

TROPICAL PLANT KNOWLEDGE FOR SCIENCE AND SOCIETY

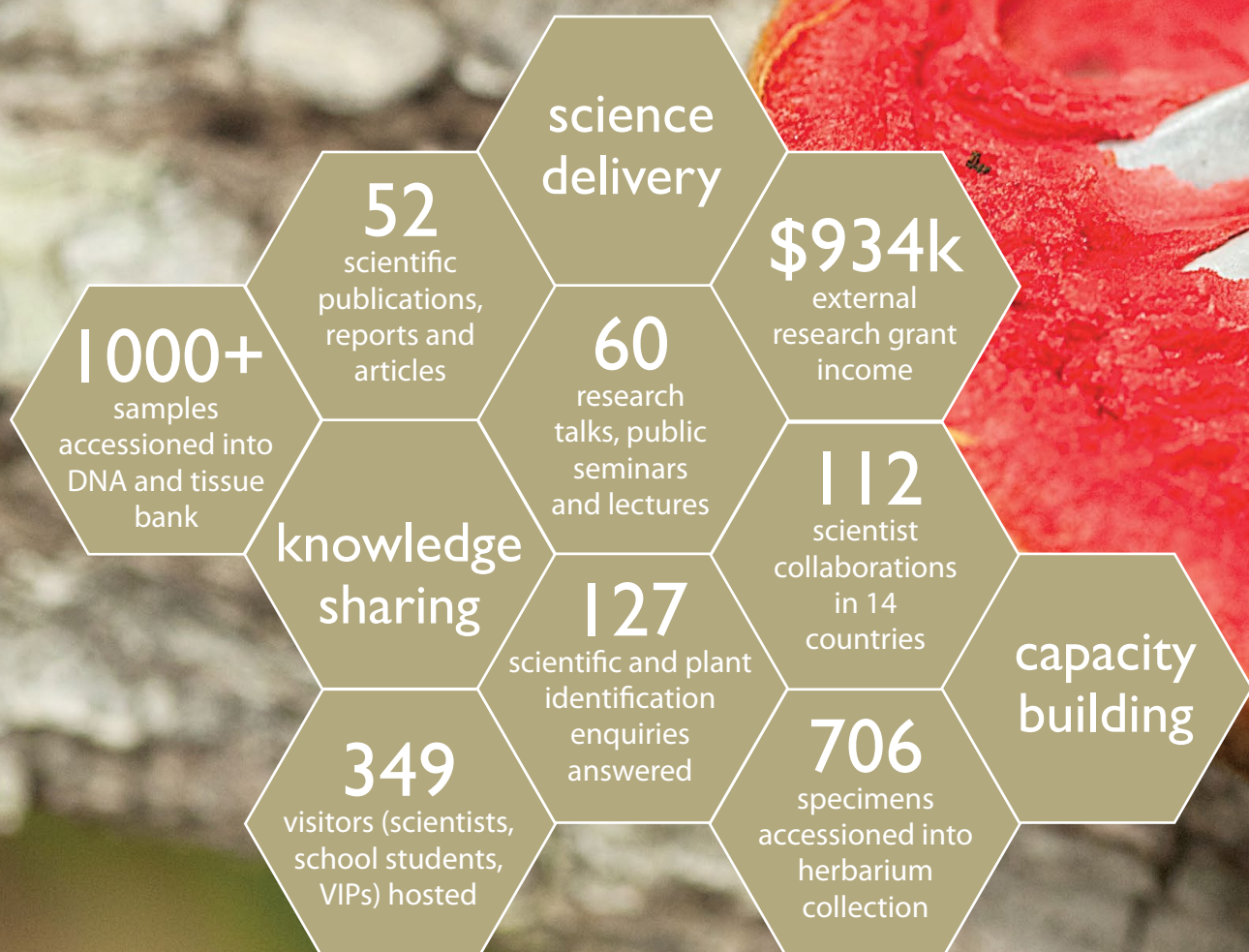
PLANT SCIENCE AT THE
AUSTRALIAN TROPICAL HERBARIUM 2019

IMPACT STORY

DIY RAINFOREST PLANT IDENTIFICATION FOR EVERYBODY

The study, use, and conservation of rainforest plants depends on being able to quickly and accurately identify the species. The tools and skills required are rarely widely available to the public, however. In response, we have built an online, free-to-use, identification system that allows anyone, anywhere to easily identify Australian tropical rainforest plants. The 'Rainforest Key' is used worldwide by thousands of different people every month, supporting research, understanding, management and enjoyment of these unique plants and the ecosystems they comprise.

Access the key at http://www.anbg.gov.au/cpbr/cd-keys/RFK7/key/RFK7/Media/Html/index_rfk.htm



CONTENTS

Summary of Achievements 2019	2
Discoveries Making a Difference	3
Science Delivery–Local to Global	12
Sharing our Knowledge	13
Scientific Collections	14
Publications	15
Our History	19
Our People	20

The Australian Tropical Herbarium (ATH) is a joint venture of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Commonwealth Director National Parks (DNP), Queensland Department of Science and Environment (DES), and James Cook University (JCU). The ATH is located on the Cairns campus of JCU, and administratively is part of JCU's Division of Tropical Environments and Societies.

The ATH's vision is to be a leader in tropical plant biodiversity research that conducts diverse, relevant and innovative research; translates that research into useful products; offers training, inspiration and engagement with the community; and, by collaborating with others, achieves a greater understanding of sustainable tropical systems.

The ATH Board oversees the operations of the ATH and sets overall strategic management policy and objectives. The Board comprises two representatives of each of the joint venture participants, and an independent Chair.



Mr. Peter Cochrane,
Chair, Australian Tropical
Herbarium Board



Dr. Linda Broadhurst,
Director, Centre for Australian
Plant Biodiversity Research



Dr. Andrew Young,
Director, National Research
Collections Australia CSIRO



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Deputy Director, Queensland
Dept. Environment and Science



Dr. Gordon Guymer,
Director, Queensland Herbarium,
Queensland Dept. Environment
and Science



Prof. Darren Crayn
Director, Australian Tropical
Herbarium

We acknowledge Aboriginal and Torres Strait Islander People as the first inhabitants of the nation and acknowledge Traditional Owners of the lands where our staff, students, and associates live, learn and work.

SUMMARY OF ACHIEVEMENTS 2019

SCIENCE DELIVERY – LOCAL TO GLOBAL

Our science was communicated broadly through:

- 35 peer-reviewed publications
- 1 thesis
- 2 web resources
- 14 reports and general articles
- 41 research seminars
- 20 public talks and lectures.

This science was supported in part by:

- \$934,000 external research grant income
- collaborations with 112 scientists in 14 countries.

SHARING OUR KNOWLEDGE

ATH staff shared our knowledge through:

- training and knowledge sharing workshops delivered to Indigenous groups in north Queensland
- plant identification training delivered through workshops to the public and to government and industry stakeholders
- hosting 274 public visitors participating in school, public and professional group tours;
- hosting 39 scientists undertaking research at the ATH
- 36 representative and leadership roles on international, national, and local bodies
- communicating through numerous media items including radio, newspaper, Facebook and Twitter.

BUILDING, IMPROVING AND MOBILISING OUR COLLECTIONS

- 706 herbarium specimens incorporated into the collections, 4,077 collection records edited and 3,229 specimens re-determined
- c. 1000 samples incorporated into the DNA and Tissue Bank, which now contains over 22,000 samples
- over 7 million specimen records downloaded in more than 34,000 download events by a range of external user groups through the Atlas of Living Australia portal (ala.org.au).

The ATH thanks its many wonderful volunteers for their valuable contributions to our specimen processing, field and research programs.



Native turmeric (*Curcuma australasica*) a north Queensland plant of Indigenous cultural significance. Photo: G. Turpin.

DISCOVERIES MAKING A DIFFERENCE

KEEPING INDIGENOUS PLANT KNOWLEDGE ALIVE

Plants have been at the centre of Indigenous cultures for millennia, and Traditional Owners are custodians of profound knowledge of the properties and uses of plants. The Tropical Indigenous Ethnobotany Centre (TIEC) partnership, based at the ATH, works through mutually beneficial partnerships with Traditional Owners to research traditional use of plants. Knowledge flow is two-way: Traditional Owners are empowered to keep their knowledge strong and to participate in and benefit from new discoveries. Visit www.tiec.org.au

Exemplar project - Mbabaram traditional plant use research. Project Leader – Mr Gerry Turpin.

This collaborative project involving the Watsonville Aboriginal Corporation and the Australian Institute for Tropical Health and Medicine (AITHM) is investigating the potential of medicinal plants of the Mbabaram people to provide drug leads for the treatment of inflammatory disease. TIEC, with assistance from Mbabaram Traditional Owners, will collect and prepare plant materials used in traditional medicines for analysis by AITHM under agreement.



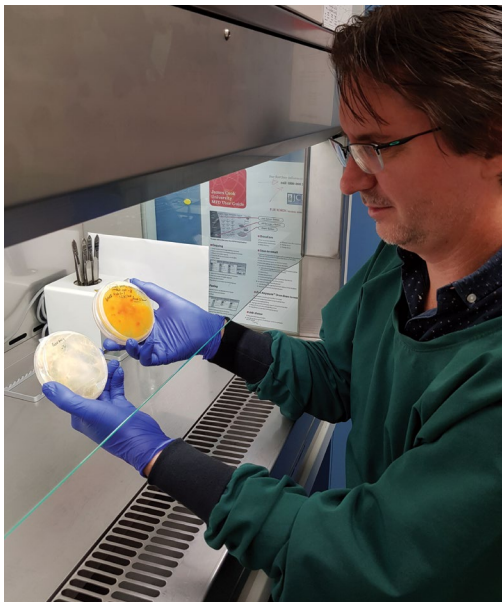
Mbabaram man, TIEC manager and Ethnobotanist Gerry Turpin, and Yidinji woman and Research Assistant Nyoka Hrabinsky.



One of the worst tropical polypore pathogens, *Pyrrhoderma aff. noxium*, on a recently-killed Hoop Pine (*Araucaria cunninghamii*) in a plantation near Cairns. Photo: M. Barrett.

UNDERSTANDING PATHOGENS

Managing plant diseases in natural and managed environments such as farms and nurseries requires knowledge of the pathogens that cause them. Vigilant border security, efficient early detection and rapid suppression are the primary weapons protecting Australian industry and environment from non-native diseases. Research by ATH scientists is helping document the diversity of pathogens, enable their rapid identification, and understand their ecological interactions with plants and insects.



Research Scientist Matt Barrett examining fungal cultures in the laboratory. Photo: M. Newton.

Exemplar project – Polypore pathogens. Project Leader – Dr Matt Barrett.

Bracket fungi with a pored hymenium (polypores) are ubiquitous wood-rotting fungi, providing primary wood recycling and hollow formation services in all woodlands and forests. A proportion of species are pathogenic, causing forestry losses, death of significant trees, or limb drop in public spaces. Despite their importance, Australian polypores are little studied. The number of Australian pathogenic species, host range, and risks to forestry and public liability are unknown or poorly understood. This project is providing new information systems for Australian polypores, including systematic identification of novel species and genera using both morphology and DNA barcoding, identification of new pathogens, and a re-interpretation of past data. The results will contribute greater precision in identifying wood decay diseases, improve detection of potential pathogens at border control points, and guide future studies of pathogenicity.



Senior Botanist Dr Ashley Field collecting lycophytes for research.

DISCOVERING NEW SPECIES

Herbarium collections are the real frontiers of plant species discovery – most new species are discovered not by intrepid explorers in wild and remote places, but by scientists working painstakingly on existing, understudied collections. ATH scientists have named over 50 new species of plants and fungi in the last 10 years including wild relatives of lilly-pillies, melons, mangosteens, heathers, quandongs and truffles, and are currently working on many more. The potential utility of plants and fungi to humans (for fibre, fuel, food, medicine or amenity), their role in the environment, and their conservation can only be addressed once they have been discovered, named and accurately classified.

Exemplar project – Evolutionary diversity of ferns and lycophytes.

Project Leader – Dr Ashley Field.

In contrast with many flowering plants, lineages of ferns and lycophytes are often very widespread, linking floras all around the world. Australian ferns and lycophytes are very diverse. Some show Gondwanan and Oceanian affinities, whereas others have apparently arrived recently by long distance dispersal from the Western Palaeotropics and the Neotropics. Research at the ATH has linked into a worldwide network of fern and lycophyte scientists to study the global evolutionary history of ferns and lycophytes from their deep time origins to recent diversification processes that are critical to their survival. New species are described as they are found.



Schizaea dichotoma, member of an ancient fern lineage. Photo: A. Field.



Principal Botanist Dr Eda Addicott surveying Vegetation on Cape York Peninsula. Photo: M. Newton

MAPPING AND MEASURING OUR BIODIVERSITY HERITAGE

Land use decision-making such as conservation reserve selection and management is based upon assessments of vegetation type and condition, threat, rarity and importance. We are contributing substantially to the evidence base for such decisions in northern Australia through mapping of Regional Ecosystems as well as identification of hotspots of biodiversity. For the latter, we are applying novel assessment methods that incorporate measures of evolutionary distinctiveness, which enables better management for a range of predicted, and unforeseen, environmental futures.

Exemplar project - Regional Ecosystem Mapping. Project Leader – Ms Eda Addicott.

The Queensland Herbarium’s Regional Ecosystems (RE) Mapping Program is an extensive survey, mapping and monitoring program of the State. The RE maps, which show pre-clearing, remnant vegetation and regional ecosystems, are important tools for governments, landholders and scientists to plan and manage the natural environment, developments and vegetation restoration. ATH staff have developed and successfully tested a new standard vegetation classification methodology for Cape York Peninsula (CYP). This method was implemented across the Gulf Plains and North West Highlands Bioregions. Future work aims to implement this across other bioregions mapped by ATH staff (Einasleigh Uplands and Wet Tropics) and the rest of Queensland. The rollout of this new methodology is improving the robustness, repeatability and transparency of Regional Ecosystem mapping methodology and fundamentally strengthens the evidence base for the regulation of land use in Queensland, including clearing, conservation and restoration.



Senior Technical Officer Mark Newton (seated) travelling from a survey site on Stanley Island, north Queensland. Photo E. Addicott.

ENVIRONMENTAL BIOSECURITY

The plant biosecurity group develops basic and applied research programs to understand the ecological traits (e.g. seed ecology) evolutionary processes (e.g. polyploidy) that cause introduced plants and fungi to become invasive, and how that knowledge can be better used to reduce their impact on the environment and agriculture. We have a broad range of national and international collaborators, allowing for cross-continental studies of species of interest. We offer our capabilities to the public and private sector, and help to design and to develop case-specific targeted studies. We also develop outreach activities to promote public awareness about good land management practices.

Exemplar project – Sicklepod ecology, evolution, and management.
Project leader – Dr Daniel Montesinos

Sicklepod (*Senna obtusifolia*) is a highly invasive weed in 67 countries. In the Australian tropics it poses a serious threat to farming and to the environment, and climate change is expected to expand its current distribution even further. We are studying the morphology, physiology, and seed ecology of sicklepod from populations along a latitudinal and climatic gradient on Cape York Peninsula, to understand which populations along that gradient are better adapted to increased temperatures, and which traits are providing that ability to survive and spread under warmer and drier conditions. Seeds of this species can remain dormant in the soil for up to 20 years, making control a difficult, long term problem. To address this, we are studying how prescribed and traditional burning practices can kill seeds or trigger mass germination, depleting the soil seed bank. Our research sheds light on the morphological and physiological mechanisms that non-native weeds use to invade, and provides cost-effective management tools targeting key traits (like germination).



Sicklepod seeds. Photo: A. Zuzuarregui.



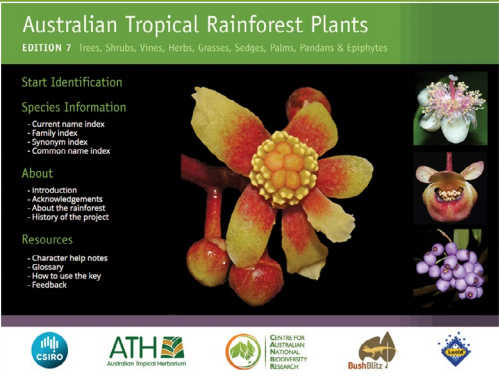
Senior Research Fellow Dr Daniel Montesinos collecting sicklepod (*Senna obtusifolia*) seeds for glasshouse experiments. Photo: A. Zuzuarregui.

PROVIDING USEFUL TOOLS FOR THE COMMUNITY

A vast amount of information on the ecology, biology, uses and conservation status, of Australia's native plants has been compiled through over 240 years of Western scientific endeavour, and thousands of years of experimentation by Indigenous Australians. This wealth of knowledge can greatly improve our ability to sustainably manage our biodiversity, but can only be utilised if the species name is accurately determined. Knowledge for identifying plants can be very difficult to access by non-specialists as it is often highly technical, expensive and held in distant libraries. The development and deployment of web-based interactive identification systems and apps targeted at the non-specialist enables almost anybody, anywhere to identify and learn about Australia's flora. This helps all community sectors to achieve their land and environmental assessment, management, educational, scientific and recreational goals. Principal beneficiaries include the resources, agricultural and horticultural industries, Indigenous land managers, private and public conservation estate managers, students, tourists, and scientific researchers.

Exemplar project – Australian Tropical Rainforest Plants Identification System.
Project Leader – Mr Frank Zich.

The 7th edition of the Australian Tropical Rainforest Plants identification system was released in late 2018 as an easy to use, free, online system that enables almost anybody, anywhere to identify over 2700 species of tropical rainforest plants in Australia. The uptake by the user community has been overwhelming – over 2,000 users and up to 13,000 page visits per month. The 7th edition extended the geographical coverage to include the whole of the Australian tropics. A key to Australia's tropical ferns is being developed, and the team is working to initiate an even more exciting project: the Australian Savanna Plant Identification System.



Front page of the online Australian Tropical Rainforest Plants identification system.



Collections Manager Frank Zich in the field.

PREDICTING BIODIVERSITY IMPACTS OF ENVIRONMENTAL CHANGE

Predicting the impacts that environmental change will have on biodiversity is critical to ensuring we manage for its survival. We are leading projects that are determining the nature and extent of climate change threats to the plant species of tropical mountains, many of which are found nowhere else on Earth.



Project leader Stuart Worboys enjoying a break from fieldwork on Bell Peak, north east Queensland, Australia. Photo: D. Crayn.

Exemplar project – Mountain plant conservation.

Project Leader – Mr Stuart Worboys.

Herbarium collections provide important information about plant distributions and therefore about the environmental requirements (niches) of species. By combining data from existing collections with extensive new field survey data for species distribution modeling analyses and climate tolerance experiments, we are predicting the impact of climate change on the rare and endemic plant species of Australia's tropical mountain tops, and taking precautionary action to secure them in ex-situ living collections in partnership with seven public botanic gardens, and two seed banks.



Rhododendron lochia, one of only two Australian native Rhododendrons, which is restricted to the mountains of Queensland's Wet Tropics. Photo: D. MacLeod.

PIECING TOGETHER THE ORIGINS AND EVOLUTION OF AUSTRALIA'S FLORA

From where did our flora come? How has it evolved? How will it adapt to environmental change? ATH researchers are using genetic analysis to peer into the past and discover the origins of some of our most unique flora such as orchids, fungi, ferns, and quandongs. Piecing together the evolutionary pathways of lineages from their deep time origins to the modern-day species enables a better understanding of not only how organisms evolve, but how and why ecosystems change through time. This knowledge is essential to predict how species might adapt in a changing world.

Exemplar project – The Sunda-Sahul Floristic Exchange. Project Leaders – Ms Elizabeth Joyce and Prof Darren Crayn.

Understanding the processes that generate and maintain biodiversity in tropical ecosystems is vital for informing conservation decisions. The southeast Asian archipelago is one of the most biogeographically interesting places on Earth. It lies at the convergence of the Sunda and Sahul continental shelves, which collided from about 23 million years ago allowing plant species to migrate between previously isolated Sundanian and Sahulian floras. This study uses molecular phylogenies of multiple lineages to determine the dynamics of this exchange through time, and to better understand how it contributed to the assembly and evolution of the floras of Asia, Australasia and the Pacific.



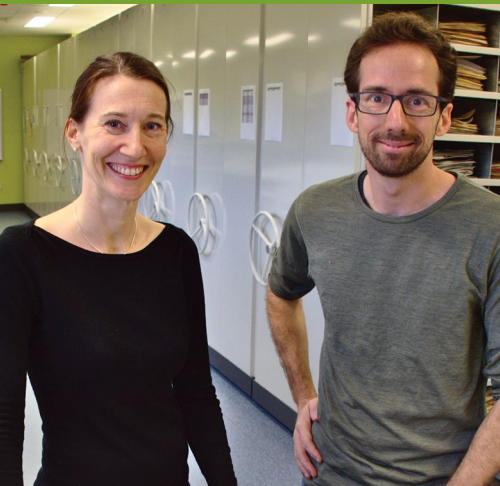
Ipomoea pes-caprae, a common tropical shoreline plant. Photo: A. Lim.



PhD student Elizabeth Joyce examining Australian pitcher plants on Cape York Peninsula. Photo: S. Prober.

BUILDING USEFUL CLASSIFICATIONS

Biological classifications, or taxonomies, are systems for ordering knowledge of the relationships among organisms and governing the scientific naming of them. Classifications and names are the way we communicate about organisms both in science and in daily life, and like a well-organised library, an accurate classification improves the efficiency and quality of research and communication. ATH scientists are using their discoveries to refine plant classifications, ensuring that they reflect the most accurate and up-to-date knowledge.



Research Scientist Dr Katharina Nargar and Postdoctoral Research Fellow Dr Lars Nauheimer, leaders of the orchid research team. Photo: S. Worboys.



A ground orchid, *Thelymitra atronitida*. Photo: L. Nauheimer.

Exemplar project – Collection genomics of Australian orchids.

Project Leader – Dr Katharina Nargar.

Australia harbours a rich and highly distinctive orchid flora, however many orchid species are rare and threatened in nature. ATH scientists extract genomic data from existing herbarium collections, some several decades old, to assemble the genealogy of Australia's orchids. In 2019, the project team generated genomic data for over 1,400 Australian orchids, resulting in a near complete inventory of Australia's orchid diversity. Our collection genomics research provides a rigorous scientific evidence base for re-examining controversial taxonomies in order to improve our orchid classification at higher taxonomic levels (e.g. at genus level) as well as to answer questions about species, such as "how many different species does this group of similar-looking plants contain?"

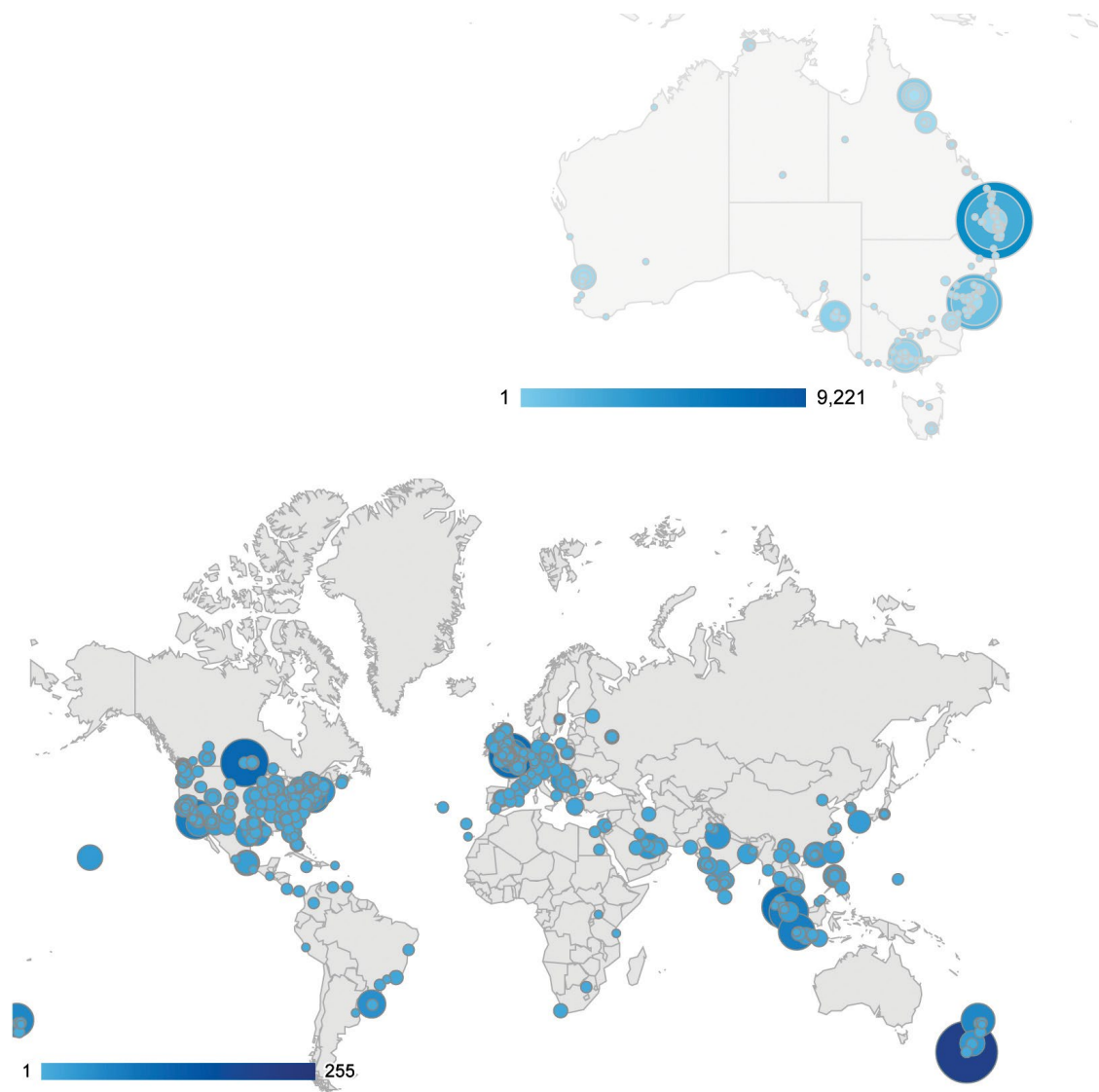
SCIENCE DELIVERY—LOCAL TO GLOBAL

Science at the Australian Tropical Herbarium is improving knowledge of plants in northern Australia. Key programs include Regional Ecosystem mapping of the Cape York, Einasleigh Uplands and Wet Tropics Bioregions, research on traditional plant use by north Queensland Indigenous peoples, and the provision of identification resources for Australia's tropical flora.

Beyond Australia, ATH staff and students work with researchers around the world on problems of local to global relevance. Our research is undertaken with colleagues on almost all continents including in Brazil, China, Denmark, Estonia, France, Indonesia, Japan, New Zealand, Papua New Guinea, Sweden, UK, USA and Vanuatu. Institutional relationships through organisations such as the Council of Heads of Australasian Herbaria provide further collaborative partnerships.

Global programs to which the ATH contributes include Global Plants, the world's largest community-contributed database used by students and researchers worldwide (plants.jstor.org). Through Global Plants, herbaria share high quality images of their plant Type specimens, experts determine and update plant names, and students discover and learn about plants in context, supporting research and teaching in botany, ecology and conservation.

ATH research has global impact: our scientific publications have been cited thousands of times by researchers all over the world, and the Australian Tropical Rainforest Plants online identification system website receives around 15,000 hits per month, many from outside of Australia.



Maps showing the national (top) and global usage of one ATH product, the Australian Tropical Rainforest Plants online identification system.



SHARING OUR KNOWLEDGE

COMMUNITY ENGAGEMENT, SERVICE, AND REPRESENTATIVE ROLES

ATH staff share their botanical expertise in many ways. We regularly give community talks and lectures on our research and other topics of current interest in Australia and overseas, we teach University plant science as well as giving talks to primary and secondary school groups and TAFE classes, and we host herbarium tours and talks for a broad range of stakeholder groups.

Through the Rainforest Plant Identification Courses, we deliver, in partnership with the Wet Tropics Management Authority, workshop-style tuition in the skills and resources needed to identify both native and weedy plant species in the rainforests of the Wet Tropics. The many past participants include environmental professionals, rangers, students and interested public.

ATH staff have delivered many other workshops to community and professional groups on such diverse topics as plant pathogens, fire in the landscape, techniques for documenting cultural plant use, and plant classification.

We also provide a plant identification service which supports professionals in the commercial and not-for-profit sectors, as well as members of the public and students. We maintain a Public Reference Collection of authoritatively identified plant specimens that is free to use, and allows students, consultants and others to identify and learn about north Queensland plants.

In 2019 ATH staff also provided leadership and advisory roles on 36 representative bodies, including various Councils, Advisory and Scientific Committees and Reference Groups for Commonwealth, State and Local Governments, not-for-profit groups and societies, and the IUCN.



Botanist Stuart Worboys delivering plant identification training in the field.



Taxonomist Raelee Kerrigan curating the herbarium collection. Photo: A. Lim.

SCIENTIFIC COLLECTIONS – FOUNDATIONAL INFRASTRUCTURE

Biodiversity science is enabled by research collections of expertly curated biological specimens. Such collections constitute an authoritative storehouse of information about biodiversity and underpin taxonomic, genetic, agricultural and ecological research - making these vital resources for conservation and the development of sustainable land and marine management systems.

The ATH boasts extensive research collections housed in facilities that are the state-of-the-art for preservation and research. The research herbarium comprises more than 180,000 pressed, dried plant specimens. The 'wet' collection of more than 17,300 samples preserves the soft parts of plants (e.g. fruits) in fluids for anatomical and other studies. A wood block collection enables research on the structural and functional properties of wood. Our DNA and tissue collection of about 22,000 samples representing over 3,000 species is the foundation of studies on genetics and evolutionary biology. Several thousands of specimens and samples are added each year to the ATH collections as a result of research activities.

HERITAGE COLLECTIONS

Among the ATH collections are items of immense scientific and cultural significance. These include three of the original botanical specimens collected in 1770 at the Endeavour River (now Cooktown) by Joseph Banks and Daniel Solander, botanists on Cook's first circumnavigation of the globe (1769-1772).

Other important items include over 18,200 collections of B.P.M. (Bernie) Hyland, the eminent and pioneering botanist of Australia's northern rainforests, 9,300 collections of Bruce Gray, and orchid specimens from the collection of Alec Dockrill.



Laboratory Manager Melissa Harrison curating the genetic sample collection.



An herbarium specimen held in the ATH collection. Photo: F. Zich.

PUBLICATIONS

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Silcock JL, Field AR, Walsh NG, Fensham RJ (2019) To name those lost: Assessing extinction likelihood in the Australian vascular flora. *Oryx* 1–11.

Speed JDM, Skjelbred IÅ, Barrio IC, Martin MD, Berteaux D, Bueno CG, Christie KS, Forbes BC, Forbey J, Fortin D, Grytnes J-A, Hoset KS, Lecomte N, Marteinsdóttir B, Mosbacher JB, Pedersen ÅØ, Ravolainen V, Rees EC, Skarin A, Sokolova N, Thornhill AH, Tombre I, Soininen EM (2019) Trophic interactions and abiotic factors drive functional and phylogenetic structure of vertebrate herbivore communities across the Arctic tundra biome. *Ecography* 42, 1152–1163.

Testo WL, Field AR, Sessa EB, Sundue M (2019) Phylogenetic and morphological analyses support the resurrection of *Dendroconche* and the recognition of two new genera in Polypodiaceae subfamily Microsoroideae. *Systematic Botany* 44, 1–16.

Thornhill AH, Crisp MD, Külheim C, Lam KE, Nelson LA, Yeates DK, Miller JT (2019) A dated molecular perspective of eucalypt taxonomy, evolution and diversification. *Australian Systematic Botany* 32, 29–48.

Venter S (2019) *Psychotria corrugata* (Rubiaceae, Psychotrieae), a new species from the Hindenburg Wall, Western Province, Papua New Guinea. *Australian Systematic Botany* 32, 134–138.

Wannan BS (2019) New records of *Lindernia s.l.* (Linderniaceae) for eastern Australia. *Australian Systematic Botany* 32, 123–133.

Whitehead MR, Sherwin WB, Crayn D, Rossetto M (2019) A predominantly southern distribution conceals a northern reservoir of diversity in a wet sclerophyll tree. *Australian Journal of Botany* 67, 455–462.

THESES

Weigner N (2019) Resolving complex evolutionary relationships in the carnivorous plant genus *Nepenthes* L.: a phylogenomic approach. B.Sc. Hons., College of Science and Engineering, James Cook University.

GENERAL PUBLICATIONS AND REPORTS (UN-REFEREED)

Bilgin G (2019) Science @ Your Fingertips: An evidence-based use of social media for science communication. Final Report, 2019 CSIRO Vacation Scholar Program.

Field AR (2019) The distribution, habitat, ecology and *ex situ* conservation of the Critically Endangered Mossman Fairy Orchid *Oberonia attenuata* (Orchidaceae). Report to the Commonwealth Department of Environment and Energy.

Field AR, Greenfield M, Pintor A, Volp T (2019) The distribution, habitat and ecology and *ex situ* cultivation of the Vulnerable ant-house-plant *Myrmecodia beccarii* (Rubiaceae). Report to the Commonwealth Department of Environment and Energy.

Hannah P (2019) *Flacourtia* sp. Shiptons Flat, it's delicious, but is it a new species? Final Report, 2019 CSIRO Vacation Scholar Program.

Joyce EM (2019) *Geosiris* is an early contender for Sexiest Plant of 2019. *The Conversation* Jan. 25 2019. <https://theconversation.com/geosiris-is-an-early-contender-for-sexiest-plant-of-2019-109889>

Lepschi B, Gueidan C, Fuchs A, Schmidt-Lebuhn A, Nargar K (2019) CANBR External Review 2020: Team Leader Reports. Internal Report, Center for Australian National Biodiversity Research, Canberra. 58 pp.

Maclean K, Woodward E, Jarvis D, Martin P, Rist P, Rowland D, Turpin G, Bara S, Beames L, Channing P, Clarke C, Eather N, Hartley F, Muriata A, O'Meara L, Robinson D, Sands N, Sellars M, Shovellov J, Sibosado D, Thompson S, Williams L, Wells R, Yelland S (2019) Building the Traditional Owner-led Bush Products Sector: Workshop report. CSIRO, Australia.

Nargar K, Crayn D, Field A, Clarkson J, Zich F (2019) Biodiverse Futures – systematics in a changing world: ASBS Conference 2020 in Cairns. *Australasian Systematic Botany Society Newsletter* 181: 71

Newton M, Worboys S, Addicott E (2019) Vegetation survey on Wuthathi Aboriginal Trust Lands - Proposed development on Wuthathi Aboriginal Trust land, Cape York Peninsula: Survey for protected plants and vegetation communities. Report.

O'Hara K (2019) Orchid phylogenomics: evolution of the Greenhood orchids (subtribe Pterostylidinae) in space and time. Final Report, 2019 CSIRO Vacation Scholar Program.

Perkins J (2019) Phylogenomic insights into the evolution of the Diurideae (Orchidaceae). Final Report, 2019 CSIRO Vacation Scholar Program.

Pollock A, Newton M, Addicott E (2019) Great Barrier Reef Priority Islands 1:25,000 Scale Regional Ecosystem Mapping Project – Mapping important Great Barrier Reef Islands within northern Queensland for National Park management. Brisbane, Queensland Government.

Simpson L (2019) How biogeography has shaped orchid biodiversity. *Australian Native Orchid Society Victoria Bulletin* 52: 5.

Venter S, Crayn D (2019) Preliminary Botanical Survey of Pomio. Report to JCU-UNDP project.

RESEARCH TALKS, COMMUNITY PRESENTATIONS AND LECTURES (PRESENTER UNDERLINED)

Addicott E (2019) A new classification approach: improving the Regional Ecosystem classification system in Queensland, Australia. PhD pre-completion seminar, JCU Cairns.

Addicott E (2019) Supervised versus un-supervised classification: A quantitative comparison of plant communities in savanna vegetation. Queensland Herbarium, Department of Environment and Science.

Addicott E (2019) What are Regional Ecosystems? And – a bit about heaths. QPWS, Heathlands National Park.

Addicott E (2019) Evaluating the RE system of Queensland. Ecological Society of Australia conference.

Barrett M (2019) Fungi and the Sahul-Sunda exchange. TESS seminar series, JCU Cairns. <https://mediasite.jcu.edu.au/Mediasite/Play/2f5748cc17864490a6b6ebe022576b5d1d>

Bilgin G (2019) Science @ Your Fingertips: An evidence-based use of social media for science communication. CSIRO Summer Scholar Symposium, Canberra.

Clements M, Howard C, Busby C, Nauheimer L, Nargar K (2019) The eastern underground orchid *Rhizanthella slateri* (Diurideae) – biology, phylogeny and conservation. 7th International Orchid Conservation Congress, London.

Crayn D (2019) Climate and Wet Tropics montane endemic plants. Centre for Tropical Environmental and Sustainability Science, Climate Flagship meeting.

Crayn D (2019) The past informs the future: evolutionary and biogeographical history, and management of Australia's tropical flora. Queensland Herbarium, Brisbane.

Crayn D (2019) Botany of the Endeavour River. Public tour commentary, Cooktown, June 14.

Crayn D (2019) Dark biodiversity. Pint of Science, Macalister's Brewery, Smithfield, May 21. <https://pintofscience.com.au/event/planet-of-the-plants>

Crayn D (2019) Dark biodiversity. St Andrews School, Yr 7 science class, May 27.

Crayn D (2019) In the footsteps of Banks and Solander. guided public walk commentary, Cooktown, Jun 15.

Crayn D (2019) Plant Rant – monthly segment on ABC Far North radio with Adam Stephen.

Crayn D (2019) TEDx – The Dark Matter of Biodiversity. Cairns (JCU), Nov 9. https://www.ted.com/talks/darren_crayn_the_dark_matter_of_biodiversity

Crayn D, Addicott E, Barrett M, Joyce E (2019) Diversity of tropical forests and woodlands – from genes to biomes. 44th New Phytologist Symposium – Determinants of Tropical Vegetation Structure and Function, Accra, Ghana. [invited]

Crayn D, Worboys S, Guja L, Sommerville K, Singh-Ramesh A, Davis D. (2019) Securing a future for Australia's climate-threatened endemic tropical montane flora. ASBS 2019 conference, Wellington, New Zealand.

Field A (2019) UneXtinct - James Cook University undergraduate lecture.

Field A (2019) UneXtinct. TESS seminar series, JCU Cairns. <https://mediasite.jcu.edu.au/Mediasite/Play/89092cdeff9f402a8b209e8b29ba25881d>

Field A (2019) UneXtinct. ASBS 2019 conference, Wellington, New Zealand.

Field A (2019) UneXtinct – Pechakucha talk, Cairns <https://www.pechakucha.com/presentations/the-unextinction-discovery>

Gardiner S, Wiedow C, Deng C, Kirk C, Grande A, Begg S, Hall B, Rouse A, Worboys S, Crayn D, MacKay M (2019) Vulnerable Australian rhododendrons – one or two species? ASBS 2019 conference, Wellington, New Zealand.

Guja L, Crayn D, Taylor D, Stevens A, Sommerville K, Makinson B (2019) Recent conservation initiatives: Partnerships protecting plants. BGANZ Victoria Network Meeting, Melbourne.

Hannah P (2019) *Flacourtia* sp. Shiptons Flat, it's delicious, but is it a new species? CSIRO Summer Scholar Symposium, Canberra.

Joyce EM, Thiele K, Crayn D (2019) The lines don't matter for plants! Insights into the Sunda-Sahul Floristic Exchange from floristic patterns. *James Cook University College of Science and Engineering Postgraduate Seminar*, Cairns, Australia.

Joyce EM, Thiele K, Crayn D (2019) Exchange insights from floristic composition across the Sunda-Sahul Convergence Zone. *Centre for Biodiversity Analysis Crossing Lines Synthesis Group Meeting*, Canberra, Australia.

Kennedy H, Telford I, Andrew R, Crayn D, Bruhl J (2019) Revising *Melichrus*; A deep dive into the past, present and future of the urn heaths. ASBS 2019 conference, Wellington, New Zealand. *WINNER Pauline Ladiges Prize for Best Student Talk

Montesinos D (2019) Biological invasions as model systems to understand evolutionary ecology. TESS seminar series, JCU Cairns. <https://mediasite.jcu.edu.au/Mediasite/Play/e6dbd8f3bcd4489d8e890e623b83aa531d>

Montesinos D (2019) The biogeography and ecology of allelopathy and chemical defences. Graham Centre for Agricultural Innovation, Charles Sturt University, Wagga Wagga.

Montesinos D (2019) Plant invasive biogeography, or the need to study invasives in their native and non-native ranges. Australian Biosecurity Symposium, Gold Coast.

Montesinos D (2019) The biogeography of domesticated plants and animals, and the importance of biosecurity. 1h lecture/game/activity with 23 children in Grade 2, Trinity Beach State School-Tropical Learning Academy. Queensland, Australia.

Nargar K (2019) How to become a DNA researcher. Benalla College Victoria, interview with year 12 biology class (videoconferenced)

Nargar K (2019) ASBS 2020: Biodiverse Futures – Systematics in a changing world. Australasian Systematic Botany Conference, Wellington, New Zealand.

Nargar K (2019) Evolution of Australia's orchid diversity, threats and conservation. TESS seminar series, JCU Cairns.

Nargar K, Simpson L, Wagner N, Nauheimer L, McLay T, Broadhurst L, Roberston G, Clements M (2019) Genomic diversity in Australian orchid complexes and its implications for taxonomy and conservation. 7th International Orchid Conservation Congress, London.

Nargar K, Wagner N, Perkins J, Nauheimer L, Bent S, Clements MA (2019) Evolution of Australia's terrestrial orchid diversity in space and time: Phylogenomic insights from tribe Diurideae. ASBS 2019 conference, Wellington, New Zealand.

Nauheimer L, Clements MA, Micheneau C, Peakall R, Wong D, Nargar K (2019) Insights into the reticulate evolution of the sun orchids (*Thelymitra*, Orchidaceae): Resolving parental lineages using target capture and haplotype phasing. ASBS 2019 conference, Wellington, New Zealand.

Nauheimer L (2019) Complex relationships in the sun orchids. TESS Annual Science Conference, Cairns.

Nauheimer L, Clements M, Crayn D, Nargar K (2019) Assessing species delimitation in the south-western Australian *Thelymitra fuscolutea* complex (Orchidaceae). 7th International Orchid Conservation Congress, London. [Poster]

Nauheimer L (2019) Complex relationships in the sun orchids. TESS Annual Conference, Cairns.

O'Hara K (2019) Orchid phylogenomics: evolution of the Greenhood orchids in space and time. CSIRO Summer Scholar Symposium, Canberra.

Perkins J (2019) Phylogenomic insights into the evolution of Australia's terrestrial orchids: tribe Diurideae. CSIRO Summer Scholar Symposium, Canberra.

Simpson L, Clements M, Orel H, Crayn D, Nargar K (2019) Spatio-temporal evolution of Asian and Australasian *Bulbophyllum* (Orchidaceae). ASBS 2019 conference, Wellington, New Zealand.

Simpson L (2019) How biogeography has shaped orchid diversity. Orchid Society Melbourne, invited talk.

Turpin G (2019) The Tropical Indigenous Ethnobotany Centre. Tablelands Regional Council, Ideas after Dark, Atherton, Queensland.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre, Australian Aboriginals. Putney, Vermont, USA, community talk.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre. Community talk at Back to the Bone, Watsonville, Queensland.

Turpin G (2019) Vegetation community identification and data collection, plant identification and collection, ethnobotanical plants. National Indigenous Fire Workshop, Yorta Yorta, Barmah Forest, Echuca, Victoria.

Turpin G (2019) Vegetation community identification and data collection, plant identification and collection, ethnobotanical plants. National Indigenous Fire Workshop, Ewamian Aboriginal Corporation, Tallaroo Station, Queensland.

Turpin G (2019) The Tropical Indigenous Ethnobotany Centre, and the importance of collection, documentation and preservation of Indigenous languages, using the Miromaa database program. Miromaa Language and Technology Conference, Darwin.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre, Indigenous Biocultural Knowledge, Indigenous Engagement and Intellectual Property (Biodiscovery Act, Nagoya Protocol). Indigenous Knowledge for the Environmental Science Curriculum Workshop, University of Queensland, St Lucia.

Turpin G (2019) Cultural Burning: History and Present. Indigenous Knowledge for the Environmental Science Curriculum Workshop, University of Queensland, St Lucia.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre, Australian Aboriginals. Student Lecture. Yale University, New Haven, Connecticut.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre, The Biodiscovery Act, Nagoya Protocol, Intellectual Property and Indigenous Engagement. University of Queensland, St Lucia. Guest lecture.

Turpin G (2019) Tropical Indigenous Ethnobotany Centre, Australian Aboriginals. Student Lecture. University of Connecticut, Storrs, CT, USA.

Turpin G (2019) Contemporary issues for Indigenous Australians; Ethnobotany Centre; Indigenous Engagement; Intellectual Property including Queensland's Biodiscovery Act and Nagoya Protocol. Guest Lecture, Class subject IA1012 Indigenous People of North Queensland, JCU, Smithfield.

Weigner N (2019) Resolving complex evolutionary relationships in the carnivorous plant genus *Nepenthes* L.: a phylogenomic approach. Honours final seminar, JCU.

Weigner N, Nauheimer L, Nargar K, Crayn D (2019) Promiscuous pitcher plants. A phylogenomic investigation of *Nepenthes* systematics and introgression. ASBS 2019 conference, Wellington, New Zealand.

Worboys S (2019) Monitoring *Phytophthora* impacts in Queensland's Wet Tropics. Ecological Society of Australian annual conference, Launceston, Tasmania. [poster and speed talk].

Zich F (2019) Australian Tropical Rainforest Plant Identification System: 7th Edition (RFK7). National Collections and Marine Infrastructure (NCMI) Forum, CSIRO, Canberra.

Zwick A, Fisher N, Nicholls J, Nargar K, Appleyard S (2019) Mobilising collections through genomics. Environomics Future Science Platform, Science Forum, Canberra.



The Sir Robert Norman Building incorporating the Australian Tropical Herbarium. Photo: B. Newton.

OUR HISTORY

Prior to the establishment of the ATH, plant biodiversity science research in Australia's tropical northeast was undertaken at three centres: the CSIRO Atherton Herbarium (QRS), the Mareeba Collection (MBA) of the Queensland Herbarium, and James Cook University (JCT). The retirement in 2002 of the Director of the Atherton Herbarium, the eminent botanist Dr Bernie Hyland, led to discussions between the CSIRO, James Cook University and the Queensland Government regarding a joint venture herbarium project. An agreement to establish the Australian Tropical Herbarium was signed on 30th of April 2006.

The Sir Robert Norman Building was completed on the Smithfield campus in November 2007, containing

state-of-the-art facilities purpose-designed for the joint venture. The QRS and MBA collections were moved into the new premises soon thereafter. The Hon. Anna Bligh, Premier of Queensland opened the building on the 4th of March 2008 and the inaugural Director commenced duty on the 31st of March, the Operational Date of ATH.

During the seven-year term of the first ATH Agreement, the organisation grew from nine staff (full time equivalents) and three postgraduate students to 15 staff and 18 postgraduate students, and increased its outputs, outcomes and impact many-fold. On April 1 2015 the Joint Venture partners agreed a further 10-year term.

OUR PEOPLE

STAFF

QUEENSLAND GOVERNMENT

Ms Eda Addicott (Principal Botanist)
Mr Peter Bannink (Senior Computer Support Officer)
Dr Ashley Field (Senior Botanist)
Mr Mark Newton (Senior Technical Officer)
Mr Gerry Turpin (Ethnobotanist)

CSIRO

Dr Katharina Nargar (Research Scientist)
Mr Frank Zich (Collections Manager)

JAMES COOK UNIVERSITY

Prof Darren Crayn (Director)
Dr Daniel Montesinos (Senior Research Fellow)
Dr Matthew Barrett (Postdoctoral Research Fellow)
Ms Melissa Harrison (Laboratory Manager)
Mr Stuart Worboys (Technical and Project Officer)
Ms Nyoka Hrabinsky (Research Assistant)
Ms Robyn Fortune (Administration)
Ms Andrea Lim (Administration)

EXTERNAL GRANTS

Ms Raelee Kerrigan (Scientific Officer)
Dr Lars Nauheimer (Postdoctoral Research Fellow)
Dr Stephanus (Fanie) Venter (Postdoctoral Research Fellow)
Ms Mai Nantawan (Laboratory Technician)
Ms Maricris Bismar (Laboratory Technician)

RESEARCH STUDENTS

Ms Eda Addicott
Ms Kaylene Bransgrove
Mr Patrick Cooke
Ms Janet Gagul
Ms Samantha Forbes
Ms Lizzy Joyce
Ms Kate O'Hara (CSIRO Vacation Scholar)
Ms Rismita Sari
Mr Arun Singh Ramesh
Ms Lalita Simpson
Mr Nicholas Weigner

ADJUNCT RESEARCHERS

Dr Sandra Abell
Dr Charles Clarke
Dr Wendy Cooper
Dr John Dowe
Mr Bruce Gray
Dr Caroline Pannell
Dr Andrew Thornhill
Mr Gary Wilson

VOLUNTEERS

Dr Charles Clarke
Mr Roger Fryer
Mrs Mary Gandini
Ms Nicky Horsfall
Dr Robert Jago
Mr Dale Perkins
Ms Heather Winsor
Ms Jenny Hoffman
Ms Pamela Schultz
Ms Vicki Crofton



Contact us / office hours

Public reference collection opening times: Mon-Fri, 9am – 4pm.

Phone: +61 7 4232 1837

Email: enquiry@ath.org.au

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Postal: Sir Robert Norman Building (E2), JCU Smithfield Campus, PO Box 6811, Cairns QLD 4870

Street: Sir Robert Norman Building (E2), JCU Smithfield Campus, McGregor Road, Smithfield Qld 4878

Location: E2.118K (Building E2; Room 118K)

Australian Tropical Rainforest Plants Identification System version 7 - free to use online at
http://www.anbg.gov.au/cpbr/cd-keys/RFK7/key/RFK7/Media/Html/index_rfk.htm