MS Access database. Plant species distribution data were served to the sector on a request by request basis – but that was still done by one operator and was useful to very few users. Recent work has been done to take it from this local database and put it into BODATSA (Botanical Database of Southern Africa) to make it accessible online in the global workshop. We hope that all species distribution data from different institutions in southern Africa will in due course become available in this single online NBIS (National Biodiversity Information System) portal in the internet 'cloud'.

South Africa's first national status report on biological invasions

Presenter: Heather Terrapon

Lead editors: Brian W. van Wilgen¹, John R. Wilson^{1,2}

Additional members of the drafting team: Tsungai Zengeya², Katelyn Faulkner^{2,3}, Tumelo Morapi², Zanele Mnikathi², Tendamudzimu Munyai², Sebataolo Rahlao²

¹Centre for Invasion Biology, Department of Botany and Zoology, Stellenbosch University

²Directorate Biological Invasions, South African National Biodiversity Institute

³Department of Zoology and Entomology, University of Pretoria

This presentation provides a preliminary assessment of the status of biological invasions in South Africa. In terms of regulations under the National Environmental Management: Biodiversity Act, the South African National Biodiversity Institute is required to produce a report on the status of invasive species, and on the effectiveness of control interventions and regu-

lations, every three years. The team responsible for compiling the report has developed a set of indicators that assess the main aspects of invasions, as well the effectiveness of control measures and of the regulations. One of the aims of this talk is to obtain feedback on the preliminary findings. Preliminary data on the number of alien species in the country, and their status in terms of distribution, dominance and impact will be presented, as well as the degree to which particular areas are invaded. An assessment of the effectiveness of control is difficult, as there are almost no adequate management plans that indicate the intended goals of control measures in particular areas, and no adequate monitoring and assessment of outcomes. While there are some localised successes, there is also a great deal of evidence that control measures have been ineffective in many areas. The regulations have been in place for less than three years, and it is probably premature to expect that their effectiveness could be assessed at this early stage. The status report on biological invasions has to be repeated every three years, so it will in future offer the opportunity to track invasions over time.

Information systems and architecture

Update on the National Biodiversity Information System (NBIS)

Brenda Daly, South African National Biodiversity Institute; e-mail: B.Daly@sanbi.org.za

This presentation provides a progress report on the proposed data sharing architecture for a National Biodiversity Information System (NBIS) to be developed by the South African National Biodiversity Institute (SANBI). NBIS includes the following key components (content types): i) systematics (taxonomy and nomenclature), ii) biogeographic (specimen and observations), iii) ecosystems, iv) descriptive data (resources metadata), v) molecular, vi) literature and vii) multimedia.

The project has started promoting a shift from tactically based information systems, aimed at delivering products for individual project initiatives, to strategic systems that promote the building of capacity within biodiversity organisations and networks. This will encourage data to be managed more effectively within SANBI, but also encourage data to be shared by the community providing integrated products and services that are needed to address complex environmental issues.

Wednesday, 16 August 2017

Advances in data science and information management: Data analytics, big data, data mining, data visualisation

Power to the people: citizen science setting collections data free

Vincent S. Smith & Margaret Gold, Natural History Museum, London; *e-mail: vince@vsmith.info*

Crowdsourcing data from the world's natural science collections is a complex task with many challenges to face and opportunities to be seized. In this presentation, we reflect on our pilot activities in crowdsourcing the transcription of specimen labels from our digitised collections at the Natural History Museum London (NHM). We will share what we've learned about the behind-the-scenes elements of crowdsourcing – the parts the 'crowd' doesn't see – e.g. flow of data between systems. For example, at the NHM London there are four systems involved (the Crowdsourcing Platform, Content Management System, Media Asset Management system and our Data Portal) and many policies and processes (data embargoes, our 'visiteering' programme, our marketing efforts to make unfamiliar groups more appealing, data quality procedures and efforts to attract funding). We also share our vision for the future of crowdsourcing and highlight emerging technologies that could open up new avenues of citizen science activity. We will close with a number of challenges and opportunities for the future that come from digitising collections of this volume and complexity, and engaging broad and diverse publics with these internationally important collections.

Virtual safaris mobilising biodiversity information in African countries

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A seed was planted during 2012 that has led to the mobilisation of many species distribution records and powerful georeferencing capability in Africa. The birth of SAFARIS (Southern African Friends and Researchers Indexing Specimens) was announced during a meeting with delegates from several African countries later that year and it now has a cousin called BioGaps (Karoo BioGaps Project). Together, these projects are releasing information from historical sources such as field notes and specimen labels to become available in NBIS (National Biodiversity Information System). There have already been about 53 000 plant species and 1 300 animal distribution records made available. The data can be used in research, monitoring, policy and any other conceivable application. Some of the value derived from SAFARIS has been correcting information in BODATSA (Botanical Database of Southern Africa) for herbarium specimen label transcriptions with typographical errors, such as a year transcribed as 1838 instead of 1938. Georeferencing of the combined data is also far more accurate and effective with more data giving better context to individual records. Many are enjoying travelling around our regions with early explorers as they transcribe their records making the information available for various uses.

Toward next generation biodiversity research

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The National Zoological Gardens of South Africa is a major role-player in the field of wildlife conservation genetics and as such also recognises its role in contributing to biodiversity information and research. As part of its drive to advance research through next generation technologies, the organisation has acquired an Ion Torrent S5 sequencer, which enables the generation of biological 'Big Data', along with computer servers for the bioinformatics analysis aspects of this data. In line with these acquisitions we are proposing to utilise the technology, in conjunction with the diverse skills set of the research team, to evaluate the feasibility of conducting next generation biodiversity assessment research. The strategy would focus on using environmental sampling in conjunction with next generation sequencing to assess the biodiversity of environments. The NZG will focus on optimising a number of methods as techniques for biodiversity assessments, which include: (a) metabarcoding; (b) metagenome sequencing; (c) microbiome analyses and (d) metatranscriptomics. The strengths and weaknesses of these strategies will initially be evaluated to establish which are effective and relevant in terms of contributing to the Foundational Biodiversity Information Program. The selected strategies will then further be optimised for implementation in future assessment strategies.

The NZG Biobank information and information systems: Analysis and improvement

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An analysis of the workflow and information management procedures and systems of the National Zoological Gardens of South Africa (NZG) Biobank was conducted and it was found that there was a lack of integration and interoperability across the board. It was therefore decided to develop and implement a new Biobank Information Management System (BIMS) based on the Specify platform.

The first phase of the project was to improve the Biobank information and information system. Within the Biobank alone, data management procedures were historically based on four different files (Microsoft Access or Microsoft Excel). To develop the new system, data from these files were first cleansed and then migrated to the Specify database. Being hierarchical, the Specify taxon tree and storage tree are particularly effective in controlling data quality. We optimised the Specify user-forms for data capture and querying, and developed Specify labels with barcodes for vials.

After implementing the Specify database we developed two useful tools:

1. An inventory of the samples in the Biobank, reporting the number of samples of each type, and number of animals from each species.
2. A workbench to facilitate further cleansing and migration, by the user, of data to Specify on a continuous basis.

Turning the Animal Demography Unit databases inside out with modern application architectures

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Database systems are traditionally designed to be inward facing, serving the needs of the organisations that create and use them and nothing further. Software applications communicate directly and seamlessly with the databases that support them, and security and data integrity concerns are built directly into those applications. This scenario is changing though, as organisations increasingly need to provide outward-facing applications for use by a wide range of external stakeholders. Biodiversity databases are no exception, and there is growing interest in using modern application architectures, especially web APIs (application programming interfaces), to provide data to a wide variety of users seamlessly and securely. An API is extra software that can be thought of as a broker between a database and external users of that database, providing a standard set of data outputs, while controlling access to and security of the data. Web APIs take the form of HTTP URLs that can be called from a web browser or a variety of other software programs, and which return data in JSON or XML format. APIs can also include the option to add data to a database, allowing for the possibility that independent parties can build and deploy their own products that make use of databases. This talk will present an overview of the APIs that have been built or are under construction for the Animal Demography Unit databases including the Virtual Museum and the South African Bird Atlas Project. The functionality of the APIs will be described and demonstrated, and lessons learnt in their development will be shared.

A system to automatically generate annotated checklists

Willem Coetzer, South African Institute for Aquatic Biodiversity; e-mail: w.coetzer@saiab.ac.za

Species checklists are needed by a broad range of workers in the field of biodiversity science, from researchers to government officials. The tradition of taxonomy and systematics is to publish an annotated checklist in a journal, for which the author usually receives benefits in addition to a growing publication record (e.g. increased funding). The lack of such recognition has been a stumbling block to data-sharing initiatives.

A prototype information system named the Catalogue of Afrotropical Bees (CAB) is described. The CAB automates the generation, from a database, of a Darwin Core-compliant annotated checklist. While the checklist can be updated easily when needed, the author's benefit from traditional publication need not be jeopardised due to the advent of the Biodiversity Data Journal, which will publish a scientific article associated with a dataset, the link to which is also included.

The technology of the World Wide Web has improved dramatically since the days when checklists were published by scientists themselves, using simple html (essentially no different from paper publications). Biodiversity information standards, such as the Darwin Core, have allowed scientists to publish richer metadata directly from a database, resulting in better quality and consistency and reaching a wider base of users.

The CAB uses the Specify database of species, citation and article records, and includes occurrences. The data are aggregated, transformed and standardised by database queries, and the final product, a Darwin Core Archive, is published to the GBIF Data Portal using an IPT server. The CAB is a typical annotated checklist that contains important nomenclatural citations (e.g. species descriptions, new combinations and synonymisations) as well as other interesting or useful information (e.g. biological or ecological information such as hostplant relationships). It is hoped that the CAB will be developed into a robust, industry-standard software tool for ongoing, wider use.

Validating records georeferenced for the BioGaps Project

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Georeferenced occurrence records of all South African biodiversity were required by the BioGaps Project to assess the potential effect of shale gas extraction on biodiversity in the Karoo. Records without coordinates were georeferenced by a team of workers at SANBI, and the completed records were sent back to the suppliers to be incorporated in the original databases.

An exercise to assess the accuracy of the 4 683 georeferenced occurrences of Apoidea was undertaken. Overall the assessment of the accuracy of assigned coordinates was good. Between 10% and 15% of locality records were either incorrect or too imprecise and probably should not have been georeferenced.

Observations that were made during the assessment included the fact that farms with common names (which could refer to many farms all over the country) had been singled out and georeferenced. The maximum uncertainty radius associated with the most imprecise estimates seemed to be too small.

All records received from the georeferencing team need to be checked for accuracy before they are incorporated into a database. This is a potential bottle-neck in future georeferencing projects.

The Namibia Biodiversity Database – content, capabilities and current status

John Irish, Namibia Biodiversity Database, Windhoek, Namibia; e-mail: webmaster@biodiversity.org.na.

The NBD (on-line at biodiversity.org.na) includes basic biodiversity information for Namibia and an adjacent portion of the southeast Atlantic Ocean. It aims to be the go-to site for determining Namibian species presence; current taxonomy, synonymy and classification; Namibian legal, conservation and endemic status; basic species context data (herbivore/carnivore, terrestrial/aquatic/marine, indigenous/alien, etc.); Namibian language common names; and interpretively collated published Namibian distribution data. The latter is being added chronologically, currently completed: 1760 to 1875. Current content: 13 869 taxa, 13 2626 records, and growing. All vetted data is visible on the site, and free.

The web site is a PHP front-end to a MySQL/MariaDB database. It is supported by an extensive editing, maintenance and security subsystem, and a variety of cron-based bash scripts that automate repetitive tasks. Only FOSS is used. The site can display in any indigenous Namibian language.

The NBD originated in 2003 as a Government-supported, donor-funded project under the National Biodiversity Programme, but some data roots go back to 1983. There was no provision for continuity beyond the end of the NBP, but I kept it alive, inter alia with GBIF support, till 2009 when it was officially abandoned by Government. At that time it included 17 361 taxa and 270 669 records. The current version is an independent private initiative that was recreated from scratch starting 2010.

Building the Biodiversity Informatics (BI) Africa agenda: Supporting the mobilisation of biodiversity information in African countries

The SANBI regional engagement strategy for Africa (2016–2021)

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Africa is one of the most megadiverse continents in the world. Here biodiversity plays a critical role in sustainable development, provides vital ecosystem services and is one of our greatest regional assets. The benefits of biodiversity are crucial to key economic sectors (i.e. forestry, agriculture, fisheries, tourism, health and energy) and to providing solutions to

sustainable development and poverty alleviation on the continent. The management of our natural assets and the information related to this are crucial. Ultimately, we cannot manage what we don't measure.

The SANBI Regional Engagement Strategy has been developed to guide SANBI's efforts in the region in support of national and regional priorities for biodiversity management. It provides a framework for the implementation of biodiversity priorities in the African region, as opportunities for collaboration on the continent are growing, due to an increase in emerging economies and investment on the continent. This provides an ideal opportunity for SANBI to consider its strategic role in the African biodiversity research, management, conservation and policy landscape.

This regional engagement strategy identifies five strategic priority areas, to advance SANBI's efforts across the value chain, to support the generation, management and use of biodiversity information for conservation, decision-making and sustainable development in Africa. The African continent is alive with opportunity and over the next five years, SANBI as an organisation will be expanding its efforts, across the Biodiversity Science and Policy Branch, to engage actively in this exciting evolving regional landscape.

The African Biodiversity Challenge: An incentive-driven approach to mobilising biodiversity data

Matthew Child, Fatima Parker-Allie & Jeffrey Manuel, South African National Biodiversity Institute; *e-mail: m.child@sanbi.org.za*

Primary biodiversity data are essential to sustainable development in Africa. However, policy-makers will only incorporate such data if they are 1) accessible, 2) fit for use and 3) relevant to national development agendas. Enabling these conditions necessitates building functional biodiversity informatics networks comprising data holders, data managers and end users. Currently, only 3.7% of the records freely accessible on the Global Biodiversity Information Facility (GBIF) were from Africa, of which 49% have been published through African organisations and South Africa contributes 97% of the total. There is thus a critical need to capacitate African countries to mobilise biodiversity data. Simultaneously, as philanthropic funding is limited and volatile, national institutional demand for mobilised data, and willingness to support networks engaged with this work, must be cultivated to sustain the momentum generating and mainstreaming biodiversity information. Here we discuss a unique project methodology, which falls within the GBIF Africa and SANBI regional strategy's scope of work, which uses a competition format to incentivise self-organisation of biodiversity informatics networks; complements alternative funding models; and incentivises the mobilisation of policy-relevant data. We present a conceptual model of linked funding mechanisms to sustain biodiversity informatics networks.

Wildlife Biodiversity for sustainable socio-economic development

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Namibian conservation policy provides for private ownership and utilisation of wildlife resources. In the 1970s, a conservation policy was changed to give ownership rights over wildlife to private landowners. This policy change resulted in an increase of wildlife numbers on private land, so that wildlife is being adopted as important form of land-use; changing wildlife's status from a liability and competition to livestock to a valuable asset. After Independence, in 1996, conditional rights over wildlife were granted to inhabitants of the communal land. More than 50% of all wildlife is found on private and communal land outside of formally protected areas. The increase in wildlife numbers outside of the protected areas was a result of economic value gained by the wildlife because of the enabling policy framework. To ensure that the growing wildlife based industry remains sustainable, and meet the conservation objectives, the Ministry regulates the use of wildlife through the permitting system. Permits for various forms of wildlife utilisation, e.g. shoot and sell, live capture, transport, trophy hunt, import and export are all manually issued and are filed manually, including the report-backs on the permits. Valuable information on wildlife utilisation that may significantly influence wildlife utilisation policy and trigger targeted research and monitoring remain inaccessible in files stored in cabinets. Such wildlife utilisation data files dates back to 1975. There are over 4 000 private farms and 82 communal area conservancies whose wildlife utilisation data is available in a hardcopy form in the Permit Office. The biodiversity data mobilisation project aims to transform currently inaccessible biodiversity data for use to inform conservation policy while at the same time bringing more biodiversity data in the public domain.

An online resource for the flora of the western Indian Ocean region

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The Madagascar and Indian Ocean Islands Hotspot harbours some 15 000 plant species, 12 000 of which are endemic. The flora is only partially documented and floristic treatments are incomplete. To extend the botanical understanding of the region, digital access to locally deposited herbarium material is critical.

The Biodiversity Project of the Indian Ocean Commission aims to empower local herbaria by creating a regional network and encourage all participants to actively disseminate information about their flora. The Botanical Research and Herbarium Management System (BRAHMS) was chosen as a common application for data management and exchange. BRAHMS offers efficient, fast and low cost image and data capture methods appropriate for the region.

As a pilot project to digitising all the herbarium specimens deposited in the region, we focused on the large family Orchidaceae. Seven regional herbaria (DBEV, HKM, MAU, TAN, TEF, REU, SEY) imaged and digitised all their orchid specimens, which are now available on a common web platform (<http://herbaria.plants.ox.ac.uk/bol/swioorchids>). The availability and collation of digital herbarium specimens will lead to improved curation of the regional herbaria, and will allow for easy and useful outputs such as species reports, checklists, field guides and maps. It will facilitate research activities in systematics, evolution, pollination biology and conservation.

Microbes are biodiversity too: The African Soil Microbiology project

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The African Soil Microbiology (AfSM) project is an USAID-funded collaborative project focussing on sub-Saharan Africa and aimed at the acquiring the first-ever continental-scale survey of soil microbial diversity. With researchers from ten other partner nations scattered across the SADC, east and west African regions, we will undertake a low resolution phylogenetic survey (1 000 sample sites) of soil microbial communities from approximately 15% of the sub-Saharan land area. Sampling and data collection strategies have been designed and will be implemented through the second and third quarters of 2017. Metagenomic DNA from all samples will be extracted using a standard methodology and subject to MiSeq sequencing of 16S (bacterial) phylogenetic markers. With the involvement of researchers from each of the partner laboratories, the phylogenetic datasets will be analysed in the context of regional climate, soil, biome, physicochemical and land-use parameters. Among other objectives is a long-term aim to develop a new soil health metric, which includes metagenomic data. This project is a first for the African continent and is at the forefront of similar national and regional landscape-scale biodiversity surveys that are currently being planned or initiated in other continents.

POSTER ABSTRACTS

The digitisation of SANBI's specimen collection: Challenges experienced and lessons learnt

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There is a great need for the digitisation of biological specimens, since data will be more accessible without the need to physically handle rare and fragile specimens. The Biodiversity Information and Planning (BIP) Directorate initiated a project to image and transcribe all herbarium specimens owned by SANBI. In order to complete this project, SANBI has purchased several pieces of equipment to facilitate the digitisation process. The imaging and transcribing of specimens project provides a platform for the rapid digitisation of specimens and in turn increases access to the herbarium collections, thus making a meaningful contribution through citizen science.

Scanners are slowly becoming inadequate as they require the upside-down placement of specimens often resulting in damage or loss of material. Also large bulky specimens are often damaged, difficult to scan and the image quality is compromised due to the unevenness of the scan. Following a consultative process and a desktop study (market research) in 2015 the most appropriate technology was procured for the task in 2016. The MK Digital Direct Technologies stack was the technology chosen for the project. The poster presentation highlights challenges associated with the project and provides lessons learnt.

Georeferencing: Understanding the concepts

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The quality of georeferenced data can be affected by a number of things. Besides individual errors, there are other technical aspects that need to be considered when georeferencing locality information. Concepts such as coordinate uncertainty, precision, accuracy, projections and scale affect the quality of the georeferenced data. Modifying these concepts without any understanding of the impact the modifications will have on the output of the data jeopardises the quality of the georeferenced data produced.

Tools like GeoLocate, Google Earth Pro, ArcMap and Quantum GIS are used for georeferencing; these tools are configured to take advantage of the georeferencing concepts highlighted above. Understanding these concepts allows the georeferencer to easily enhance the georeferencing tools used. This poster presentation will try and easily define and describe the concepts that are related to georeferencing. It will also highlight modifications that can be made to take full advantage of the tools that are provided for georeferencing.

Demystifying biodiversity informatics

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What's an API? Who is Json and why is everyone talking about him? When it gets right down to it, what does a database actually do? Does machine learning involve computer school? These questions are often brushed under the rug and ignored, or explained laboriously in extremely technical terms, but this insidious obfuscation of what technology really *does* impedes our work. Understanding what can be automated or made easier by the computer and how (including best practices) will lead to better decisions and software choices. This poster will demystify some simple technical concepts that are frequently misunderstood in our sector.

E-Taxonomy: What it means for the marine biodiversity sector

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Recent strides made by the SeaKeys Project have resulted in a total of 26 electronic national species checklists. These checklists will form the backbone of South Africa's use of marine biodiversity informatics to improve our decision making based on available foundational biodiversity information of high taxonomic resolution. The checklist templates, based on the

global standards, are meant to ensure that the taxonomy is rendered interoperable towards South Africa's desire to serve high quality fit-for-purpose marine biodiversity data through multiple planned online platforms spearheaded by the FBIP. Even though we have made good strides to collate the checklists, the taxonomic status of the majority of South African marine taxa is dubious with high levels of synonymy. The checklists therefore also provide a baseline for much needed future taxonomic revision work and prioritisation of capacity development. However, given South Africa's desire to meet its biodiversity informatics priorities, taxonomic business-as-usual cannot underpin our research output endeavour. In this poster we highlight priority areas of change for South African marine taxonomists that will allow us to meet the demands of the modern era including producing online taxonomic checklists, electronic keys, species webpages, mobile phone apps or anything else that cybertaxonomy will allow!

Transcribe: A digital representation of specimen information

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Before the digital age, thousands of historical museum and herbarium specimens were collected. The information associated with these specimens is critical to understanding previous location patterns of species. However, the information is inaccessible if it remains in hard copy only. The South African National Biodiversity Institute (SANBI) implemented a tool that is intuitive and affiliated with the need to digitise specimens. This allows for specimen labels to be made available electronically.

Transcribing is a process of converting written information into digital format. SANBI needs to digitise all museum and herbaria records for scientists to analyse the data. Volunteers are used to digitise the data available on the specimen label once the photograph of the specimen is uploaded to website.

The website is an easy-to-use crowdsourcing portal. This poster presentation will cover a step-by-step method on how to register, and will also teach users to capture relevant bee, grasshopper or plant information. An introduction to SANBI's current Karoo BioGaps project will also be presented, showcasing the various ways in which users can get involved in the project.

The need for accurate georeferencing of medicinal plant record specimen

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Just under one third of the medicinal plant species (2 000) in South Africa are used in local muthi markets. Of these species, 20% have been found to be unsustainably sourced across South Africa, with 42% of them already listed as threatened with extinction. The need to introduce measures to protect and conserve these species thus becomes an issue of high significance. Two important aspects in the conservation of these medicinal plants are firstly to determine the location of these species, and then to manage the multiple datasets once they've been identified. Georeferencing and data management techniques thus become useful tools in enhancing the quality and efficiency of occurrence data collected.

Georeferencing of 150 000 species occurrence records is in process, and the aim is to create a database of the key and threatened species. Data management techniques will be used to create a database with only key information. Data management techniques used to attain key fields will be shown together with different methods and techniques used to georeference these records. Species distribution maps to highlight the accuracy of original and georeferenced data will also be presented.

Biodiversity and impacts of plant-feeding mites on tea plant (*Camellia sinensis*) in South Africa

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Mites are the most serious pests of tea in almost all tea producing countries. The vast expanse of tea ecosystem provides a stable, favourable microclimate, uninterrupted food supply and suitable sites for the reproduction and survival of pests. Annual surveys of mites in South Africa were carried out between 1959 and 1990 for the National Collection of Arachnida

(NCA), but much focus was placed on natural ecosystems. Mites on tea plantations were neglected and the diversity on the functional estates is unknown. The purpose of the study was to evaluate the diversity, taxonomy, and study the biology and ecology, symptoms and impacts of economically important mite groups. Five estates were surveyed between 2015 and 2017, Tshivhase and Makumbane estates from Limpopo Province, Ntingwe estate in Kwa-Zulu-Natal, as well as Magwa and Majola estates in the Eastern Cape. Over 400 slide-mounted specimens have been recorded with the NCA. These belong to 10 families, 16 genera and at least 20 species. The ongoing morphological study indicated that at least six new species belonging to three families and five genera, Tetranychidae (Schizotetranychus and Myxonichus), Tenuipalpidae (Brevipalpus and Tenuipalpus) and Tuckerellidae (Tuckerella) have been discovered. Where phytophagous mites were found, the leaves looked red at the sites of attack. As the population increased, the infested leaves become darker, took a scorched appearance, and general reduction in size of the new fresh leaves was common. Eventually these resulted in low tea production, fruit drop and even death of the plant.

Bridging the gap with a bilingual field guide to the frogs of Zululand

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Biodiversity data is often not appealing to those not involved in biodiversity-related fields of study. This is especially true if they are not scientists. An understanding of biodiversity by the general public is vital to the success of conservation initiatives. *A Bilingual Field Guide to the Frogs of Zululand* is a book representing a relatively novel way of presenting biodiversity data to non-scientists. The first step in writing this book was documenting how members of the Zululand Community relate to frogs, their cultural perceptions of frogs, and what interests them about frogs. Subsequently, this was studied and the book was formed around the lessons learnt. Zululand frog biodiversity data was then presented in a way that bridges amphibian knowledge gaps in the Zululand Community. An attempt to bridge the gap in development of indigenous South African languages was also made through publishing the book in both isiZulu and English.

Mite diversity in the national collection of Arachnida

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The National Collection of Arachnida (NCA) serves in documenting South Africa's mite biodiversity. Specimens are mounted and sealed on a microscopic slide for identification and preservation. Mites are very important pests in agriculture. The late Dr M.K.P. Smith-Meyer established the NCA in 1959 and Dr E.A. Ueckermann made a huge contribution to the NCA until his retirement in 2015. The NCA collection consists of three orders (Mesostigmata, Trombidiformes and Sarcoptiformes (Krants & Walter 2009)) and also comprises of 65 000 slides representing 159 families, 692 genera and 2 049 species. Field trips were taken annually from 1960 to 1992 to collect mites throughout South Africa. Collection trips are still taken by request or on demand in South Africa and overseas, but material is mostly received from researchers, quarantine and the public. Dr C. Craemer (Eriophoidea), Dr P.A. Maake (All families except Eriophoidea) and Ms M. Makutoane (collection manager) continue to contribute to the NCA to date.

2015



2016





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