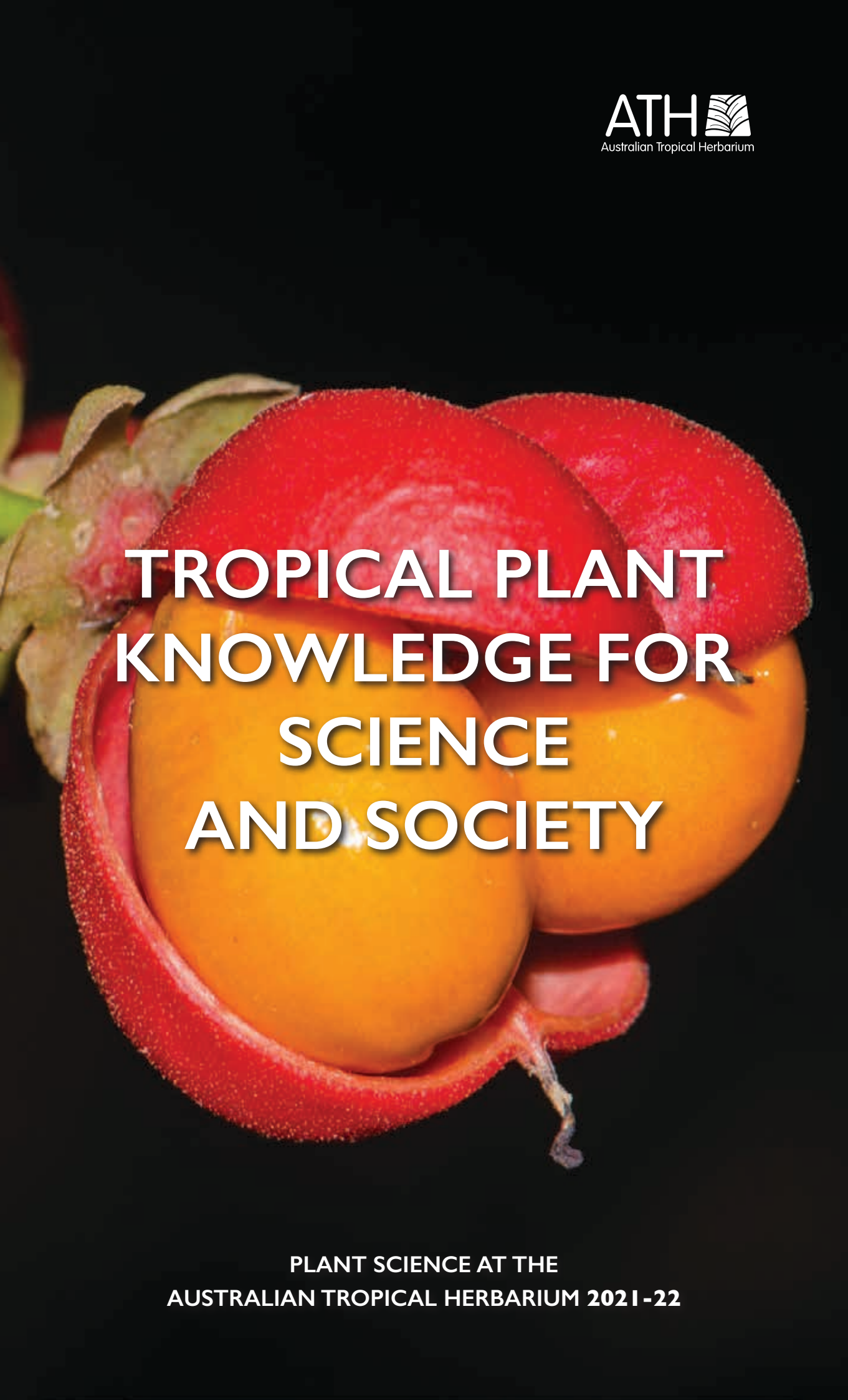
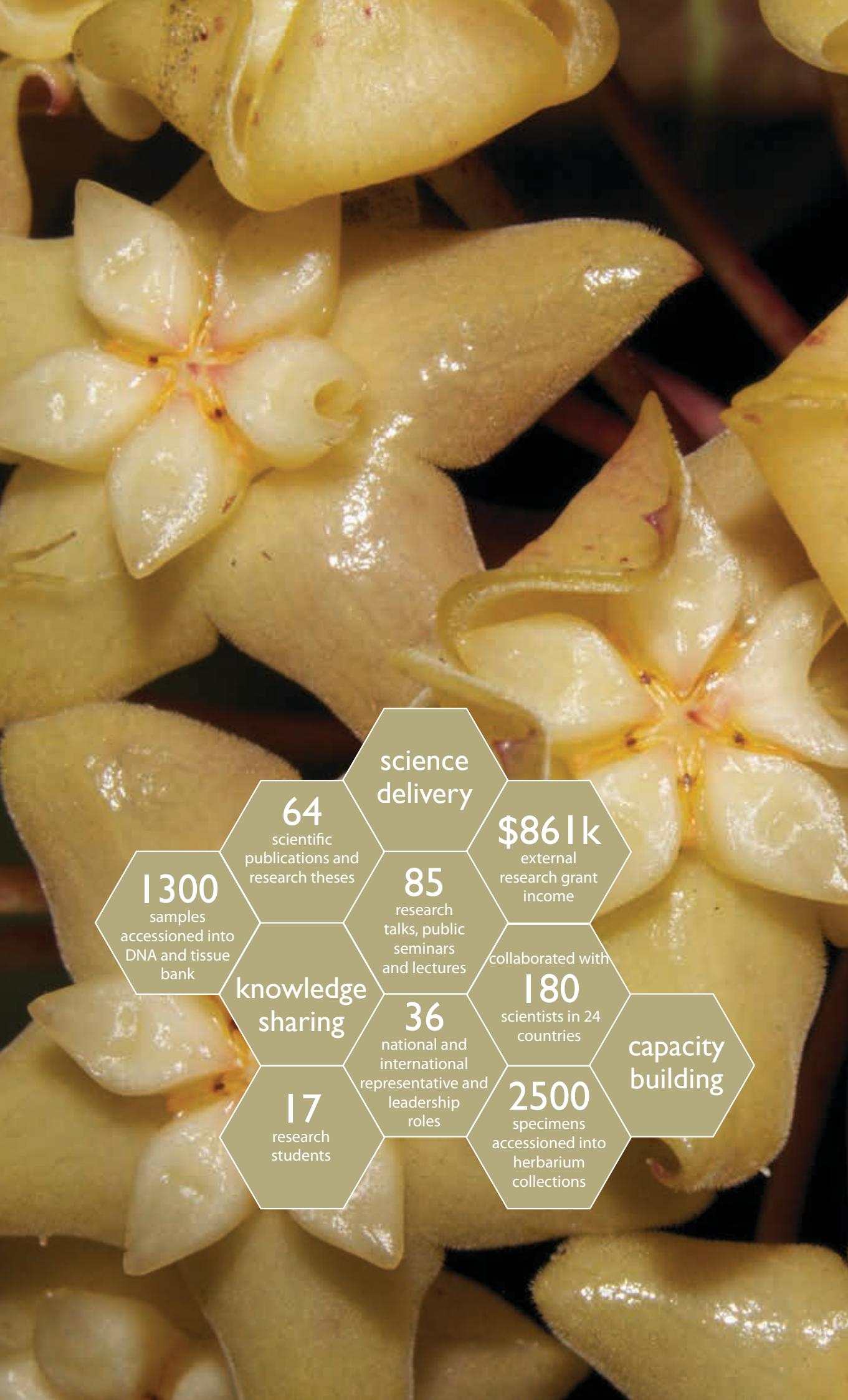
ATH
Australian Tropical Herbarium



TROPICAL PLANT KNOWLEDGE FOR SCIENCE AND SOCIETY

PLANT SCIENCE AT THE
AUSTRALIAN TROPICAL HERBARIUM **2021-22**


science delivery
64
scientific publications and research theses
$861k
external research grant income
1300
samples accessioned into DNA and tissue bank
85
research talks, public seminars and lectures
knowledge sharing
collaborated with
180
scientists in 24 countries
36
national and international representative and leadership roles
capacity building
17
research students
2500
specimens accessioned into herbarium collections

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

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. David Bush, Director, Centre for Australian Plant Biodiversity Research, Director Australian Tropical Herbarium, CSIRO

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

Prof. Ron White, Dean, College of Science and Engineering, James Cook University

Dr. Gillian Brown Director, Queensland Herbarium, Queensland Dept. Environment and Science

Prof. Andrew Krockenberger, Dean Research, James Cook University

Dr. Mark Jacobs, 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.

Flowers of the Leichhardt tree (*Nauclea orientalis*), a plant of Indigenous cultural significance. Photo: G. Turpin

SUMMARY OF ACHIEVEMENTS 2021-22

SCIENCE DELIVERY – LOCAL TO GLOBAL

Our science was communicated broadly through:

- 61 peer-reviewed publications
- 3 theses
- 52 research seminars
- 33 public talks and lectures.

This science was supported in part by:

- $861,000 external research grant income
- collaborations with more than 180 scientists in 24 countries.

SHARING OUR KNOWLEDGE

ATH staff shared our knowledge through:

- hosting public visitors participating in school, public and professional group tours, and scientists undertaking research at the ATH;
- training 17 research students (Honours, Masters, and Doctoral)
- 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

- 2487 herbarium specimens incorporated into the collections, 5896 collection records edited and 2897 specimens re-determined.
- c. 1300 samples incorporated into the DNA and Tissue Bank, which now contains over 23,000 samples
- over 23 million specimen records downloaded in more than 23,000 download events by a range of external user groups through the Atlas of Living Australia portal (ala.org.au).

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

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 and potential new applications. Knowledge flow is two-way: Traditional Owners are empowered to keep their knowledge strong and to participate in and benefit from new discoveries. For more information visit www.tiec.org.au

Exemplar project – New anti-inflammatory drugs from Mbabaram medicinal plants. Leader – Mr Gerry Turpin.

Diseases of inflammation are a major problem in Western societies and new treatments are urgently needed. This project aims to identify potential new drugs to treat inflammation. Scientists from the ATH and the Australian Institute of Tropical Health and Medicine have been invited by Mbabaram Traditional Owners to work hand in hand with them to document the ethnobotanical knowledge of the Mbabaram people. Based on this knowledge, plants are selected for laboratory analysis.

Other projects:
A Deadly Solution: towards an Indigenous-led Bush Food Industry. ATH Lead: Gerry Turpin

Mbabaram man, TIEC manager and Ethnobotanist Gerry Turpin. Photo B. Menadue

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 ands insects.

Other projects:
Phytophthora dieback in the WetTropics –
Lead: Stuart Worboys

Exemplar project – Fungus v. fungus – using native fungi to control plant pathogens. Leader – Dr Matt Barrett.

An aggressive pathogenic fungus, *Pyrrhoderma noxium*, previously known as *Phellinus noxius*, attacks numerous species of trees in North Queensland. The fungus is particularly destructive to ornamental street trees and forestry plantations. Another fungus, *Trichoderma*, has been recommended as a biocontrol agent against *Pyrrhoderma noxium*. However the commercially available strains are non-local to the Cairns area, and their efficacy has not been evaluated for the Wet Tropics. This project is using locally-collected *Trichoderma* and *Pyrrhoderma* strains with the aim to develop an effective, locally-appropriate solution to *Pyrrhoderma* fungal rot.

A "stocking" of brown root rot on a nutmeg tree trunk, with characteristic white growing margin. The tree, weakened by the rot, fell a few days after the photo was taken. Photo: M. Barrett

Trichoderma (white mass) suppressing a small culture of Brown Root Rot (*Pyrrhoderma noxium*). Photo: M. Barrett

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

Dr Wendy Cooper documenting the flora of Cape York Peninsula. Photo: F. Zich

DISCOVERING NEW SPECIES

Herbarium collections are the real frontiers of plant species discovery – most species new to science are discovered not by intrepid explorers in wild and remote places, but by scientists working painstakingly on existing, understudied collections. Australia has the second highest rate (after Brazil) of discovery of plants in the world, with around 150 new species named and described each year. ATH scientists have contributed by naming more than 60 new species of plants and fungi in the last 10 years including native lillipillies, melons, mangosteens, heathers, quandongs, bracket fungi 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 scientifically named and accurately classified.

Other projects:

- Biogeography, biology and DNA barcoding of tropical Australian fungi – Lead: Dr Matt Barrett
- Systematics of Australian Arum lilies (Araceae) – Lead: Dr Matt Barrett
- Systematics of the keystone hummock grass genus *Triodia* (Poaceae) – Lead: Dr Matt Barrett

Exemplar project – Systematics of Australian *Kayea*. Leader – Dr Wendy Cooper.

Australia's tropical flora has been fairly well studied compared with other tropic regions of the world, but still there are many species remaining to be described. One of a number of small taxonomic projects undertaken in the last few years named two species of rainforest trees in the genus *Kayea* (family Calophyllaceae). It was nearly 50 years ago that botanist Bernie Hyland recognised that these plants were probably new to science, but it took many years to gather sufficient collections to complete the taxonomic studies and formally describe and name the species.

Flower of *Kayea meridionalis* W.E.Cooper & Zich, a new species described from the Atherton Tablelands. Photos: T. Hawkes

Fruit of *Kayea meridionalis* W.E.Cooper & Zich, a new species described from the Atherton Tablelands. Photos: T. Hawkes

Shannon Hudson (seated) and Isabel Zorn recording vegetation communities on Border Island, north Queensland. Photo: S. Worboys

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.

Other projects:

Island Arks: mapping the vegetation of Great Barrier Reef Islands – Leads: Stuart Worboys, Isabel Zorn

Exemplar project – Regional Ecosystem Mapping. Leader – Dr 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 the Cape York Peninsula (CYP). This method has been 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.

Principal Botanist Dr Eda Addicott surveying vegetation on Flinders Island. Photo: M. Newton

ENVIRONMENTAL BIOSECURITY

The plant biosecurity group develops basic and applied research programs to understand the ecological traits (e.g. seed germination, competitive ability) and evolutionary processes (e.g. polyploidy, rapid adaptation) 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 the economy. 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.

Other projects:

- The contribution of polyploidy to weed invasiveness and control – Lead: Dr Matt Barrett
- The biosecurity of global change – Lead: Dr Daniel Montesinos
- Fire and weeds – Leads: Dr Daniel Montesinos, Mr Gerry Turpin

Exemplar project – Plant-animal interactions of invasive tropical weeds. Leader – Dr Daniel Montesinos.

Sicklepod (*Senna obtusifolia*) is an invasive weed originating from the American tropics and now found across the tropical world, including northern Australia. In its native range, successful pollination relies on native bees that are able to buzz their wings in a specific manner to shake pollen from the anthers. This is called buzz-pollination. How were they able to spread through the Australian tropics? Our research shows that some native Australian bees are also able to "buzz" in a similar way. Further, many other native insects have found ways to extract pollen from sicklepod flowers without buzzing, such as breaking into the anthers, or "milking" them. These and other cheeky tricks are not as efficient as buzzing but still secure plenty of pollen that helps sicklepod produce plenty of seed. Our findings help to explain how species can become invasive in new environments even though they have apparently unsuitable specialisations, and will help us to improve screening methods and risk analysis for future invasions.

Sicklepod flower with insect visitor. Photo: L. Lopresti.

PhD candidate Ms. Laura Lopresti (left) shows sicklepod plants around Cairns to visiting Prof. Rebecca Karanja (right) and student Mrs. Anita Owino (centre) from Kenyatta University. Photo: D. Montesinos.

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: 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.

Other projects:

- Australian Tropical Ferns and Lycophytes Key – Leads: Dr Ashley Field, Mr Frank Zich
- Ericaceae: an eFlora of Australia treatment – Lead: Dr Fanie Venter
- Biodiscovery of new immune modulating drugs – Lead: Dr Karma Yeshi
- Molecular identification tools for regulatory enforcement of trade in horticulturally important orchid groups – Lead: Dr Katharina Nargar
- Fire and weeds – Leads: Dr Daniel Montesinos, Mr Gerry Turpin

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

The 8th edition of the Australian Tropical Rainforest Plants identification system was released in late 2020 as an easy to use, free, online system (https://apps.lucidcentral.org/rainforest/) and mobile app that enables almost anybody, anywhere to identify over 2760 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. A key to Australia's tropical ferns and lycophytes was released in mid 2022 and is available on the web (https://apps.lucidcentral.org/ferns/text/intro/index.html) and as a mobile app.

Collections Manager Frank Zich working in the herbarium. Photo: B. Wannan
(right) Species profile from Edition 8 of the online Australian Tropical Rainforest Plants identification system.

Nursery grown plants of *Eucryphia wilkiei*, one of Australia's rarest plants, found only on Mt Bartle Frere in Queensland's Wet Tropics. Photo: W. Worboys

Exemplar project – Tropical mountain plant conservation. Leads – Mr Stuart Worboys, Prof. Darren Crayn.

Herbarium collections provide important information about plant distributions and therefore about the environmental requirements (niches) of species. By combining genetic data with extensive new field survey data, 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. Simultaneously, we are taking precautionary action to secure them in ex-situ living collections in partnership with seven public botanic gardens, and two seed banks. This project was the 2021 recipient of the Cassowary Award for Climate Change Leadership, awarded by the Wet Tropics Management Authority. Find out more about this project at www.tromps.org.au

Presentation of the 2021 Cassowary Award for 'Climate Change Leadership'. Photos: WTMA

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

CONSERVATION OF BIODIVERSITY UNDER ENVIRONMENTAL CHANGE

The one thing that is constant in the environment is change, both natural and human-mediated. Managing for the long-term future of Australia's biodiversity requires accurate information on the extent and distribution of diversity (including genetic diversity), and accurate predictions of the impacts that environmental change will have on biodiversity. We are leading projects that are measuring and mapping biodiversity from genes to ecosystems, determining the nature and extent of threats to this diversity, and undertaking targeted conservation interventions for species at most risk.

Other projects:

- Conservation genomics in *Thelymitra* species complexes – Lead: Dr Lars Nauheimer.
- Conservation genomics of *Paracaleana* – Lead: Dr Lalita Simpson
- Ex-situ conservation of collector-targeted vulnerable and endangered plants – Lead: Dr Ashley Field
- Accelerating conservation genomic assessments and monitoring for Australia's threatened orchid species through advanced collection genomics – Lead: Dr Katharina Nargar
- Integrating climate adaptation into rainforest restoration plantings – Lead: Ms Kali Middleby

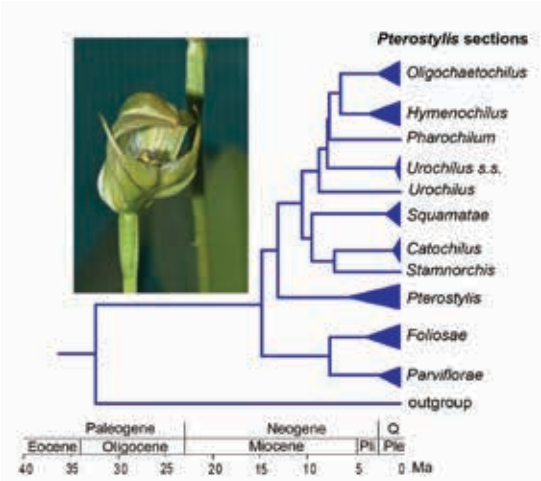
Project leader Dr Katharina Nargar examining orchid herbarium specimens. Photo: S. Prober.

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.

Other projects:

- Origins of the northern Australian flora – role of the Sunda-Sahul Floristic Exchange – Leads: Dr Lizzy Joyce, Prof Darren Crayn
- Phylogeography of Australian *Cymbidium* orchids – Lead: Dr Lalita Simpson
- Assembling the reference genome of the Queen of Sheba orchid – Lead: Dr Katharina Nargar



Time tree of the orchid genus *Pterostylis*, modified from Nargar et al. 2022. Inset: *Pterostylis curta*. Photo: M. Clements.

Exemplar project – Australasian orchid diversification in space and time. Leader – Dr Katharina Nargar.

Australia harbours a rich and highly endemic orchid flora, with over 90% of species occurring nowhere else, including many rare and threatened species. Understanding how the Australian orchid flora was assembled and has diversified through time and space provides critical insights into past responses to climatic and environmental changes to inform today's conservation decisions. Based on genomic data obtained from herbarium collections, ATH scientists build densely sampled evolutionary trees to elucidate the evolutionary origins and range evolution of Australian orchid lineages. In 2021, our orchid team traced back the evolutionary origins of Australia's second largest orchid subtribe, the greenhood orchids, to the early Oligocene, shortly after Australia had separated from Antarctica over 30 million years ago. Subsequent diversification of main lineages occurred in conjunction with profound environmental and climatic changes during the Miocene. The majority of today's greenhood species were found to have emerged during the Pleistocene, a dynamic period of rapid climatic fluctuations. From the Australian continent, greenhood orchids expanded to other Australasian regions, such as New Zealand and New Caledonia. Read more online: https://doi.org/10.3389/fpls.2022.912089.

The Russell River Fern was identified by ATH researchers (Field and Bloesch) as a natural hybrid between two different fern genera and described as Australia's first nothogenus: x *Abacopterella altifrons*. Photo: A. Field

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, and therefore provide the best possible foundation for biological, ecological, and evolutionary research.

Other projects:

- Continental scale phylogenomics: towards a genus-complete phylogeny of the Australian flora – Lead: Prof. Darren Crayn
- *Garcinia* (Clusiaceae) - systematics, biogeography and evolution of mangosteens – Lead: Ms Rismita Sari

Exemplar project – Evolution and classification of ferns and lycophytes.
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. This work has resulted in a new global classification of ferns based on evolutionary relationships, and new insights into the Australian fern flora.

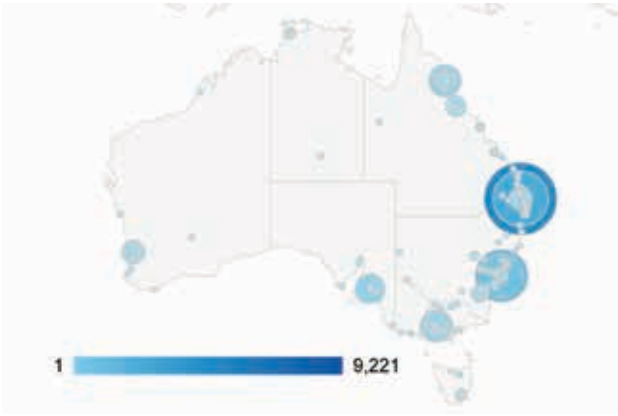
Senior Botanist Dr Ashley Field collecting lycophytes for research.

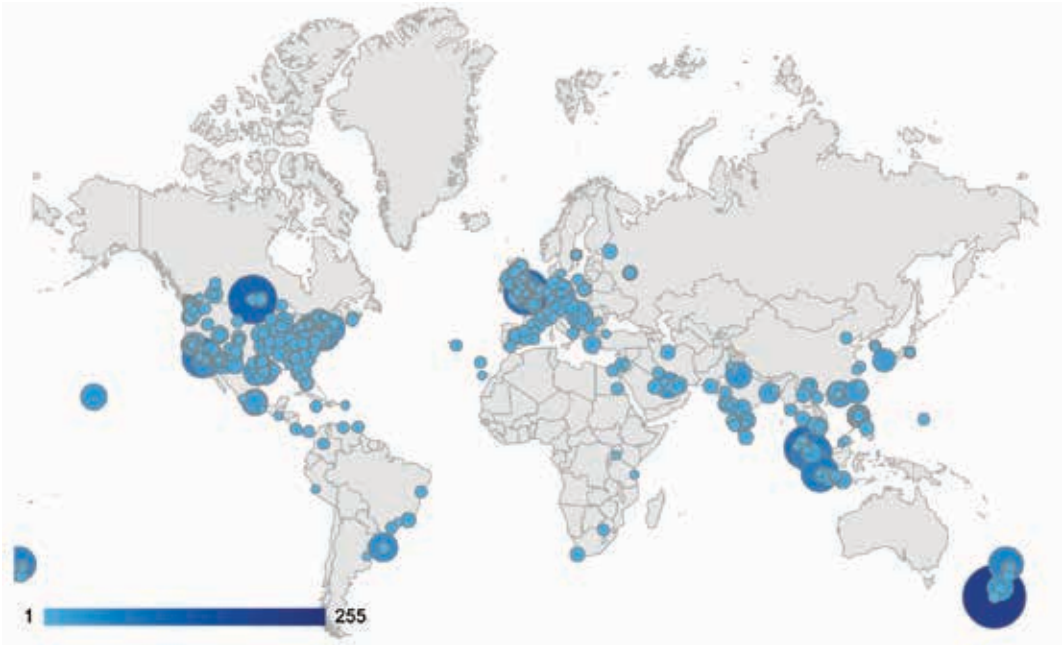
SCIENCE DELIVERY – LOCAL TO GLOBAL

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 in partnership with First Nations people on traditional plant use, 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.

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.

Botanist Stuart Worboys delivering plant identification training in the classroom with the assistance of other ATH staff Mr Frank Zich and Dr Fanie Venter.

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 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 plant species and weeds in Australia's tropical rainforests. The many past participants include environmental professionals, Indigenous Rangers, students and interested public.

ATH staff have delivered many other workshops to community and professional groups on 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 2021 and 2022 ATH staff served the community through 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

Assistant Curator Raelee Kerrigan working in 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 23,000 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. In 2022 we commenced work to image at high resolution the entire ATH collection of herbarium specimens and make the images publicly available.

Research Operations Officer Melissa Harrison curating the genetic sample collection.

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.

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

PUBLICATIONS 2021 – 2022

SCIENTIFIC PUBLICATIONS

ATH staff are in **bold** type.

1. **Addicott E**, Neldner VJ, Ryan T (2021) Aligning quantitative vegetation classification and landscape scale mapping: updating the classification approach of the Regional Ecosystem classification system used in Queensland. *Australian Journal of Botany 69*, 400–413.
2. Barrett RL, **Barrett MD** (2022) *Dianella lignosa* (Asphodelaceae), a new species from the north-west Kimberley region of Western Australia. *Telopea* 25, 197–202.
3. Barrett RL, **Barrett MD**, Clements MA (2022) A revision of Orchidaceae from the Kimberley region of Western Australia with new species of tropical *Calochilus and Dipodium*. *Telopea* 25, 203–270.
4. **Bloesch Z**, **Nauheimer L**, Elias Almeida T, **Crayn D, Field AR** (2022) HybPhaser identifies hybrid evolution in Australian Thelypteridaceae. *Molecular Phylogenetics and Evolution* 173, 107526.
5. Callmander MW, Buerki S, **Zich F, Field AR**, Gallaher T (2021) *Pandanus grayorum* (Pandanaceae), a new species endemic to north-eastern Queensland, Australia. *Australian Systematic Botany* 34, 327–335.
6. Chen C-W, Perrie LR, Glenny D, Chiou W-L, Fawcett S, Smith AR, Parris BS, Ebihara A, Ohlsen D, Lehtonen S, Don S-Y, Lehnert M, **Field AR**, Chao Y-S, Murdock AG, Sundue M (2022) An annotated checklist of lycophytes and ferns of the Solomon Islands. *Fern Gazette* 21, 292–419.
7. Cooke P, Fahey M, Ens EJ, Raven M, Clarke PA, Rossetto M, **Turpin G** (2022) Applying biocultural research protocols in ecology: Insider and outsider experiences from Australia. *Ecological Management & Restoration* 23, 64–74.
8. **Cooper WE** (2022) *Diospyros venablesii* W.E.Cooper (Ebenaceae), a new and endemic species from the Iron Range area, Cape York Peninsula, Queensland. *Telopea* 25, 75–79.
9. **Cooper WE** (2022) *Xylosma craynii* (Salicaceae), a new and restricted species for Queensland's Wet Tropics Bioregion. *Australian Journal of Taxonomy* 3, 1–6.
10. **Cooper WE**, Forster PI (2021) *Aglaia monticola* W.E.Cooper & P.I.Forst. (Meliaceae), a new species for Queensland's Wet Tropics. *Austrobaileya* 11, 80–86.
11. **Cooper WE, Zich FA** (2022) Reinstatement and revision of *Kayea* Wall. (Calophyllaceae) in Australia, including two new species from Queensland's Wet Tropics bioregion. *Austrobaileya* 12, 1–13.
12. **Crayn DM, Jago RL** (2022) Banks and Solander search for plants in 'New Holland'. In 'Captain Cook in Queensland.' (Eds R Kirkpatrick, M Kowald, R Kerr, V Donovan.) pp. 98–121. (The Royal Historical Society of Queensland: Brisbane)
13. Crous PW, Boers J, Holdom D, Osieck, Steinrucken TV, Tan YP, Vitelli JS, Shivas RG, **Barrett M**, Boxshall AG, Broadbridge J, et al. (2022) Fungal Planet description sheets: 1383–1435. Persoonia - Molecular Phylogeny and Evolution of Fungi 48, 261–371.
14. **Dowe JL** (2021) Udo Dammer (1860–1920): a palm specialist at Berlin Botanical Garden. *Palms* 65, 67–79.
15. **Dowe JL**, Appelhans MS, Bräuchler C, Hilje L, Schlumpberger BO (2022) The botanical expedition of Hermann Wendland in Central America: a nomenclatural study and travel report. *Boissiera* 73, 1–136.
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Flowers of *Kayea concinna*, a new species described in 2022 by Dr Wendy Cooper. Photo: R. Jensen.

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Joyce EM (2021) Evolution of the northern Australian flora: role of the Sunda-Sahul floristic exchange. PhD, College and Science and Engineering, James Cook University. Awarded Cum Laude and awarded University Medal.

Perkins D (2021) Environmental clines as pools of invasive genotypes preadapted to climate change. Honours thesis, James Cook University.

Ficus opposita. Photo: G. Turpin.

Melicope xanthoxyloides. Photo: J Dowe

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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.

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

ATH
Australian Tropical Herbarium

Contact us / office hours

Public reference collection opening times: Mon-Fri, 9am – 4pm.
Phone: +61 7 4232 1837
Email: enquiry@ath.org.au
Web: www.ath.org.au, www.tiec.org.au
Facebook: www.facebook.com/tropicalherbarium
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 8 - free to use online at apps.lucidcentral.org/rainforest/
Australian Tropical Ferns and Lycophytes Identification System - free to use online at apps.lucidcentral.org/ferns/

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