

50
YEARS

**People
Passion
Science**



CELEBRATING 50 YEARS OF THE ARTHUR RYLAH INSTITUTE FOR ENVIRONMENTAL RESEARCH
1970 - 2020

Indigenous statement

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past, present and emerging whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

Regretfully, there was little recognition of Indigenous land, culture and knowledge for most of the 50 years covered in this book. In recent times this has changed, and partnership projects are now being undertaken. We hope that the future is even more inclusive and effective in both supporting and integrating biodiversity and Indigenous culture.

Acknowledgements

Valuable contributions of historical information, pictures, text and comments to this book were made by Phoebe Macak, Mike Nicol, and the late Jim Cooper (photographer). Many other people also contributed names to staff lists, photos, historical knowledge, bits of text, and advice, and we particularly acknowledge Roger Bilney, Bill Bren, Peter Brown, Eddie Buzinskas, Keith Cherry, Peter Christie, Keith Dempster, Fern Hames, Katie Howard, Peter Johnson, Sally Kenny, Kim Lowe, Richard Loyn, Lindy Lumsden, Malcolm Macfarlane, John McKenzie, Ed McNabb, Ian Mansergh, Annette Muir, Graeme Newell, Ian Norman, Ken Norris, Tim O'Brien, Bill O'Connor, Steve Platt, Jim Pribble, Rob Price, Tarmo Raadik, Joy Sands, Charlie Silveira, Geoff Sutter, Arn Tolsma, Stuart Vallis, Bob Warneke, Matt White and Ross Winstanley.

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The Arthur Rylah Institute for Environmental Research was named after Sir Arthur Gordon Rylah KBE, CMG, Deputy Premier and Chief Secretary of Victoria (1955-71), and Attorney-General in Sir Henry Bolte's Liberal Party State Government.

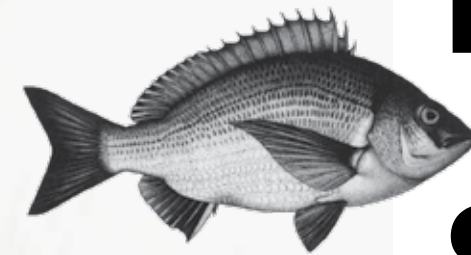
The Institute is one of Australia's leading centres for applied ecological research. It provides strategic research and advice to inform policy development for ecologically sustainable land and water management. ARI has key partnerships with universities and other ecological researchers across Australia. Our clients include Government agencies in Victoria and other states, Catchment Management Authorities, Water Authorities, Commonwealth Government agencies, First Nations organisations, and non-government organisations.

ARI's highly qualified staff significantly contribute to ecological science in Australia, publishing peer-reviewed papers, books and chapters, conference papers and technical reports, plus newsletters, popular articles and software. The Institute also informs policy debates by providing public knowledge through state and national media, and science education and development via associations with the tertiary education sector.

For more information:

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Sir Arthur Rylah



50
YEARS

People Passion Science

CELEBRATING 50 YEARS OF THE ARTHUR RYLAH INSTITUTE
FOR ENVIRONMENTAL RESEARCH **1970 - 2020**

An illustration of two yellow-green birds perched on a branch with green needles and a yellow flower. The birds have black markings on their heads and chests. The branch is positioned to the right of the main text.

**John Koehn, Geoff Brown, Pam Clunie, Peter Menkhorst,
Luke Woodford, Michele Kohout, Andrew Pickworth**



*Managing Koalas
has been an
ongoing priority
since the 1920s*

Contents

- P01** WELCOME
- P03** THE OPENING OF ARI
- P07** IN THE BEGINNING
- P11** 1970s
- P19** 1980s
- P27** 1990s
- P35** 2000s
- P43** 2010s
- P51** RESEARCH THEMES AND TECHNIQUES
- P63** ENVIRONMENTS
- P67** MAKING A DIFFERENCE
- P77** CHANGES OVER TIME
- P87** STAFF
- P95** PHOTO GALLERY

Welcome

As part of the 50th Anniversary celebration for the Arthur Rylah Institute for Environmental Research, *People Passion Science* chronicles the people, workplace and projects over the last 50 years. The passion and achievements of everyone who has contributed are evident from the fond memories, anecdotes and reflections shared in this book – all of which will resonate with those who have worked here since the doors opened in 1970. Those who are less familiar with the Institute will welcome the insight into the scientists and other staff who have dedicated themselves to researching and providing knowledge to support the management of our natural environments.

The Arthur Rylah Institute for Environmental Research, commonly known as ARI (pronounced A. R. I.), uniquely combines work on aquatic and terrestrial flora and fauna and their ecosystems and is the Victorian Government's environmental research institute. Located in the north-eastern Melbourne suburb of Heidelberg, ARI is one of Australia's few remaining large government research institutes.

The conception of ARI in the late 1960s reflected a growing public consciousness of the values of nature. Over the past 50 years, ARI has undertaken the conservation and effective management of biodiversity and natural resources based on good science and knowledge. However, the journey has been challenging, involving regular changes in Government, departmental structures and policies, funding cuts, threats to its existence, and the erosion of environmental priorities.

ARI staff are greatly dedicated to their work, showing exceptional camaraderie, collaboration, and teamwork. They have had the resilience to survive over five decades and make a remarkable contribution to public science. Although the intervention of COVID-19 prevented this publication from being part of a joyous staff reunion, we hope that this book provides many smiles and great memories.

A sincere thank you to all those who have been part of the ARI family to date; may the Institute continue to survive and prosper. Given the current wave of species extinctions, alongside the degradation of and ongoing threats to ecosystems, the purpose of ARI to provide quality science to help manage our natural resources, environments, and their biodiversity, is needed now more than ever.

In this book, we briefly describe the inception and opening of ARI and its development as an Institute. We highlight projects that depict the extensive range of work undertaken, involving many species and management issues across aquatic and terrestrial ecosystems. We also include a timeline that shows ARI's influence over key events and events that influenced the Institute itself. Major projects, research techniques, environments and management issues are explored in more detail, examining how research focus and ARI evolved. Finally, we give prominence to the Institute's many successes, list the names of all ARI staff members, and present a compendium of images which highlight the enduring spirit of the Institute.

The authors have had the rare privilege of working at ARI for many years (collectively over 190), allowing an opportunity to witness firsthand much of the extraordinary work accomplished there. The reward for us in drafting this book has been to view and appreciate the full history of the Institute over the past 50 years. We have reminisced, laughed at many photos, and been overwhelmed by the wonderful contributions made by many people. The success of any workplace depends in large part on the character and enthusiasm of its staff, and we dedicate this book to everyone who has worked at ARI. We hope that we have done justice to your passion, science and stories.

John, Geoff, Pam, Peter, Luke, Michele and Andrew



The opening

“ Thank you for your kind welcome.

Those who will work here will devote their energies to conserving the environment which is essential to the fish and wildlife resources of the future. I congratulate the people of Victoria on their awareness of these problems and on providing facilities for solving them. I am delighted to declare the Arthur Rylah Institute for Environmental Research open. ”

Her Majesty Queen Elizabeth II

03



Her Majesty Queen Elizabeth II officially opened ARI on 8th April 1970 at 3pm. The royal entourage included Their Royal Highnesses, Prince Philip, Prince Charles and Princess Anne.

The Heidelberger newspaper reported that more than 2,000 people attended the opening ceremony. The many dignitaries included Sir Arthur and Lady Rylah, the Chief Commissioner of Police, Mr N. Wilby, and Councillor Vern Henderson, Mayor of Heidelberg. The Victoria Police Band entertained the crowd for 45 minutes before official proceedings. The Boy Scouts and Girl Guides were also amply represented, and Heidelberg Council built a special stand on the tennis courts so that children from the Helping Hand Association, a disability service provider in Victoria, could also attend the opening. After the official ceremony, the Royal Party forwent refreshments in a temporary marquee, preferring to tour the Institute in the company of Alf Dunbavin Butcher (Director of Fisheries and Wildlife Department) and several senior scientists.

However, the tour was not without its drama. Bob Warneke (later to be the leader of the Wildlife Section) recalls what happened next:

“ After the speeches, the Royals and honoured guests were shown around the Institute. Security was tight, with each staff member allotted to a specific room and primed to interpret a carefully organised display. Strangely, I have no clear recollection of the display I was supposed to explain, some photos I'm sure. Sid Cowling (in charge of Game Management) manned a display of duck wings and John Seebeck was stationed in the animal room ready to reveal salient facts about Leadbeater's Possum. There was a lively one in a large cage. I learned later that as the Queen and Prince Charles were shown in, John was fully occupied trying to catch the possum which was reluctant to be returned to its cage.

However, such mishaps were of little importance compared with the stir caused by Alf Butcher. While escorting the Queen at the beginning of her tour of inspection, Alf considerably whisked her into the lift on the ground floor, the doors closed and carried them up to the first floor alone together! This put security into a frantic spin. ”



Illustration of the Helmeted Honeyeater from John Gould's *The Birds of Australia, Supplement (1867)*, used on the cover of the booklet prepared for the opening of ARI and, in a nod to history, on the cover of this book



Her Majesty The Queen inspecting wildlife specimens with Alf Dunbavin Butcher and Bob Warneke

04

Several would-be ARI staff who lived locally also remember the pre-Institute landscape, the construction of the office building and the official opening. Bill O'Connor lived in Cape Street as a child in the 1960s and played on the overgrown vacant block where the Institute now stands. The site was originally a quarry, then a landfill site. Bill remembers that the construction 'seemed to take ages' and being thrilled at finding refundable soft drink bottles the workers had discarded, which back then could be cashed in at a milk bar. Although he didn't attend the opening because he was at school, he recalls how excited his English neighbours were about Her Majesty The Queen travelling along Brown Street.

ARI stalwart Tim O'Brien inadvertently attended the opening of the Institute. As a boy he accompanied his mother to play tennis on the courts that previously fronted the Institute. Unaware of the gravity of the moment, he was caught up in the hubbub, secured a prime viewing position for the ceremonies and, like many in the crowd, was given a small Australian flag to wave. Little did he know how his career would later play out inside the building that was the focus of proceedings.



The Conservation Mural and ARI's artwork



Artist Robert Ingpen applying the final touches to the mural

The Conservation Mural, commissioned for the Institute's opening and painted by celebrated Australian artist Robert Ingpen (1936), comprises four panels (total 8 m x 2.4 m) depicting the relationship between humans and nature. The mural, mounted in the original ARI foyer, highlights our increasing exploitation of natural resources. A tandem bicycle is used to depict the unequal efforts of humans and nature in separate endeavours to control the environment. Too often humans assume the dominant steering position in the front seat of the tandem, forcing nature to contribute to their needs, leading to erosion, pests, weeds and pollution. Humans

seemingly dispense with nature as a partner as the tandem bicycle is dumped in a rubbish tip. The mural now adorns the ARI Conference Room. ARI also has a collection of some 400 original artworks depicting natural history. Most originally appeared in 19th Century treatises on Australian natural history, such as John Gould's works on Australian birds and mammals, Eugene von Gerard's landscapes and Fanny Anne Charsley's wildflowers. All were donated to the Institute in the early 1970s by a range of donors, most notably Arthur and Caroline Howard. Examples hang on the walls of the Institute and other Government offices.

In the beginning

07



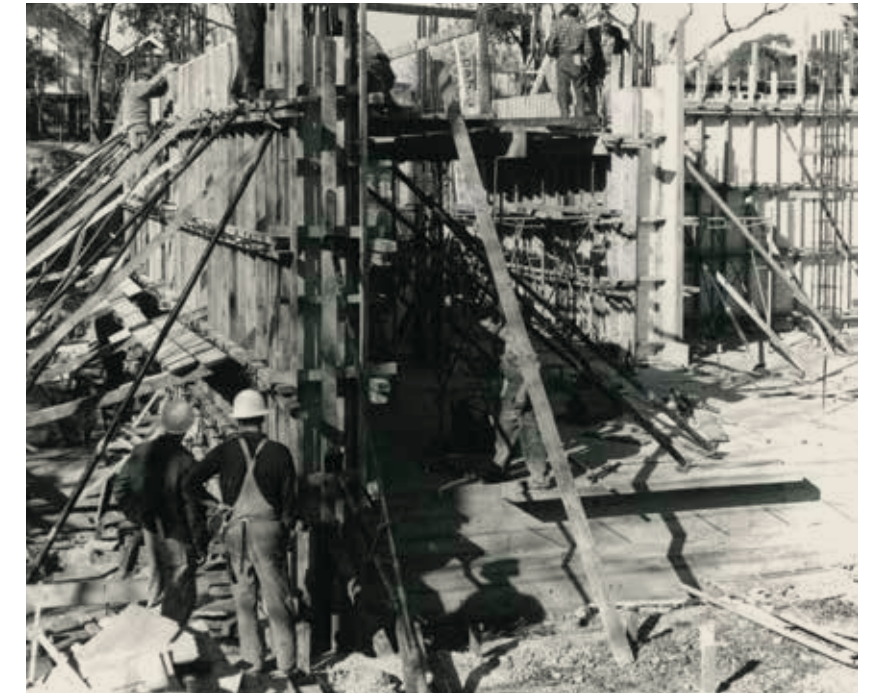
Designed by the Public Works Architect, Noel C. Belcher, ARI was built on 2.5 acres of an old landfill site at 123 Brown Street, Heidelberg and cost about \$1 million at the time.

When the initial builder went bankrupt, the task was taken up by the large construction firm A.V. Jennings and completed quickly but with minimal finish. Nevertheless, it was described in *The Heidelberg* at the time as 'architecturally one of the most pleasing glass houses to be erected in or around Melbourne'. Three tennis courts fronted the Institute and while these were leased to the local tennis club, they were available for use by ARI staff for lunchtime tennis matches.

It's worth visiting the pre-Heidelberg history since this provides context for the establishment of the Institute. Until the 1960s, the primary focus of the Fisheries and Game Department had been facilitation of consumptive use of fish and wildlife. This included a large investment in the development and operation of the Snobs Creek Government Fish Hatchery (opened in 1947) to stock streams with introduced sport fish, and the control of native species then regarded as pests, such as the Water Rat and cormorants.



Snobs Creek Fish Hatchery circa 1940s



08

Conservation of native species for their intrinsic values steadily gained prominence through the 1950s and was boosted in 1958 when the department was rebadged as the Fisheries and Wildlife Department, increasing the profile of native flora and fauna. The beginnings of research into native fauna in the 1960s included work on the Koala, Leadbeater's Possum (1960), Brush-tailed Rock-wallaby (early 1960s), Mountain Pygmy-possum (1966), and New Holland Mouse (1970), along with studies of fur seals, ecology of ducks, and island and seabird ecology. At this time most aquatic research involved marine commercial fisheries and the propagation of introduced salmonids, with little consideration of native species.

In 1969 the Fisheries and Wildlife Department moved to Heidelberg to found ARI with staff consolidated from a range of sites, including Marine Fisheries at 605 Flinders Street and Game Management at La Trobe Street in the Melbourne CBD. The original ARI research programs were: Marine Fisheries, Freshwater Fisheries (recreational species), Marine Pollution (chemistry and toxicology), Wildlife Research, Game Management, Environmental Studies, the Snobs Creek Fish Hatchery and the Serendip Research Station near the You Yangs. At that time ARI included a 'natural history survey room' (museum), large aquarium, chemistry and data processing laboratories, and support staff included a typing pool, draftsman, scientific editor, statistician, and photographer.



When ARI was founded, hunting and fishing were mainstream recreational activities and hunters formed a powerful lobby group. They made a solid contribution to the conservation of wetlands and waterbirds.

Furthermore, there were commercial marine and freshwater fisheries to be managed and increasing concern over pesticides and other forms of chemical contamination, stimulated by the publication in 1962 of *Silent Spring* by Rachel Carson.

ARI's 1970 charter was 'to provide the basic data, the facts and the inventories which will permit the interpretation and the assessment which are the prelude to the ethical use of resources...'. There was no mention of any intrinsic value of flora and fauna; rather, conservation was framed in terms of 'the wise use of resources' for the benefit of humans. This translated into an emphasis on consumptive use of fish (especially introduced salmonids) and wildlife, and management of agricultural pests.

Alfred 'Alf' Dunbavin Butcher was the inaugural Director of the Arthur Rylah Institute for Environmental Research, but it is also fair to say he may be considered its 'father'. A distinguished public servant, the ARI Directorship was one of many significant positions he assumed, including Director of Fisheries and Wildlife, Chairman of the Zoological Board of Victoria, President of the Royal Society of Victoria, and trustee of the World Wildlife Fund Australia. He was also an active member of numerous other scientific, conservation and resource-management organisations.

LEFT: This photo of the then Premier of Victoria, Sir Henry Bolte, duck hunting near Kerang in 1969, reveals much about community attitudes to hunting at the time of ARI's opening

RIGHT: Trout and salmon species were widely produced and stocked to support angling



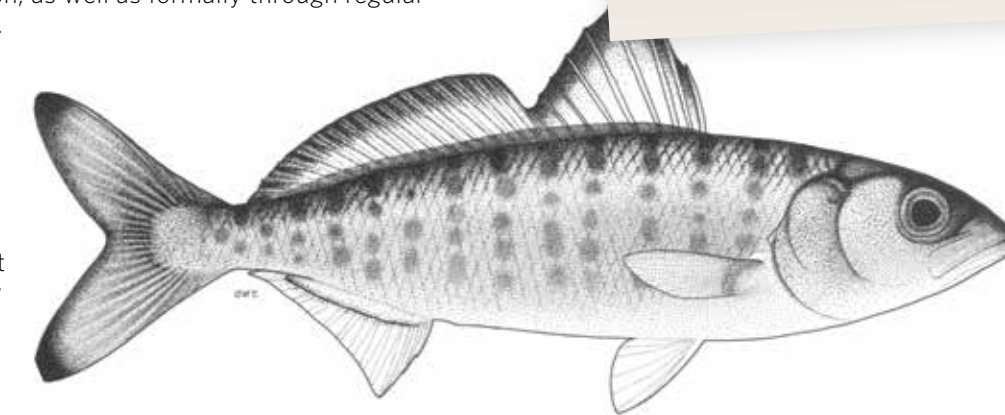
Alfred Dunbavin Butcher

Alf Butcher joined Fisheries and Game as a biologist in 1941, the first graduate scientist appointed to the public service in Victoria and he became its Chief Inspector in 1947. In 1960 Fisheries and Game was re-named the Fisheries and Wildlife Department, and his position re-titled Director. Under Alf's leadership, science became an integral part of the various sections, all originally created to give effect to enforcement of the *Fisheries Act 1890* and the *Game Act 1890*. He was politically shrewd and enjoyed the trust of Sir Arthur Rylah (then Chief Secretary of Victoria) and this mutual respect was likely a factor in obtaining the finance for ARI. The concept of ARI was probably inspired from Butcher's visit to the USA on a

Commonwealth Fund Fellowship where he visited state fauna authorities, field research agencies and university campuses, and appreciated the synergies between them.

While Alf Butcher was ARI's Director, he never interfered in its day-to-day running, trusting his qualified staff to manage the Institute. This worked because the senior staff of the various sections (Game Management, Freshwater, Wildlife, Reserves, Marine) knew each other and were familiar with each other's domains - while also working in close proximity due to limited office space! Alf also made a point of maintaining direct and personal contact with each person, as well as formally through regular Quarterly Technical Conferences.

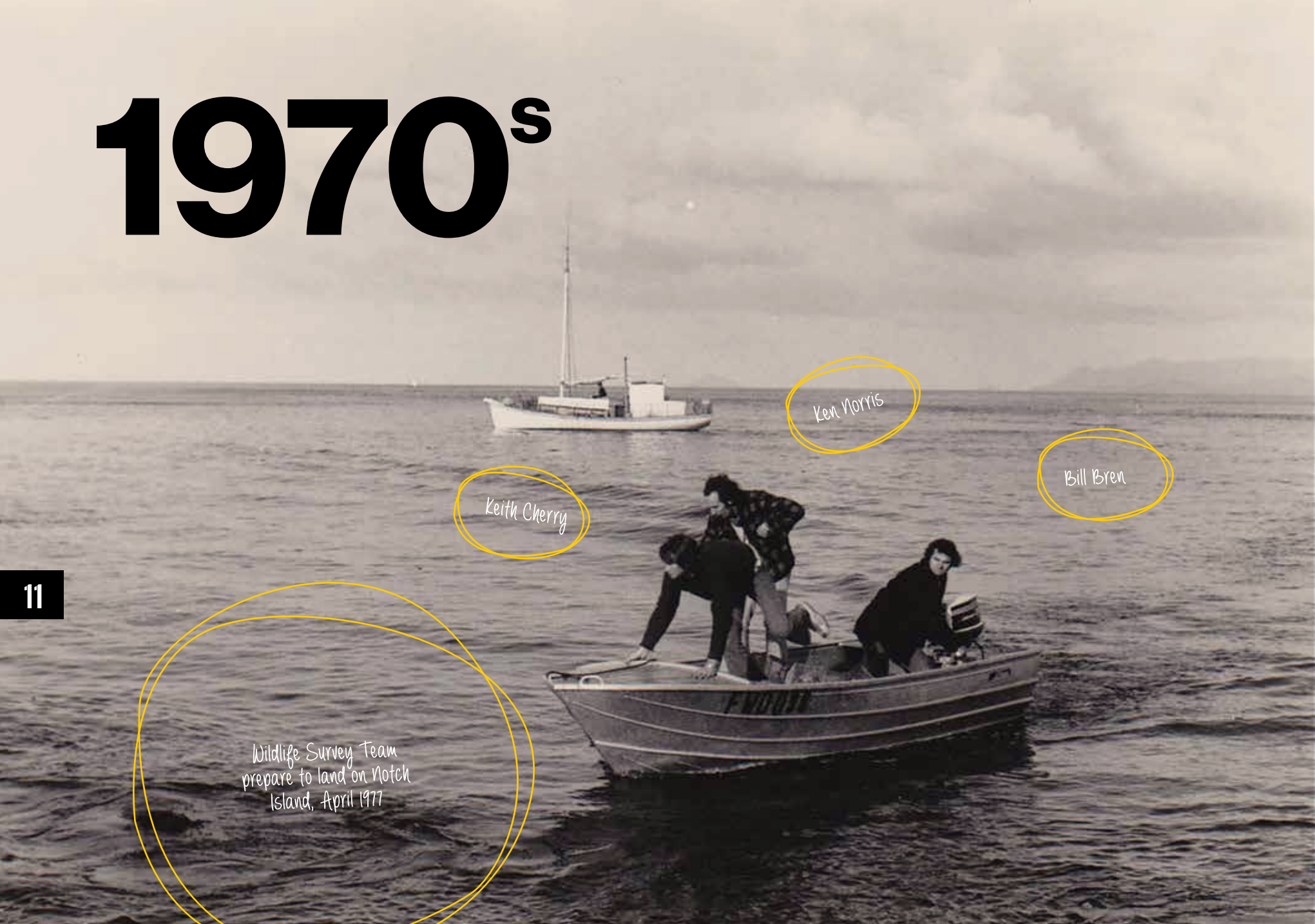
Alf Butcher continued as Director of the Fisheries and Wildlife Department when it became part of the new Ministry for Conservation. He had a long career devoted to public service until his retirement in 1978 and was an extraordinary man by many measures.



The Fisheries and Wildlife Department published a monthly newsletter titled Fur Feathers and Fins. It ran to 139 issues between December 1957 and December 1972, and carried an odd mix of departmental news, jokes (including some that would not be acceptable today) and social notes such as announcements of impending marriages and births



1970^s



Ken Norris

Keith Cherry

Bill Bren

Wildlife Survey Team prepare to land on Notch Island, April 1977

- 1970**
 - ARI opened by HRH the Queen
 - Alfred Dunbavin Butcher is Director of the Fisheries and Wildlife Department
 - ARI is part of the Fisheries and Wildlife Department
 - Land Conservation Council established
 - The Environment Protection Act prescribed
 - Henry Bolte (Liberal) is the Victorian Premier
- 1971**
 - Sir Arthur Rylah retires from politics
 - National Parks Service established
 - Flora and Fauna state emblems announced
- 1972**
 - Victorian Conservation Trust established
 - Broad-scale clearing for pine plantations begins
 - Rupert Hamer (Liberal) becomes the Victorian Premier
- 1973**
 - ARI's Wildlife Survey Unit established
 - Department changes name to Fisheries and Wildlife Division
 - The Land Conservation Council commissioned a series of terrestrial faunal studies in the 1970s, such as the 1973 South Gippsland Area Review, of native flora and fauna, to inform their broad-scale land use decisions
- 1974**
 - Sir Arthur Rylah dies
 - Bush fires burn 117 million hectares across six states
- 1975**
 - The Federal Department of Environment is formed – lasted for nine months under that name
 - National Parks Act and the Wildlife Act legislated
- 1977**
 - The Atlas of Victorian Wildlife established

This decade saw the new Institute established and consolidated. Existing projects, such as the Snobs Creek Hatchery and the production of salmonids, research into fur seals, small mammals and waterfowl (mostly game ducks), and marine fisheries were transferred to ARI. Scientific capacities were enhanced with many new staff appointments and new projects, such as the toxicology program.

In this period, fauna policy and management were generally conducted separately from flora research (reflecting the distinction made in the *Wildlife Act 1975*), while fisheries policy and management were applied through the *Fisheries Act 1995*. Fish research was also conducted at the Snobs Creek Hatchery near Eildon, and later the Kaiela Fisheries Research Station established at Shepparton. Further field stations were established at Cambarville, east of Marysville, to facilitate forest-related fauna research and a small laboratory on the Nicholson River for studies on the Gippsland Lakes.

The establishment of a Wildlife Survey Team supported the investigations of the newly-formed Land Conservation Council, and consequently escalated the inventory of Victorian fauna species distributions and populations. Other noteworthy research themes were seabird monitoring, which provided important, ongoing baseline data, investigations of little-known terrestrial or arboreal mammals, and the development of a classification system of Victorian wetlands.

In the mid-1970s, Victorian Government agencies with an environmental or land management focus were united for the first time into a single ministry, the Ministry for Conservation. Joining the Fisheries and Wildlife Department were the National Parks Service, Soil Conservation Authority, Land Conservation Council, Environment Protection Authority and Port Phillip Authority. The Forests Commission of Victoria was not included under the conservation umbrella – that took another decade.



Fisheries and Wildlife Victoria logo designed by Bob Warneke



Other projects

A six-year study (1975-80) of Estuary Perch investigating the species' distribution, growth, spawning and diet across the State, provided valuable insights into its status and ecology.

There was concern for the conservation status of the Australian Grayling and surveys commenced to determine its distribution and abundance.



Fisheries programs

The freshwater fisheries program was led by Don Buckmaster with considerable effort still being dedicated to hatchery production and survey of introduced salmonids for recreational fisheries. In addition, a marine fisheries program, headed by Mike Sanders, included shark, abalone, rock lobster and scallop fisheries, with their research vessels (Capitella and Delphinus) moored at North Wharf. This section relocated to Victoria Parade (CBD) offices in 1979 and later to the Marine Science Laboratories at Queenscliff.

Photo: Don Buckmaster

Dartmouth Dam

The building of Dartmouth Dam led to a major environmental effects statement that involved field studies of flora, fauna and fish. This was a precursor to environmental flow studies to define the flows to be released into the Mitta Mitta River downstream after the dam's completion. Of particular interest were the impacts on Murray Cod, Trout Cod, Macquarie Perch and Brown Trout.

Photo: The construction of Dartmouth Dam, with the outlet tower visible on left

Toxicology

Chemistry and toxicology laboratories were a major element of ARI's original set-up with capabilities for analysis of heavy metals, many chemicals and water quality parameters. Studies of the impacts of heavy metals in sharks and birds, pesticides (such as DDT) in birds and eggs, and potential impacts on fish and small mammals of fluoride from the newly established Portland Alcoa smelter were undertaken. Eventually, ARI's toxicology program found a new home at the newly-formed Environment Protection Authority.

Photo: The original ARI chemistry laboratory

Hatchery production

Production at the Snobs Creek Fish Hatchery was largely for the widespread stocking of Brown and Rainbow Trout into upland rivers and for Chinook Salmon into lakes in Western Victoria. Fish health was a major consideration as part of hatchery protocols.

Photo: Examining the viability of fish eggs in the Snobs Creek Fish Hatchery



Carp

In the late 1960s introduced Carp were released into waters around Victoria, and in the late 1970s they escaped into the Murray-Darling River system. This prompted the initiation of a substantial Carp project, located at the Kaiela Fisheries Research Station, Shepparton. Carp became a major vertebrate pest and have remained a significant research theme for ARI.

Staffing

Six key staff were added to the Freshwater Fisheries Management Branch to lead newly-established research projects on native fishes and Carp. Peter Jackson studied River Blackfish, John Beumer studied eels, and Phil Cadwallader worked on Macquarie Perch, mostly within Lake Dartmouth. Jim Pribble (from the USA), Alistair Brown (from Scotland) and Doug Hume all worked on Carp.

Photo: Dr Alistair Brown

Ecology of River Blackfish

Peter Jackson led research on the spawning and early life development of River Blackfish, still a popular angling species at that time. This research included the discovery of spawned eggs inside a hollow log. Major population surveys and research were conducted for Wilson's Promontory, the Grampians and the upper Yarra River catchment.

Photo: River Blackfish eggs inside a hollow log

Ecology of eels

John Beumer led a research project on the general biology, feeding, movements and breeding of Short-finned and Long-finned Eels. Eels were a commercially important species, with much interest in their biology to guide the collection of glass eels (young eels) and assess their potential for aquaculture. While this research was centred in Gippsland, the knowledge gained also assisted eel fishery management along Australia's eastern coastline, in Tasmania and Fiji.

Photo: Dr John Beumer





Other projects

The Atlas of Victorian Mammals began in the late 1970s when details of thousands of Victorian mammal records were collated for future computer database entry – the forerunner of the Atlas of Victorian Wildlife (see 1980s).

The need for an effective method of surveying small arboreal mammals, such as the Feather-tailed Glider, led to a study of the benefit of nest boxes as a survey tool. Nest boxes have since become a popular means of supplementing tree hollow shortages; equally important is educating the public on the value of these boxes.



Peters Menkhorst and Johnson nest box study Duk Duk 1977

Ecology of the Australian Fur Sea

A long-term study of Australian Fur Seals was initiated in 1964 and led by Bob Warneke until his retirement in 1991. Based at Seal Rocks off Phillip Island, it monitored population demographics and diet. A research hut, built of local stone, enabled researchers to visit for extended periods. An observation tower, constructed in 1969 to allow a panoramic view of the colony, enabled the monitoring of over 16,000 seals marked as pups over 11 breeding seasons.

State-wide fauna surveys

In the early 1970s, the newly formed Land Conservation Council required detailed information on the flora and fauna of all major areas of Crown Land. This led to the establishment of a Wildlife Survey Team led by Bill Emison, recruited from the USA Fish and Wildlife Service. A warm and personable man, Bill formed a dedicated team of scientists and technicians which conducted extended field-trips across most Crown Land in Victoria for over two decades. Study areas were divided

into a 5-minute latitude-longitude grid, each surveyed for mammals, birds, reptiles and frogs. Collection of museum voucher specimens was a routine requirement. This grid-based data collection led to the development of distribution maps based on grid cells, culminating in two landmark publications *The Atlas of Victorian Birds and Mammals of Victoria*, and databases that evolved into Victoria's Biodiversity Atlas.

Photo: Peter Menkhorst and Bill Bren baiting cage traps, Pyrenees Range, December 1976

Peregrine Falcon

In the 1970s there was concern about predatory birds suffering from egg-shell thinning caused by organochlorine pesticides. Bill Emison led a study of breeding numbers and breeding success of Peregrine Falcons in Victoria, including banding of nestlings. This necessitated the development of tree-climbing and rock-climbing skills; about 70% of chicks were from eyries on cliffs, the rest from eyries in trees. The banding of chicks continued during 1980s and 1990s, and by 1996, 807 chicks had been banded in Victoria and 66 of these had been either recovered or resighted.

Photo: Bill Emison with Peregrine Falcon

Seabird studies

Frederick 'Ian' Norman pioneered seabird studies in Victoria over several decades. These included long-term studies of Little Penguin breeding, diet and movements, with Peter Dann of Phillip Island Nature Parks and, later, Australasian Gannets breeding on navigation structures in Port Phillip Bay. Mapping of Victorian seabird breeding colonies and estimates of breeding numbers at all sites, established baseline data for future monitoring.

Photo: Ian Norman at Popes Eye gannetry

Little-known mammals

John Seebeck and Bob Warneke continued their studies of little-known mammal species, including the Eastern Barred Bandicoot, Long-nosed Potoroo, Broad-toothed Rat, Mountain Pygmy-possum, and whales and dolphins in Victorian waters. An animal house was maintained at ARI where various mammals were held for study, including the Spot-tailed Quoll, Long-nosed Potoroo and Leadbeater's Possum. A collection of mammal skins was also maintained until transferred to the National Museum of Victoria in the mid-1980s.

Photo: John Seebeck

Management of duck hunting

The annual duck hunting season was a major event that required mobilisation of a large proportion of Departmental staff and resources. ARI assisted in the collection of data on harvest rates on opening weekend, via hunters' bag surveys, a tradition of almost 50 years, using analyses to inform ongoing management.

Mapping and classification of wetlands

Recognition of the high rate of loss and alteration of wetlands across the State led to the mapping of Victorian wetlands and their classification into an ecologically-based framework of wetland types. In the days before satellite imagery was widely available this necessitated driving to potential wetlands, many on private land, to check their current status. The wetland classification developed by Andrew Corrick formed the basis of the Government's present-day wetland data layers.

Atlas of Victorian Wildlife
Wildlife Management Branch,
National Parks and Wildlife Division

Name: *P. Menkhorst*
Address: *ARI*

Ref: Prj: Obs: Punched: Checked: Date:

First Date: *06 03 1977*
Locality: *Snake Island site 3*
Second Date:

Grid Ref: *Lat: 3 8.44 Long: 146.29 Acc: 50*
Map no: AMG:

Altitude: *10* Your Ref: *PVM 171*
Coverage: Birds Mammals Herps

Antechinus minimus
Code: *M 1026* Count: *1* X T

70s

Fisheries Don Buckmaster, Jim Pribble, Phil Rhodes (enforcement), Peter Rogan, Jim Wharton, Charlie Barnham.

The Idleburger

Not many people know or remember that ARI had its own 'newspaper' - *The Idleburger* (a parody of the local free newspaper *The Heidelberger*).

Edited by John Beumer and Peter Jackson, it was described as 'A Rough, Informal, Err, Rag' (ARIER). The Idleburger was produced for five years (1978-82) with 2 to 3 issues a year - 13 issues in all. Production had the endorsement of the ARI Director and included staff news in a section called 'Out of the Yabby Pot', essentially a version of 'Births, Engagements, Weddings, Deaths, Other Transfers'. There were lots of politically incorrect statements, jokes, comics and other material from a multiplicity of sources, including staff.



The Idleburger 1980, 1981 and 1982 editions



People Passion Science

“ There were always adventures and a sense of excitement to fieldwork. Many of world's problems were solved while sitting around the campfire having a few beers and talking the proverbial BS. ”

John (Macca) McKenzie



John McKenzie, Bob Warneke, Fred Baum, Keith Cherry, (foreground) on Deen Maar (Lady Julia Percy Island)

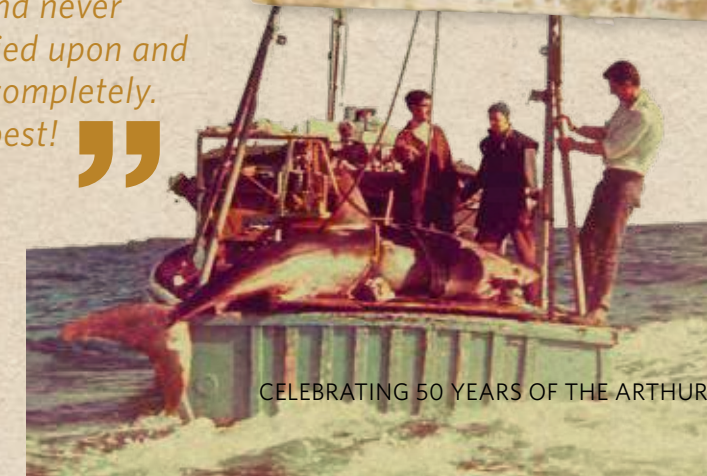
Seals

The Seal Rocks observation pylon, 45 feet high, cost £250 and was erected in July 1969. It fell over after only two days but was repaired and re-erected.

“ Working on fur seals was often a shitty and at times dangerous job. We all sustained minor injuries. The staff were enthusiastic and never complained. We relied upon and trusted each other completely. Yes, they were the best! ”

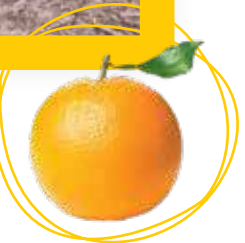
Bob Warneke

Seal Rocks White Pointer

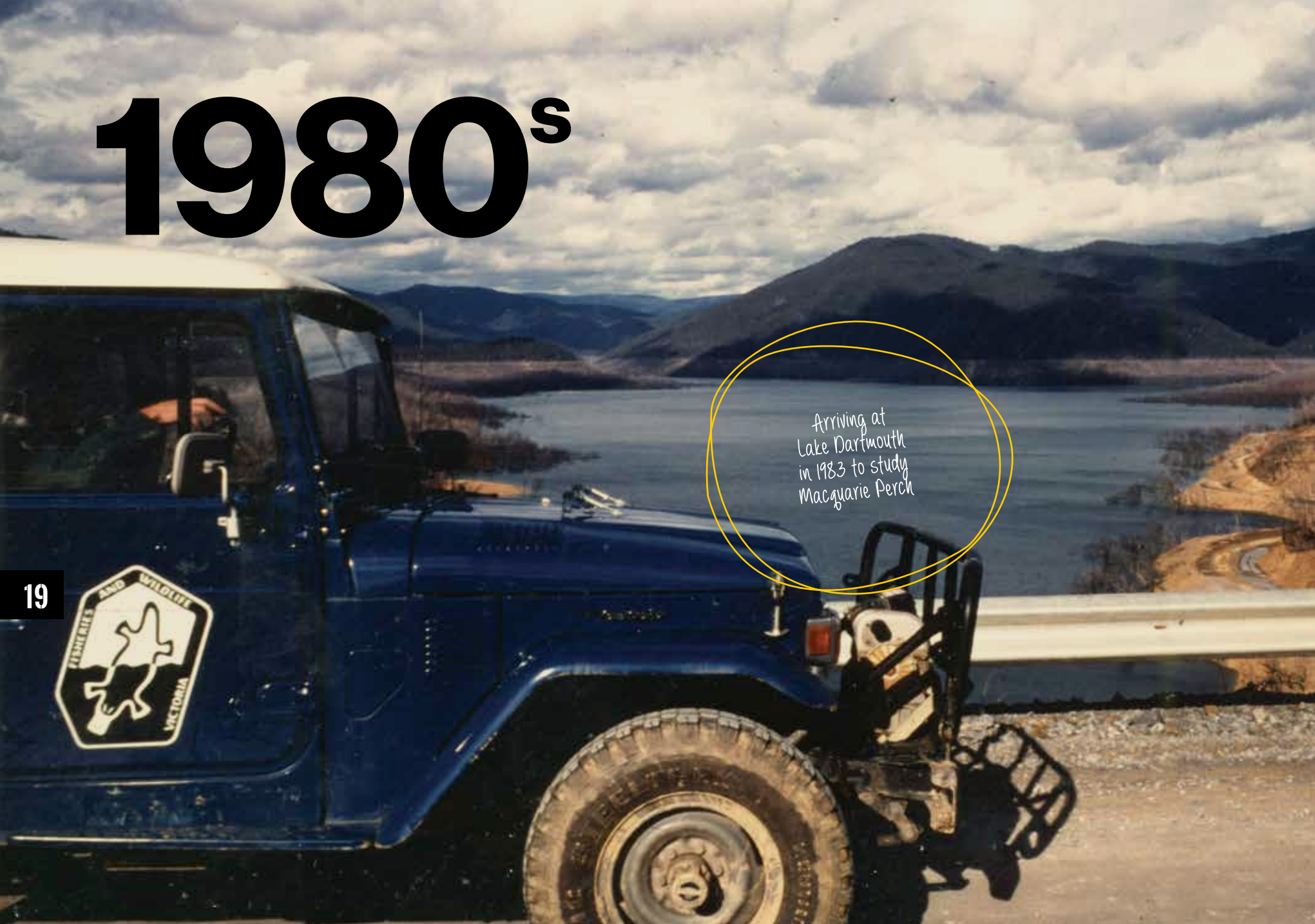


Peter Jackson and his new flow meter

Prior to the purchase of the new flow meter, Peter measured stream velocity with an orange attached to a length of string and a stopwatch. While working in Wilson's Promontory National Park a member of the public asked him, 'What are you doing?' The ever-droll Peter quipped, 'Taking my orange for a walk' before explaining properly.



1980^s



Arriving at Lake Dartmouth in 1983 to study Macquarie Perch

The Institute was now well-established and ARI's core objectives centred on promoting knowledge of the distribution and ecology of both threatened and invasive species. Although much attention was still given to hatchery production of salmonids and duck hunting, focus was also placed on forest management (especially concerning the impacts of timber harvesting), wildlife on private property, and impact assessments of the Dartmouth Dam.

The election of the Cain Labor Government in 1982 resulted in another departmental reshuffle with the new Department of Conservation, Forests and Lands (1983-90) taking responsibility for the management of all Crown Land, including State Forests and the regulation of timber harvesting therein. ARI's responsibilities within this reconstituted department meant a greater emphasis on forest research, typically around the impacts of different silvicultural approaches and the status and management of threatened forest biota.

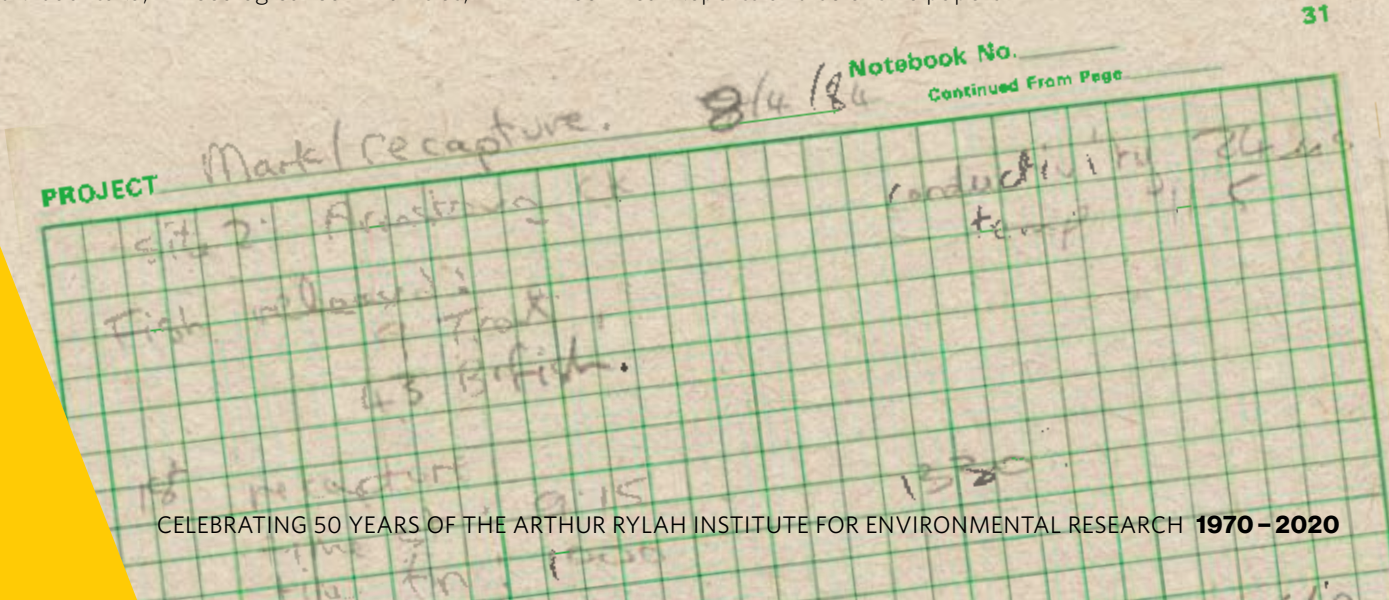
and 43 potentially threatening processes. ARI was extensively involved through the generation of listings and the provision of information for the drafting or implementation of FFG Action Statements and other management plans. Three ARI staff (Peter Jackson, Fiona Coates and John Koehn) were members of the FFG Scientific Advisory Committee that assessed nominations for listing and reports for the Minister.

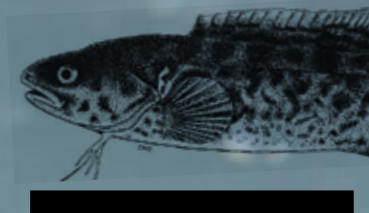
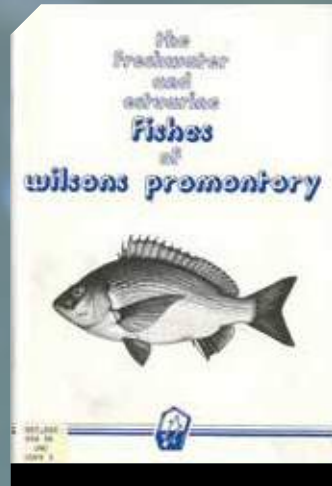
The *Flora and Fauna Guarantee Act* (FFG) was the first biodiversity conservation legislation in Australia. It was enacted in 1988 (proclaimed in 1990) and helped set conservation priorities for recovery. By 2020 the FFG had over 2,000 listings, comprising more than 1,900 listings for individual taxa, 42 ecological communities,

Survey and research techniques continued to evolve through the 1980s, with a growing emphasis on understanding habitat requirements; the management needs of native species; and the impacts of threats on them. Management strategies for threatened fauna, environmental flows, duck hunting, general fish and faunal surveys and species-specific ecology, were all subjects of ARI Technical Reports and scientific papers.



- 1982** John Cain Jr. (Labor) becomes the Victorian Premier
- Ten Victorian wetlands listed as wetlands of international significance under Ramsar Convention
- 1983** Ash Wednesday Bushfires
- The Department of Conservation, Forests and Lands replaced the Department of Crown Lands and Survey, the Department of State Forests and the Ministry for Conservation
- 1985** Begins a 15 year period with no on-site ARI Director
- 1986** ARI plays a major role in the discovery of a new species of mammal, the Long-footed Potoroo described by John Seebeck
- 1987** The *Conservation, Forests and Lands Act* legislated
- 1988** Victoria's wetlands mapping project 1988-1993 resulted in a key corporate dataset, the 'wetland layer', that is still used today
- The *Flora and Fauna Guarantee Act* is enacted





Other projects

Trout Management Team surveys for recreational species were the most common form of fish sampling.

Angling surveys were undertaken on the Gellibrand and Barwon rivers.

A proposal to introduce a paddle steamer onto the Goulburn River near Shepparton included extensive de-snagging to provide boat passage. This necessitated a major survey of the instream woody habitats of this area. Thankfully, the proposal did not proceed.

The status of Australian Bass, Australian Grayling and Trout Cod were determined by targeted fish surveys.

Research into Black Bream spawning.



Rob Price and Rob Gibb with catches from Trout Management Team surveys

Hatchery production of native fish

A major upgrade of the Snob's Creek Fish Hatchery was undertaken to accommodate the production of native fish, especially Murray Cod. The establishment of a pilot Murray Cod hatchery at Lake Charlegrark, west of Horsham, was the beginning of a program to produce and stock native fish, not just introduced salmonids.

Photo: Ray Donald and Geoff Gooley with a Murray Cod brood fish

Fish surveys

Extensive fish surveys were undertaken for the Grampians, Wilsons Promontory, Croajingalong National Parks, the Otway Ranges, Dandenong Creek and Westernport catchment. Regular trout management surveys continued and surveys to determine the distributions of Australian Grayling were undertaken. Fish surveys have continued to provide valuable data for management. *The Freshwater and Estuarine Fishes of Wilsons Promontory*, written by Peter Jackson and illustrated by Jeff Davies, was published in 1983.

Photo: Cover of *The Freshwater and Estuarine Fishes of Wilsons Promontory*

Electrofishing

ARI hosted Australia's first national electrofishing workshop in the mid-1980s. A National Code of Practice was subsequently established following the examination of electrofishing equipment, efficiencies, safety and procedure. ARI has remained at the forefront of electrofishing development and its use as an effective fish sampling tool.

Photo: Electrofishing workshop

Environmental flows

Environmental flow studies commenced on the Thomson River below the new Thomson Dam during the early 1980s and were also conducted on the Gellibrand and Barwon Rivers in south-western Victoria and the Wimmera and Mitta Mitta rivers. These studies were the origins of important ongoing research into environmental flows.

Photo: Terry Glenane establishing streamflow transect in the Mitta Mitta River

River Blackfish ecology

The study of the habitat requirements and movements of River Blackfish revealed the importance of an instream woody habitat and their preference for slower water velocities. With small home ranges and minimal movements, they were found to be nocturnal and showed high site fidelity, especially when the male fish were guarding Blackfish eggs. A survey of blackfish angling was conducted in the Gellibrand River due to concern over reductions in the population there.

Chinook Salmon

Chinook Salmon fisheries were important in Victoria's Western District lakes, being established and maintained through hatchery and stocking programs. Additional research was undertaken to improve Chinook breeding programs and provide the foundation for an emerging salmonid aquaculture industry. Sponsored by Mitsubishi, who were manufacturing cars in Australia but with major aquaculture interests internationally, this program helped launch the careers of two ARI aquatic staff (John Koehn and Fern Hames) and revolutionised fish husbandry techniques.

Photo Top: Fern Hames on a Chinook Salmon study tour in Japan

Photo Bottom: John Koehn (middle) and the Quigley brothers Doug (left) and Len (right)

Freshwater Fish of Victoria

In 1983 the publication of *A Guide to the Freshwater Fish of Victoria* by Phil Cadwallader and Gary Backhouse provided a seminal contribution to the identification and recognition of native fish in south-eastern Australia. This guide was the 'go to' text on Victorian fish for both researchers and managers; it provided much biological information and highlighted the threats that needed to be addressed.

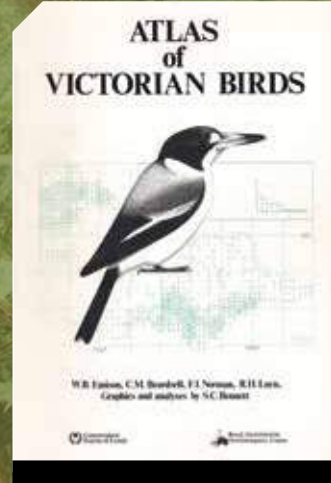
Photo: Cover of *A Guide to the Freshwater Fish of Victoria*

Macquarie Perch in Lake Dartmouth

The filling of Lake Dartmouth, led to a dramatic expansion of the Macquarie Perch population, providing a valuable recreational fishery, in contrast to other declining river populations. A major study of the diet, population structure, spawning and ecology of Macquarie Perch was undertaken by Phil Cadwallader to assist the preservation of this popular angling species.

Photo: Ray (the 'Fox') Donald netting in Dartmouth Dam





Other projects

Broad-scale fauna surveys for the Environment Conservation Council (previously LCC) continued and led to dramatic increases in records, especially for little-known taxa (e.g. bats, reptiles).

The Woodland Fauna Program initiated ground-breaking ecological studies of the Squirrel Glider and Regent Honeyeater.

Development and application of the Taxon Priority System for the Victorian vertebrate fauna by Leigh Ahern and others led to the Threatened Species Advisory Lists.



Alternative silviculture

The Silvicultural Systems Project, established in 1987, investigated whether a better balance between economic and environmental concerns in production forests could be achieved by harvesting systems other than clear-felling (i.e. seed tree, shelterwood and gap selection). Sites were primarily in mountain ash forests of central and southern Victoria, and the lowland mixed eucalypt forests in East Gippsland. A subsequent program, the Value Adding and Silvicultural Systems Program, ran for several years from 1990.

Forest research and survey

Forest fauna research was exemplified by surveys of the Central Highlands for the Yellow-bellied Glider, Greater Glider, Mountain Brushtail Possum and Leadbeater's Possum, the latter presumed extinct until its re-discovery in 1961. Victorian Forests Commission ecologists (Richard Loyn, Malcolm Macfarlane, Evan Chesterfield) joined ARI to bolster research into the impacts of forestry and fire on biodiversity. Multi-disciplinary teams provided invaluable field experience for many young ecologists, their findings crucial for identifying locations of many threatened taxa and communities and modifying timber harvesting prescriptions.

Photo: Greater Glider

Atlas of Victorian Wildlife

The *Atlas of Victorian Wildlife* collects distribution data for vertebrate fauna. Established in the mid-1980s, and managed at ARI for many years by Brad Dale and Barbara Baxter, it consolidated data from multiple sources, including the *Atlas of Australian Birds* (Royal Australasian Ornithologists Union). Location data plus ecological and biological information were curated and used to inform conservation status assessments and land management. The Atlas evolved into the more complex *Victorian Biodiversity Atlas*, a web-based information system that also includes species attributes and is used for spatial analyses (e.g. NatureKit).

Threatened terrestrial fauna

The *Flora and Fauna Guarantee Act* legislated a greater focus on the research and management of threatened species, including development of Victorian Action Statements and later, National Recovery Plans. ARI staff worked on a suite of threatened species, including Eastern Barred Bandicoot, Long-footed Potoroo, Smoky Mouse, Mountain Pygmy-possum, Squirrel Glider, Brush-tailed Rock-wallaby, Red-tailed Black-Cockatoo, Orange-bellied Parrot, Helmeted Honeyeater, Regent Honeyeater, Spotted Tree-frog and Striped Legless Lizard.

Photo: Smoky Mouse

Management of duck hunting

Building on work in the 1970s, management of duck hunting was steadily refined through the phasing out of poisonous lead shot and mandating a duck identification test. ARI waterbird specialists Ian Norman and Ron Brown played significant roles in the development of this test. Pre-duck hunting season waterbird counts began in the mid-1980s and continue to this day, providing vital information about wetland values and the management needed during hunting season.

Flora Information System

Paul Gullan established the Flora Information System (FIS), a substantial database for plant records and information, in the mid-1980s. The Flora Information System was managed at ARI from 1992 with ongoing development and curation until it was ultimately incorporated into the *Victorian Biodiversity Atlas*.

Photo: Ranunculus gunnii Snowy Plains

Annuello Corridor

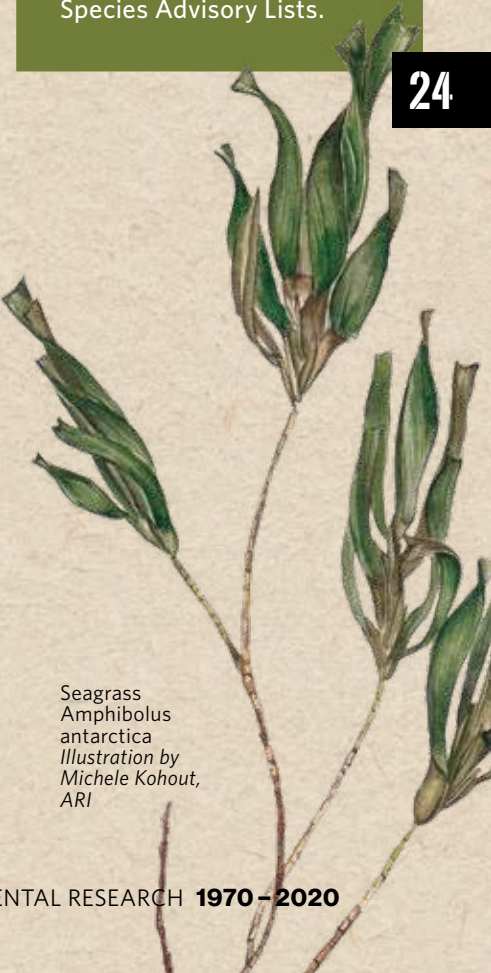
The Annuello Corridor was instituted in 1985 to create a continuous habitat link between the Annuello Flora and Fauna Reserve and the Murray-Sunset National Park. This provided a unique opportunity to monitor fauna use of a narrow habitat corridor over time. ARI conducted surveys in and near the Corridor during 1988-93 and 2005-06. The Corridor appeared to be functioning as habitat for a suite of semi-arid fauna, providing an important bio-link between the two large reserves, as well as being a viable ecological unit in its own right.

Photo: Nobbi Dragon

Birds: abundant and rare

Birds continued to be a research focus. A major investigation into damage to grain crops by Long-billed Corellas included aerial surveys of flock sizes and dispersal in both Victoria and adjacent South Australia. Studies began of the habitat of the Red-tailed Black-Cockatoo in south-western Victoria and the life-history and diet of Australasian Gannets in Port Phillip Bay. The intensive Helmeted Honeyeater recovery program began in 1988.

Photo: Orange-bellied Parrot



Seagrass Amphibolus antarctica Illustration by Michele Kohout, ARI

80s

Bill O'Connor, John Koehn, Terry Glenane, John McKenzie, Rob Gibb and Des Harrington at Armstrong Creek



Jeff Davies - technical officer and artist

ARI Technical Report Series

ARI's first Technical Report, drafted in 1982 by Andrew Bennett was titled *A Preliminary Evaluation of the Effect of Intensive Timber Harvesting on the Fauna of the Otway Region South-western Victoria*. ARI has since produced over 320 Technical Reports, although the style and format have changed.



John Garnham, Ruth Lennie and Jim Bacher



Mark O'Sullivan and a Yellow-bellied Glider at Mosquito Creek in 1985

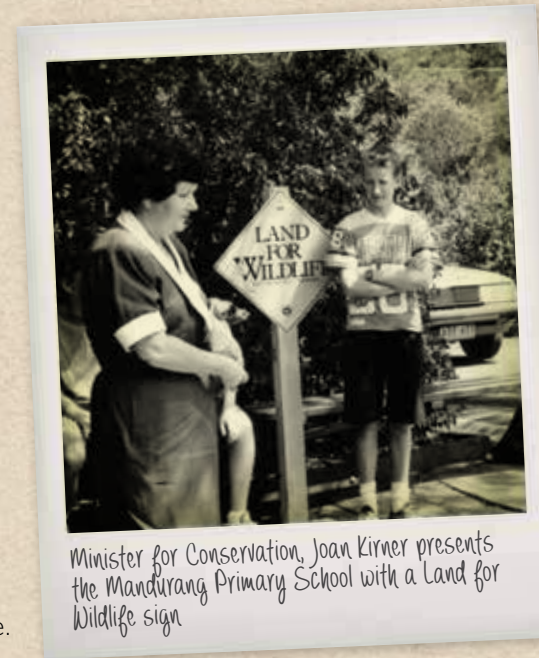


Geoff Brown, Dave Scotts, Keith Cherry, Jenny Nelson

Land for Wildlife

ARI held regular meetings with the Bird Observers Club of Victoria. One meeting led to the creation of Land for Wildlife, a voluntary wildlife conservation program supporting landholders to undertake conservation actions aimed at the creation or protection of wildlife habitats on private property.

Launched in 1981 with the first property at Winchelsea, it was significantly upgraded in 1990 due to the efforts of ARI staff Leigh Ahern and Steve Craig, and the appointment of a co-ordinator, Stephen Platt. The scheme provided the latest scientific information to landholders through its newsletter and technical notes. The scheme boomed with 600 property registrations per year and grew from 800 properties in 1989 to over 6,000 (more than 530,000 ha of private land) by 1996 and 10,000 (involving 24,000 individuals) by 2020. Following relocation to the regions, the scheme continued to be led by ARI alumni Felicity Nicholls, Peter Johnson and Pam Clunie.



Minister for Conservation, Joan Kirner presents the Mandurang Primary School with a Land for Wildlife sign

Memories of ARI:

“ The gourmet field-trip cooking escapades? The lung-busting climbs out of the Otway streams? The great bulk sleeping bag purchase negotiations of 92? Me pretending to throw a snake at Des Harrington up at Mitta River (which he DID NOT think was funny), the trauma of Billy O'Connor getting a leech in the eye? So many adventures and laughs. ”

Paddy O'Leary

1990^s



This was the decade of formal recognition of threatened species, communities, threatening processes, and actions to recover them. The introduction of the *Flora and Fauna Guarantee Act 1988* led to the official listing of many species. Similarly, recovery plans were drafted for species listed under the national *Environment Protection and Biodiversity Act 1999* (EPBC). ARI was central to listings, provision of location and ecological information, and the preparation of plans.

Through the late 1980s and 1990s there was considerable change within Government, exemplified by budget cuts to the public service, reorganisations and pushes for relocations, sell-off of public assets and a need to fight for both ARI and conservation outcomes. The Kennett Liberal Government (1992-99) also planned privatisation of many Government research institutes, including ARI. ARI staff designated as having policy roles were relocated to 'Head Office' (East Melbourne), weakening the close collaboration between policy and research. While this turmoil diverted much staff time and energy away from the primary focus of conservation research, the dedication of staff ensured that major outcomes were still achieved.

The exodus of policy staff in the mid-1990s coincided with the arrival of other forest research staff to ARI, namely those of the Centre for Forest Tree Technology, later named Forest Science Centre and eventually part of the School of Ecosystem and Forest Science, the University of Melbourne at Creswick (departing ARI in 2007).

The development of conservation lists progressed rapidly. Threatening processes were more clearly defined in National Recovery Plans and Victorian Action Statements, that focused ecological knowledge towards managing species recovery.

Technology evolved, improving monitoring and research capabilities, yet some older technologies persisted, such as the use of VHF acoustic transmitters to track wildlife, sticky hair snares to detect species, and sand pads to record animal prints. The radiotracking of fish was pioneered, the impacts of Dartmouth Dam and forestry operations investigated, knowledge of species distributions improved, and ARI vegetation surveys and research were greatly enhanced with the formation of a flora team. Unfortunately, ARI also documented the loss of the small, endemic Christmas Island Pipistrelle bat.



Steve Saddler inserting a radiotracking transmitter into a fish

1990

- The Flora and Fauna Branch is created
- Flora research staff moved to ARI from Kew

- CFL renamed Department of Conservation and Environment

- Joan Kirner (Labor) becomes the Victorian Premier

1992

- ARI begins undertaking Regional Forest Agreement (RFAs) surveys

- DCE renamed Department of Conservation and Natural Resources

- Jeff Kennett (Liberal) becomes the Victorian Premier

1995

- Centre for Forest Tree Technology (later named Forest Science Centre) moves to ARI from Creswick

- Flora and Fauna policy staff move to head office at Victoria Parade whilst research staff remain at ARI

- ARI proposed to be corporatized
- Ed Hilliard appointed as ARI General Manager

1996

- DCE renamed Department of Natural Resources and Environment

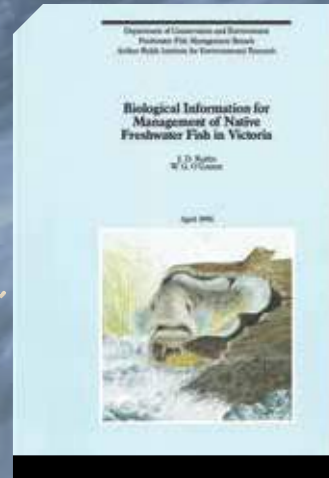
- Freshwater Ecology ARI amalgamated into Marine and Freshwater Resources Institute. Proposed corporatisation and relocation of ARI staff to Snobs Creek ultimately unsuccessful

1999

- Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC) 1999 legislated

- Steve Bracks (Labor) becomes the Victorian Premier

AQUATIC 90^s



Other projects

Surveys were undertaken to determine the distribution of the endangered Barred Galaxias in the Central Highlands and inform recovery actions.

A range of environmental flow assessments, fish passage surveys and Carp removal projects were undertaken.



Carp surveying - Matt Jones, Pam Clunie

Photo: Time Doeg in the Otways



Native fish information

Biological Information for the Management of Native Fish in Victoria was published in 1990 with the explicit aims of raising the profile of fish and providing managers with easy access to information.

Radiotracking and the ecology of native fish

John Koehn led a project investigating the habitats, movements and spawning ecology of Murray Cod. This project was the first to use radiotracking to study fish in Australia and the first to capture Murray Cod larvae in the wild. Radiotracking was later used to study Trout Cod, Golden Perch, Carp, then many other species.

Findings were conveyed to the public through the *Codwatch* newsletter with 20,000 copies per edition. The project generated considerable public interest and media attention and won several awards.

Bringing the Native Fish Back

The Commonwealth National Heritage Trust funded a range of rehabilitation projects under the banner of Bringing the Native Fish Back.

- Ecology and management of Carp (spawning and movements) in Barmah-Millewa Forest.
- Downstream migration of adult Murray-Darling fish - revealed downstream movement is important and can be impeded by weirs.
- Thermal rehabilitation in the Murray-Darling Basin (MDB) - cold water outlets of impoundments prevented fish spawning and recruitment.
- The drafting of a *Murray-Darling Basin Fish Recovery Plan* - to recover multiple species at a time.
- Pilot river rehabilitation through re-snagging - ARI research quantified that instream woody habitat was important to lowland river fish populations, but needed to prove that re-snagging was feasible.
- Conservation genetics of Murray-Darling Basin fish species- genetics becoming accepted as a component of restoration ecology.
- Development of a population model for the threatened Trout Cod.

Threatened fish

There was a flurry of nominations for the listing of Victorian threatened fish and Potentially Threatening Processes under the new *Flora and Fauna Guarantee Act*. Fourteen fish species and seven threatening processes were listed (removal of wood, alterations to stream flows, alteration to temperatures, inputs of toxins, inputs of sediment, introductions of non-native fish, and blockages to fish passage), and ten Action Statements drafted. ARI was involved at all stages of this process.

Photo: Australian Grayling

Impacts of the Dartmouth Dam

Political debate surrounded the need for an outlet tower with the capacity to release water from near the surface, rather than cold water from deep or near the bottom of the dam. Unfortunately, this option was not included and cold water (up to 15°C colder than natural) continues to be released, resulting in the loss of Murray Cod, Trout Cod and Macquarie Perch populations in the Mitta Mitta River downstream. Note that some Murray cod have since re-appeared following warmer water temperatures during drought years.

Photo: Dartmouth Dam

Salinity tolerances

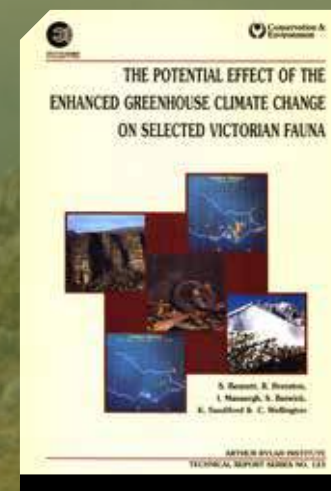
The intrusion of saline groundwater into rivers emerged as a major threat in northern Victoria. Salinity assessments were undertaken in the Goulburn and Wimmera rivers to determine salinity levels and investigate disposal sites. High salinity levels at the bottom of deep pools made such areas uninhabitable for fish and recommendations were made to manage this using flushing flows. Salinity tolerances of fish were tested in the ARI aquarium.

Photo: Tim O'Brien in the lab

Impacts of forestry

Comprehensive fish surveys were undertaken in the Otway region in relation to forestry through the Silvicultural Systems Project (SSP), in East Gippsland through the Value Adding and Silvicultural Systems Program (VSP), and more broadly through Regional Forest Agreement projects. Investigation of the impacts of logging included water quality - especially sediment in streams - and testing of sediment tolerances of several fish species in the ARI aquarium. There was some tough trekking into beautiful forest stream sites.

TERRESTRIAL 90s



Other projects

Changes in vegetation from a grazing trial on Yanakie Isthmus, Wilsons Promontory National Park.

Changes in mixed forest after fire and clear-felling on the Errinundra Plateau.

Population monitoring to inform conservation and management of the Bush Thick-knee in northern Victoria.

Evaluation of the impact of cats on wildlife by surveying wildlife admitted to animal welfare agencies.

31

Leopard Orchid
Diuris maculata
Illustration by
Michele Kohout,
ARI

The Northern Plains of Victoria

Extensive landscape change to the Northern Plains of Victoria precipitated a large collaborative study of the value and function for biodiversity in fragmented remnant woodlands, led by Andrew Bennett. The project was designed to investigate the status of the fauna persisting in remnant vegetation and to examine patterns of faunal distribution and abundance in relation to landscape patch attributes and vegetation structure.

Photo: Cover of the *Fragments for the Future* book

Regional Forest Agreement surveys

The Forest Protection Survey Program (for the RFA) comprised pre-harvest surveys within logging coupes to detect plants and animals that were threatened or of high conservation value. This information helped protect flora and fauna from logging activities while reducing uncertainty to the timber industry and led to forest agreements being signed in the late 1990s and 2000.

Ecological Vegetation Classes

The Ecological Vegetation Class (EVC) concept was developed to classify and map vegetation on a state-wide basis, helping to define old-growth forests and contribute to the National Forest Policy Statement. An EVC consists of one or a number of floristic communities that appear to be associated with a recognisable environmental niche; each EVC is described through floristics, lifeform and ecological characteristics. EVCs are now the standard way of classifying vegetation in Victoria.

Photo: *The Bogong High Plains*

Threatened fauna

Many management plans and conservation strategies for threatened taxa were produced in the 1990s, often in collaboration with regional colleagues and other agencies. Plans and aligned surveys were drawn up mostly for birds (Helmeted Honeyeater, Orange-bellied Parrot, Turquoise Parrot, Regent Honeyeater, Bush Thick-knee, Plains-wanderer), and research plans for groups, such as threatened woodland birds. Management plans were also drafted for selected mammals (Long-footed Potoroo, Leadbeater's Possum) and frogs (Spotted Tree Frog, Baw Baw Frog).

Photo: *Alpine Tree Frog*

Rainforests

The 1990s saw consolidation of work on the distribution, diversity and ecology of rainforest communities. Significant rainforest sites were mapped early in the decade, leading to formal definitions and classifications; Cool Temperate, Warm Temperate and Dry Rainforest are rare and restricted to small, fragmented areas. Often located in inaccessible terrain, this made fieldwork challenging. Further mapping and inventory occurred in Rainforest and Cool Temperate Mixed Forests, with a code of practice established for management of threats such as fire and pathogens, including Myrtle Wilt.

Climate change

Led by Simon Bennett, ARI produced a perceptive publication in 1991 entitled *The Potential Effect of the Enhanced Greenhouse Climate Change on Selected Victorian Fauna*, in what was the Institute's first work on the potential impacts on fauna of a changing climate. It reviewed the prospects of 42 species and determined that all would undergo a reduction in bioclimatic range in response to climatic warming. Key recommendations included the creation of a large system of reserves to allow wildlife to 'self-regulate' or failing that, to 'intensively manage' wildlife populations.

State-wide wetland survey

Victorian wetland vegetation communities were poorly understood and rarely documented. In the early 1990s the sampling of 800 sites revealed species-richness to be low, particularly within more inundation-prone central zones in contrast to wetland edges that could be very diverse due to the wetting and drying cycle. Data collected during these surveys led to the generation of benchmarks for Wetland Ecological Vegetation Classes for the Index of Wetland Condition.

Photo: *Doug Flood surveying a wetland*

Christmas Island Pipistrelle

Between 1994 and 2009 ARI staff, led by Lindy Lumsden, played key roles in establishing and tracking the status of the Christmas Island Pipistrelle, a small bat that was formerly common and widespread on Christmas Island yet declined rapidly through the 1990s. ARI staff were the first to identify the decline, and desperately tried to avert its extinction. Unfortunately, these efforts failed, and staff were present on the day the species went extinct in August 2009.



A Cat with native prey

32



Early flora group: Rear (L-R) David Cheal, Ross Peacock, Cathy Molnar, Jane Dickens, Steve Mueck, Sally Edwards, Karen Swayn, Fiona Cross, Anna Murphy, Adrian Moorrees, Annette Muir, Joanne Busuttill, Judy Downe. Front (L-R) Paul Gullan, Keely Ough, Lucille Turner, Juliette McCallum, David Cameron, Ann Opie, Pauline (Susie) Duncan, Bertram Lobert

Fighting for ARI and conservation

Through the late 1980s and 1990s Governments reduced the size and cost of the public service. Government research was a misunderstood and ill-advised target (“can’t we just use universities?”)

Cain Government Conservation Minister, Steve Crabb, was determined to decentralise and send staff to regional Victoria, a theme that often re-emerged. The Kennett Liberal Government (1992-99) enacted substantial cuts to public service staffing and planned the corporatisation or privatisation of Government research institutes, leading to the implementation of a ‘purchaser-provider’ model, (where Head Office policy staff were deemed the appropriate purchasers of research services) and the loss of many experienced ecologists.

In 1995, ARI was earmarked for corporatisation as part of a Natural Resources Research Institute along with the Keith Turnbull Research Institute (weed and pest research), Centre for Forest Tree Technology and Catchment and Land Protection Research (soil conservation). This plan was abandoned after about 18 months, although the Freshwater Ecology Group was integrated with the marine (Queenscliff) and Snobs Creek research sections as Marine and Freshwater Resources Institute (MAFRI), also proposed to be corporatised. The Snobs Creek Fish Hatchery, already separated from ARI, was leased to a private consortium for the next decade.

The MAFRI corporatisation also proposed the relocation of ARI aquatic staff to Snobs Creek, creating a very stressful and disruptive time for them. Neither the relocation nor corporatisation eventuated following a major public demonstration with extensive newspaper and television coverage, and the Freshwater Ecology Group remained at ARI. If either relocation or corporatisation had happened then ARI, like most other Victorian research agencies of the time (e.g. State veterinary, water and chemistry laboratories) would likely not have survived.

Thankfully, ARI adopted good business practices and clarified its role and the significance of its expertise and value. This resulted in a strong and efficient Institute with a business focus, working on full cost recovery that was mostly externally funded (including outside Victoria) to provide client-focused, applied research.



Flower Power

In 1992, botanists of the Flora Survey Group, stationed in the Soil Conservation Authority building in Kew (and previously Treasury Place and National Herbarium of Victoria at the Royal Botanic Gardens), relocated to ARI and formed the Flora Section.

The survey group was originally led by Paul Gullan and, while Paul didn’t transition to ARI (the group was led by David Parkes), he had considerable involvement in the development of the Flora Information System (database).

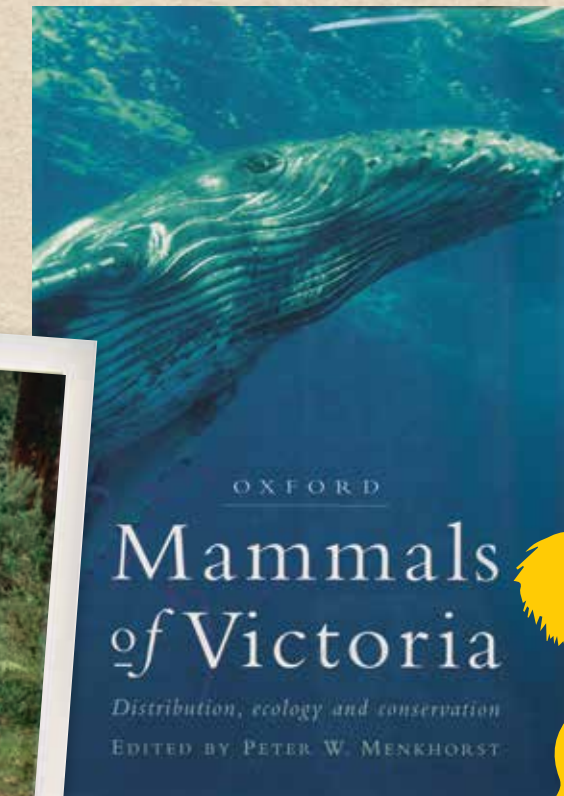


Keely Ough and Anna Murphy 1991



Mammals of Victoria

Compiled by nine ARI staff, the landmark book *Mammals of Victoria: Distribution, ecology and conservation* (1995) was spawned by the *Atlas of Victorian Wildlife* project. It quickly became the authoritative reference work on Victorian mammals and twenty-five years later is still widely used and cited.



2000^s

35



2000

- The Freshwater Ecology section returns to ARI administratively
- A full-time, on-site Director (Dr Tim Clancy) is appointed, the first since 1985

2001

- The ARI website was launched on the 6 May at an ARI Open Day

2002

- Department splits and becomes DSE (Department of Sustainability and Environment) and DPI (Department of Primary Industries)

2003

- Bushfires burn extensively across The Great Dividing Range

2005

- Several vertebrate pest research staff move to ARI from the Keith Turnbull Research Institute (Frankston)
- Robert Begg appointed ARI Director
- Cattle grazing removed from the Alpine National Park

2006

- The flora and fauna groups become the Terrestrial Ecology section
- ARI sited within the new Biodiversity and Ecosystem Services Division (BES) within DSE

2007

- Forest Science Centre leaves ARI for Melbourne University to later become part of the School of Forest and Ecosystem Science
- John Brumby (Labor) becomes the Victorian Premier

2009

- Biodiversity and Fire, a small policy division relocates to ARI from head office
- Dr Sze Flett appointed ARI Director
- Caretaker's house demolished and new workshop constructed

- ARI split into 3 Aquatic and 3 Terrestrial sections
- Horrific 'Black Saturday' bushfires hit Victoria

Field-based survey and monitoring were complemented by expanded databases, more sophisticated analyses of data, and the formulation of concepts and practical ways to translate these to management (e.g. ecological condition indices, spatial modelling). Recovery actions for threatened species were realised and greater focus was placed on pest species. Business practices improved and more research was undertaken beyond Victorian borders. Science quality, communication, community involvement, and collaborations all increased.

The concept of ecological condition examined the idea of not only what species' distributions may be but also habitat location and condition (through the Habitat Hectares classification). Key to this approach was maximising the use of the Department's existing biodiversity datasets, and complementing with other public-domain datasets (e.g. Bureau of Meteorology, NASA, etc). This enabled ARI to undertake complex analyses for multiple species, ecosystems and condition, and integrate them into simple maps at very large spatial extents, such as the whole of the Murray-Darling Basin.

Field study technologies saw significant advancements in remote sensing. Tracking devices were developed using integrated GPS technologies into ever smaller packages, allowing for high-resolution tracking of animal movement, from micro-bats to wild pigs. Some devices even allowed for real-time monitoring via data uploads. Camera traps, as they came to be known (i.e. remote sensing using automated cameras), became routine in mammal research, improving the reliability of data and reducing costs. Thus, ARI undertook detailed studies of wildlife presence, abundance and even

density estimations across Victoria on an unprecedented scale. *The Murray-Darling Basin Native Fish Strategy*, authored by ARI, increased the focus on the poor status of fish populations and prioritising actions to restore them. This revolutionised the management of freshwater fish in south-eastern Australia and was an example of the increased focus on integration of recovery actions.

The theme of integration was epitomized by the formation of the Department of Natural Resources and Environment (1996-2002) that incorporated Agriculture and Conservation under the banner of 'One NRE'.



Fox and bait station caught on camera trap

36

AQUATIC 00's



Aquatic surveys

By now, ARI routinely sampled various aquatic fauna - not just fish. The Sustainable Rivers Audit (SRA) assessed river health across the Murray-Darling Basin, including nine Victorian catchments. Reviews of biodiversity information for threatened fish and aquatic crustaceans identified knowledge gaps, threats and management options, and some targeted research was undertaken. Local river and wetland surveys assessed aquatic faunal communities and provided advice on management issues such as drought, alpine fire impacts, and land and river management.

Photo: Invertebrate sampling



The restoration of Lake Condah

As part of the Lake Condah Restoration Project, ARI studied the distribution and ecological responses to flow of native fish in Darlots Creek and Lake Condah, before water was restored to the lake. The movements of Short-finned Eels and Tupong were also examined using acoustic tracking. This work represented the beginning of a collaboration with the Gunditjmarra Traditional Owners of the Budj Bim landscape which continues today.

Photo: Acoustic tag being implanted into an eel



Threatened aquatic species recovery - large and small

National Recovery Plans and Victorian Action Statements continued to be prepared and updated. Species in focus included large-bodied native fish (Trout Cod, Macquarie Perch, Silver Perch, Freshwater Catfish), smaller-bodied fish (Barred Galaxias, Murray Hardyhead, Yarra and Variegated Pygmy Perches), and aquatic invertebrates (Mt Donna Buang Wingless Stonefly, Dandenong Freshwater Amphipod). Surveys assessed species' status, key threats were identified and managed, and habitat improvements occurred.

Image: Freshwater Catfish



Aquatic pests

Assessments of the impacts and management of aquatic pests included reviews of Gambusia and Oriental Weatherloach and their potential threats to a suite of aquatic fauna and flora. An assessment of the risk of Marron (a crayfish introduced from Western Australia) spreading across Victoria from the Mornington Peninsula was also undertaken.

Photo: Marron



Fishways and fish passage

As efforts to build fishways across Victoria increased, so too did monitoring and assessment of their effectiveness (e.g. sites along the Barwon, Maribyrnong, Thomson and Yarra rivers). ARI carried out pre- and post-fishway surveys, advised on improvements and in some cases collated baseline fish community data. ARI prepared reports on prioritisation of barriers requiring fish passage for the Loddon, Campaspe and Broken river systems.

Photo: Barriers in waterways can be large and small



Saving the Barred Galaxias

Many small galaxiid species are highly threatened, with very restricted distributions in headwater streams. For more than 25 years, ARI has led the successful conservation management of the non-migratory Barred Galaxias to prevent its extinction. Work has included comprehensive surveys to determine distribution and abundance, control of key predators (exotic Brown and Rainbow trout) and establishment of barriers to prevent their reinvasion, ex-situ captive management, artificial breeding and translocations. These methods and lessons learnt have been applied to other threatened galaxiids.

Photo: Barred Galaxias



Wetland condition and management

Under the *National Action Plan for Water Quality and Salinity*, ARI studied the impacts of salinity on wetland ecology, focussing on vegetation and macroinvertebrates in the Wimmera River. Field surveys and glasshouse experiments provided insights on biodiversity protection. The Index of Wetland Condition (IWC) was developed, with 13 indicators measuring wetland soils, physical form, hydrology, water quality, biota and catchment health. The IWC became the standard assessment method of wetland condition in Victoria, being applied to over 1600 wetlands.

Photo: Keely Ough



The Millennium Drought's impact on fish

Drought conditions continued through much of the 2000s. Following concerns over the status of populations of freshwater fish, their patterns of distribution and abundance were assessed to gauge the likely impacts. Key actions to protect threatened species most at risk, including Yarra Pygmy Perch, were identified and implemented. Refuge habitats were identified and protected, threats which compounded the effects of drought were identified and post-drought recovery planning occurred.



Re-snagging the Murray River



Other projects

A pilot project to add instream woody habitat to rivers began.

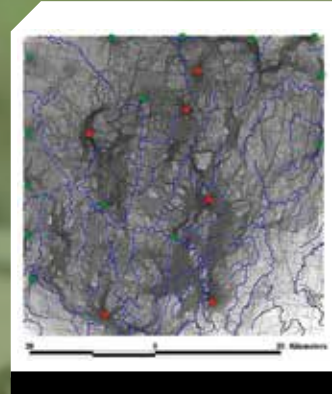
Trout Cod Recovery Program hits full swing.

Monitoring of Murray Cod populations, habitats, breeding and movements in response to flows in the Mullaroo Creek.

Macquarie Perch spawning and movements in the Yarra River were investigated.

Many expert panels conducted for environmental flows.

00s



Other projects

- Bio-mapping for the Surf Coast Shire.
- Northern Victoria vegetation condition modelling.
- Research on a suite of threatened frog species (e.g. Spotted Tree Frog, Booroolong Frog, Baw Baw Frog, Alpine Tree Frog, Growling Grass Frog) as awareness grew of their importance as key indicators of ecosystem health.
- The relationship of the threatened Pink-tailed Worm-Lizard with ants (its prey) and fire.
- Habitat models to explore the links between Long-footed Potoroos, fox baiting and fire.
- Forest protection surveys focused on the use of old trees as important wildlife habitat.
- Monitoring of the threatened Southern Bent-wing Bat.
- Post-fire monitoring and searches for rare species (following 2003, 2006-07 and 2009 fires).

Menindee Lakes

During 2000-01, ARI was commissioned by the then NSW Dept Land and Water Conservation to conduct a major biological inventory of the Menindee Lakes area in western NSW. The sparse woodlands of the floodplains and periphery of lakes, dominated by Black Box or River Red Gum, supported a diverse terrestrial vertebrate fauna. Surveys yielded at least 235 species, including new vertebrate species for the area and notable range extensions. The woodlands supported this assemblage because the lower Darling River, its lakes and floodplains, provide resource-rich habitats in an otherwise resource-poor landscape.

Photo: Cawndilla Channel, Menindee Lakes

Biodiversity in agricultural landscapes

Two substantial projects investigated the effects on biodiversity of landscape-scale management in agricultural landscapes: (1) collaboration with CSIRO (2006) saw the abundance and diversity of vertebrates and native plants evaluated in response to the presence of woodland trees, fertilization, grazing regime, and scale of tree clearing, and (2) the Ecologically Sustainable Agriculture Initiative (2002), with the Department of Primary Industries, explored new ways to help farmers better protect Victoria's natural environment and biota while maintaining the economic viability of their farms.

Alpine mossbeds

In 2004, the Victorian Government established the Alpine Grazing Taskforce, its aim to investigate the future of cattle grazing in the Alpine National Park. ARI and La Trobe University researchers assessed the condition of alpine mossbeds across the Bogong High Plains to determine their condition after a long history of grazing. Most mossbeds were in poor condition prior to the 2003 fires, and in even worse condition after. This assessment helped eliminate alpine grazing, the Minister announcing in 2005 that all cattle grazing in the Alpine National Park would cease.

Photo: Arn Tolsma, Bogong High Plains

A new home for Flying-foxes

In 2003 ARI staff were instrumental in the relocation of the Grey-headed Flying-fox colony from Melbourne's Royal Botanic Gardens where a colony of up to 20,000 animals had established itself and was damaging heritage-listed vegetation. After much public outcry, the colony was moved to Yarra Bend Park. ARI refined the fly-out count technique to assess population numbers, identified potential relocation sites, radiotracked captive animals after release, oversaw the environmental impact assessment, monitored post-relocation numbers, and contributed to the management plan.

Habitat Hectares

Graeme Newell and David Cheal were instrumental in developing Habitat Hectares, a site-based vegetation assessment method that measures native vegetation condition against a benchmark for the same vegetation type or Ecological Vegetation Class (prior to European settlement). Because the approach does not require high level botanical skills, Habitat Hectares has proven to be useful as a comparable measure allowing departmental staff to make objective and explicit conservation decisions.

Photo: Mature eucalypt woodland

Linking fire tolerance with plant growth-stage

ARI botanist David Cheal described how fire tolerance intervals and growth-stage attributes of native vegetation could be used to create spatially explicit datasets for fire management planning and fire ecology assessments. The report remains essential reading for fire ecology practitioners and fire managers, and those interested in the interactions between spatial and temporal patterns of biodiversity. This work also has wider applications for the sustainable management of vegetation for water quality, forestry and carbon sequestration.

Impacts of climate change

As climate change awareness increased, so did the desire to understand its impacts. ARI's Ecological Analysis and Synthesis Program, led by Graeme Newell, examined how climate change may affect selected terrestrial ecosystems. Cutting-edge modelling techniques of the time were developed and were used to suggest that major range shifts for some biomes were likely over an 80-year period.

Photo: Example graphic of modelled landscape permeability to terrestrial fauna

Melbourne Strategic Assessment

The Melbourne Strategic Assessment commenced in 2008-09 to help mitigate the impacts of Melbourne's urban development on threatened species and ecological communities, including grasslands, woodlands and wetlands. Clearing approvals and conservation actions were coordinated, resulting in the progressive establishment of new conservation areas. ARI contributed to reserve design, set conservation objectives, monitored ecological outcomes, and provided management advice and modelling to test the likely benefits of management strategies.

Photo: Growling Grass Frog



00s



Alison King with Murray Cod



David Choquenot



Standing (L-R) ARI staff: Jarod Lyon, Scott Raymond, Dave Crook, Fern Hames, Zeb Tonkin, Charles Todd, Belinda Cant, John Koehn, Pam Clunie, Steve Saddler; Seated: Mark Lintermans and Jim Barrett from the Murray-Darling Basin Authority

A wide range of native fish projects were led by Alison King during the 2000s, including the spawning and recruitment requirements of both large and small fish, particularly in relation to various environmental watering projects. Working with Leah Beesley, these projects included the watering of Murray River wetlands and monitoring of fish in Barmah-Millewa Forest and the adjacent Murray River.

David Choquenot returned to Australia from New Zealand to lead ARI's Fauna Ecology Research section (2003-05), injecting intellect and exuberance in equal measure.

Ed McNabb brought animal sound recording expertise to ARI. Ed specialised in surveys of nocturnal fauna, particularly owls and arboreal mammals, regularly using call-playback. He produced a library of high-quality recordings of these nocturnal taxa along with frog calls. Here he is in the field using a parabolic reflector and digital recorder.



Louise Grgat with a Bandy Bandy



John Silins digging pitfall trap holes



Ed McNabb

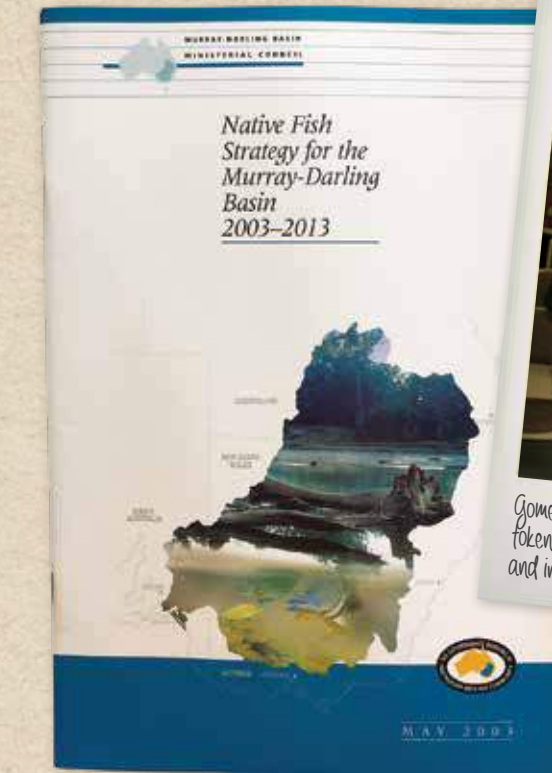


Phoebe Macak, Julian Miles (contractor) and Dan Purdey

Native Fish Strategy for the Murray-Darling Basin 2003-13

The Native Fish Strategy for the Murray-Darling Basin provided a major example of collaboration across State jurisdictions, integrating the priorities of the Murray-Darling Basin Authority, State and Federal agencies, fish ecologists, policy makers, community, anglers, Indigenous and other stakeholder groups.

This strategy revolutionised fish management in the Murray-Darling Basin by establishing fish as key environmental assets under the Murray-Darling Basin Water Plan and undertook core restoration actions to address key threats. It delivered an applied research program of over 100 projects which directly led to many on-ground management actions. The *Native Fish Strategy* was supported by specialist taskforces — with ARI staff as members (e.g. for fish passage) — project coordinators in each State and a strong communication strategy. Multiple restoration actions were undertaken jointly with local agencies and communities on select river reaches, to demonstrate how river restoration could provide significant benefits to fish.



Gomerai elder Phil Duncan presents John Koehn with a token of friendship and appreciation for his contributions and indigenous inclusion in the *Native Fish Strategy*

2010^s



The 2010s saw facilities at ARI upgraded with the most significant investment since the Institute opened. Refurbishments included: a new library, replacement of the ‘house’ annexe with a maintenance shed, roof-top solar panels, upgrade of the aquarium, a new staff tearoom (named in honour of eminent ARI mammal ecologist John Seebeck) and meeting rooms, open-plan workspaces on the first floor, the construction of a new conference facility, and a large on-site boat and storage shed that replaced the dusty and dilapidated St Hellier Street store. In addition to updated facilities, our technological capabilities also increased.

There was a growing focus on informing and influencing management, with an integrated approach to multiple issues. New technologies were increasingly used and refined, and mapping and modelling were now key to decision-making. A major innovation was the use of Bayesian statistics and Machine-Learning (AI) approaches, shifting away from standard statistical modelling, since in ecology there is rarely enough data for the required statistical power. This revolutionary approach has progressed towards ‘deep learning’ algorithms as a way of understanding patterns in complex ecological data. New fire, environmental water, and recovery programs expanded these key themes. There was growing recognition of the need for improved communication of our work to influence management, with greater effort on targeting various audiences. Communication plans started to be integrated into projects and citizen science emerged as a worthwhile resource.

developed and used to assist in both species’ recovery (such as establishing new populations or habitat gained or lost) and other supporting management actions. Fire ecology research, much of which is undertaken in collaboration with partner organisations, helped determine the effects of fire on Victoria’s ecosystems (including flora, fauna, carbon and fuel) and thus support Victoria’s fire and biodiversity management.

Spatial modelling had become commonplace with habitat distribution models available for most of Victoria’s terrestrial vertebrates and vegetation types. Population models were also



“ Being at ARI has always been my dream job. Reflecting on the many gurus I’ve met, learnt from and worked with actually makes me emotional. I still often think of John Seebeck and smile – I was lucky to find both a mentor and a friend. ”

Pam Clunie

2010

- ARI celebrates its 40th birthday by hosting various events
- Ted Baillieu (Liberal) becomes the Victorian Premier

2011

- Major building renovations undertaken, with a new conference facility, library, reception and meeting-rooms constructed
- ARI hosts ecological sciences Q & A panel

2012

- Capability funding allows for the purchase of modern hi-tech research equipment
- Major flooding across much of the western and central parts of Victoria, as the Millenium Drought breaks

2013

- ARI launches a Research Strategy, to outline the research priorities and directions for ARI for the next five years
- Fifteen staff choose to take redundancy packages and leave ARI under the Victorian Government’s Sustainable Government Initiative
- An internal reorganisation within DSE results in ARI being placed in the newly formed Environment Programs Division but remaining as a branch dedicated to research
- ARI aquarium receives a major upgrade and revamp

2014

- Dr Kim Lowe appointed as the Director of ARI (after having acted in the role for the previous 12 months)
- Department becomes DEPI (Dept. Environment and Primary Industries Dennis Napthine (Liberal))

2015

- First-floor redevelopment (open plan offices) completed
- Some DELWP Port Phillip regional staff re-locate to ARI
- Daniel Andrews (Labor) becomes the Victorian Premier

2017

- Official collaboration with La Trobe University is established
- Department becomes DELWP (Department of Environment, Land, Water and Planning)

2018

- Biodiversity 2037 plan released
- Feral Cats declared as pest animals

2019

- Large new boat and storage shed constructed, equipment storage pulled from the old dilapidated St Hellier St storage facility
- Flora and Fauna Guarantee Amendment Act 2019 passed
- Logging of old-growth forest ceases; native forest harvesting to be phased out by 2030

AQUATIC 10^s



Tracking migratory eels

To better understand the mysterious lifecycles of anguillid eels, adult Short-finned Eels were tracked as they left Victorian rivers for the open ocean. The innovative GPS satellite tags provided key information on migration routes, spawning areas and the environmental conditions that eels experience while travelling. While many eels were eaten by predators, including sharks and whales, some eels travelled about 3,000 km to the South Pacific Ocean. This study was a collaboration with Gunditjmarra Traditional Owners, Catchment Management Authorities and Melbourne Water.

Photo: Wayne Koster with a satellite tag



Fish ecology

Major studies were undertaken on the ecology of Macquarie Perch, Silver Perch, Golden Perch and Australian Grayling, especially in relation to movements and flows. Together with other research, such as monitoring and tagging programs, this increased our knowledge for both large and small-bodied fish species. Collaborations with waterway managers across states and federally has contributed to landscape-scale approaches to the management of water regimes for many fish species. Large datasets have also been collated and analysed to better understand factors which affect recruitment of species, such as Silver Perch.

Photo: Scott Raymond holding a Macquarie Perch



The Dandenong Burrowing Crayfish

Surveys were carried out to understand the distribution of the threatened Dandenong Burrowing Crayfish. This species lives in the Cool Temperate Rainforest and its habitat is affected by weeds. These crays are very hard to survey because they are cryptic and live underground. ARI staff developed a modified Norrocky Trap to specifically target these types of crayfish, leading to improved capture rates. ARI has worked collaboratively with local volunteers, government agencies and citizen scientists to monitor this species, and build awareness of its plight.

Image: Di Crowther with volunteers



Fire recovery

After major bushfires in 2009 and 2019-20, recovery efforts were funded through such initiatives such as the Natural Values Recovery Program. ARI led many projects which helped to protect and recover bushfire-affected ecosystems and their biota, and to manage pests. ARI provided strategic advice on appropriate actions, surveyed priority species and sites, carried out emergency extractions and translocations and also kept some threatened fish, crayfish and freshwater mussel species in captivity as insurance against extinction. Once environmental conditions improved, these species were returned to the wild.

Photo: Mike Nicol surveying Euchre Creek after a sediment slug



Fish passage

A 2010 review of Victorian instream barriers identified structures where fish passage could be improved through modification, removal or establishment of fishways. ARI's role in fish passage management is extensive: providing advice on priority actions and sites, design, installation, removal of gauging weirs, the development of operational guidelines, assessment of fishway efficacy, and monitoring the response fish communities when fish passage is improved. Examples include Dight's Falls on the Yarra River, the Barwon River barrage near Lake Connewarre, and many coastal and inland stream barriers.

Photo: Fish sampling at a vertical slot fishway



Murray Hardyhead and salinity

The salinity tolerance of eggs, larvae and juveniles of the nationally threatened Murray Hardyhead were studied in the ARI aquarium. This species is very short-lived (about 18 months) and now only occurs in a handful of saline wetlands. Understanding the environmental conditions necessary for survival and successful breeding is essential, so as to guide improved management of environmental water for the species. ARI also bred fish for release into the wild to establish new populations.

Photo: Dan Stoessel in the ARI aquarium



Flows, fish and wetlands

ARI undertook long-term fish monitoring at many 'icon sites' under The Living Murray Program (especially Barmah-Millewa, Gunbower, and Lindsay-Mullaroo systems) to better understand fish movements and breeding in response to environmental water management. The National Water Commission funded two key projects: Watering floodplain wetlands in the MDB for native fish and Ecological responses to altered flow regimes (with CSIRO). Both evaluated wetlands for fish and fish population dynamics, developing watering guidelines for water delivery and monitoring protocols.

Photo: Leah Beesley sampling at Barmah



Riparian (streamside) vegetation

Riparian land links terrestrial and aquatic ecosystems and provides many key functions including filtering nutrients, pollutants and sediments to protect water quality, stabilising riverbanks, and providing food, habitats and corridors for many wildlife species. This land is often degraded through clearing, weeds, livestock grazing and altered river flows. ARI has been involved in the Riparian Intervention Monitoring Program (RIMP) which assessed the effectiveness of three management actions to protect this land - weed control, revegetation and fencing.

Photo: Bryan Mole Chris Jones and Ana Backstrom (consultant) survey riparian vegetation

Other projects

Two large-scale, long-term projects investigated the effectiveness of providing environmental water: VEFMAP (Victorian Environmental Flows Monitoring and Assessment Program) and WetMAP (Wetlands Environmental Water Monitoring and Assessment Program).

The Index of Estuarine Condition monitored estuaries across Victoria to understand condition and establish baseline data for fish and vegetation.

A large project on the reintroduction of woody habitat in the Murray River was completed.

Genetic studies by Katherine Harrison helped our understanding of fish ecology and responses to particular environmental conditions.

A Guide to the Management of Native Fish in Victorian Coastal Rivers and Wetlands was published.





Estuary condition

The condition of the fringing vegetation around most of Victoria's estuaries was quantified with respect to the cover of built structures, nativeness and structural complexity. Scoring of estuaries in this way provides managers with detailed information on where degradation has occurred, where values have been retained, and how to better manage these environments under the challenges from human use, climate change and invasive species.



Gobi Desert, Mongolia

In 2017, ARI staff Steve Sinclair and Matt White, with the support of Sustainability East Asia and the Wildlife Conservation Society, visited Mongolia to devise and test a method for measuring the condition of desert rangelands in the Gobi Desert. Generating a defensible assessment of condition is challenging because finding common ground amongst stakeholders is essential and assessments influence land-use decisions on large scales. Metrics were developed for three ecosystems that explicitly represented the consensus view of a diverse stakeholder group, including nomadic pastoralists, botanists, wildlife ecologists and policy-makers.

Photo: Steve Sinclair in Mongolia



Locating Leadbeater's Possum

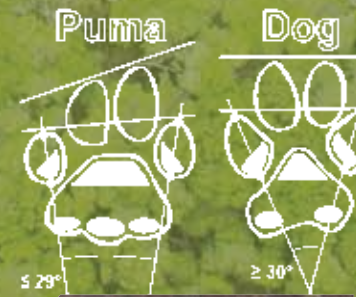
Automated cameras have been extensively used for ground-based surveys, yet not in trees for arboreal mammals. ARI worked with arborists to install cameras on tree trunks at varying heights (up to 47 m) to record Leadbeater's Possum, using creamed honey as a lure. Areas of well-connected vegetation were targeted, yielding many possum records and improving our knowledge of distribution and habitats using this 'new' method.

Photo: Arborist setting camera trap



Koala management

Some of Victoria's Koala populations are overabundant, so proactive management of high-density populations is required. ARI has long played a key role in Koala research and management and in the 2010s this included: the translocation of overabundant Koalas from French Island and Cape Otway and assessment of their survivorship using radiotelemetry, determining Koala distribution, identifying key drivers of Koala density in south-western Victoria, and estimating the size of Victoria's Koala population.



Big cats!

ARI reviewed information pertaining to the possible presence in Victoria of a wild population of unknown species of 'big cat' (variously suggested to be pumas or panthers). Despite no records in official zoological databases, nor any resulting from considerable fauna survey over many decades, there are many thousands of reports of 'big cats' by members of the public. The most parsimonious explanation was that these 'cats' were large, feral individuals of the Domestic Cat. Since publication of the report the issue has receded from public discourse.

Photo: A feral Domestic Cat



Chainsaws and Leadbeater's Possum

Intense wildfires and logging have removed much of the available hollow-bearing trees suitable for Leadbeater's Possum. Skilled arborists used chainsaws to create artificial hollows in existing trees, and hollow use was then monitored using borescopes and in-situ cameras. 90% of all artificial hollows were used by arboreal forest species, over half used by Leadbeater's Possum.

Photo: Lindy Lumsden with an example of a chainsaw hollow



Turtle studies

In 2009 during the Millennium Drought, ARI collaborated with the Yorta Yorta Nation Aboriginal Corporation to gather baseline information on the turtles of Barmah-Millewa Forest. This gave rise to several studies to monitor movement of two turtle species using GPS tracking, and assess turtle nest predation by Red Foxes and turtle responses to environmental water releases.

Photo: Juvenile turtles



Genetic management of threatened species

ARI led several collaborative projects to improve how models inform translocations, including quantitative measures of success. A modelling framework included genetic diversity dynamics with other forces (e.g. breeding success, survival rates) that may influence the genetic profile of a population, while providing practical management options. This framework was validated on the Woylie (a small marsupial) by analysing genetic samples from several translocated populations. Ultimately, a trapping regime was designed that ensured animals sourced for translocations or breeding programs were unrelated.

Photo: Carlo Pacioni taking genetic samples

Other projects

Monitoring threatened grasslands fauna, especially Plains-wanderer and Hooded Scaly-foot.

Monitoring threatened alpine skinks.

Assessing the extent of rainforests.

Modelling the age of tree stems to inform forest management.

Carbon, Fire and Biodiversity Project.

Development of protocols for measuring understory plant diversity and structure, applied to 600 permanent sites on a five-year rolling basis to demonstrate sustainable forest management.

Development of methods and commencement of surveys to help protect high conservation values in logging coupes under the Forest Protection Survey Program.

Assessing the consumption of deer carcasses by scavenging animals.

Projects on genetic relatedness in deer and pigs, and the impacts of inbreeding depression on the Helmeted Honeyeater.



Justin O'Connor at Dights Falls with dignitaries



Michele Kohout and Dave Bryant botanising

People Passion Science



The inaugural ARI science committee (left to right): Back: Josephine MacHunter, Dave Forsyth, Prof. Graham Mitchell (Department Chief Scientist, Foursight Associates Pty Ltd), John Koehn (Chair), Sze Flett (ARI Director); Front: Fiona Coates, David Crook, Paul Reich, Alison King



Nick Clemann

Science review

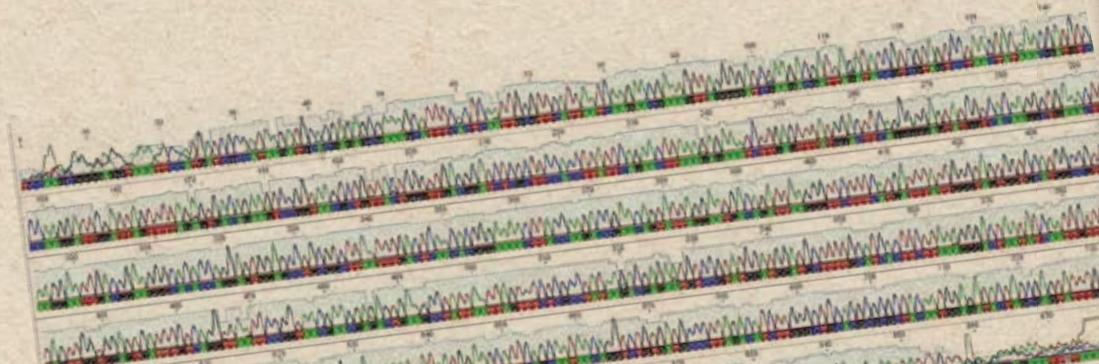
In 2012 ARI initiated a review of its science to assess its quality for stakeholders, benchmark it against other similar institutions and provide a base-line for improvement.

The review, undertaken by a panel of independent scientists, found ARI to be:

“ *an impressively resilient organisation... contributing to high quality, relevant and effective applied research knowledge to assist in the conservation of biodiversity in Victoria and southern Australia.* ”

The Review was reassuring and confirmed the research objective at ARI - to generate and disseminate knowledge through world-class, applied, ecological research.

An example of genetic coding



ARI 40th

In 2010 the then Governor of Victoria, Professor the Hon. David de Kretser AC, joined current and former ARI staff in a reunion to celebrate the 40th anniversary of ARI, marking the occasion with a ceremonial planting of a Forest Red Gum in the front garden of the Institute.



Venom Bank

The snake venom bank project was a collaboration with Museum Victoria and The University of Melbourne's Australian Venom Research Unit. The venom, milked by ARI's Nick Clemann, was to be used for medical research and taxonomic and biodiversity studies.

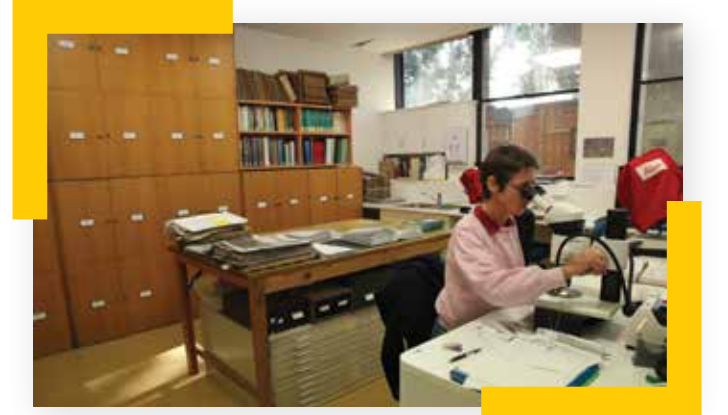
Game birds

A comprehensive report and field guide on how to age and sex Victorian game bird species from their wing and tail plumage will help management staff collect data that will inform hunting season rules, including its duration and bag limits.



Drs Graeme Mitchell, Sze Flett and The Hon. David de Kretser

Jeff Davies prepared detailed illustrations of feather patterns to help age and sex game birds



Judy Downe identifying plants

ARI's Botanical Identifications Laboratory

ARI's Botanical Identifications Laboratory has been a crucial resource for several decades, providing Institute botanists and visitors the facilities to identify rare plant taxa. The laboratory includes microscopes, identification guides, software and an herbarium with an impressive 2,175 taxa represented by 3,656 specimens, a collection which is constantly increasing.

Research themes and techniques

Species, communities and habitats have long been investigated to improve our understanding of them for the purposes of conservation, utilisation, restoration and recovery. ARI has consistently been at the leading edge in developing new approaches and technologies for field study. This has necessitated physical changes to the Institute, exemplified by a spatial analysis lab, an aquarium, an electronics lab and the construction of a large on-site shed for storing field equipment, trailers and a growing fleet of electrofishing boats.

The following examples of major research themes, techniques and facilities illustrate the capacity, evolution and continuing relevance of the Institute.



Wild dog/Dingo tracking collar

TERRESTRIAL FAUNA

Traditional survey techniques

From its first days ARI routinely used several different types of traps to survey terrestrial fauna, notably folding aluminium box traps (originally Sherman traps imported from the USA and after the early 1970s the locally-made Elliott traps) for small terrestrial vertebrates and wire cage traps for larger mammals. Pitfall traps – large buckets dug into the ground with an associated low drift fence – were also commonly employed for terrestrial fauna in environments that allowed digging.



Dave Scotts and Steve Craig



John Alderson and bat trap

ARI's John Alderson designed the Austbat harp trap in the early 1980s and it is now commonly used worldwide. This portable bat trap is made from a lightweight aluminium tubing and can be easily assembled in several minutes. The sides of the frame telescope (collapse and slide into itself) to reduce size for transporting and enable adjustment of line tension – monofilament fishing line strung vertically in two parallel sets. Micro-bats are unable to detect or navigate this arrangement and they fall neatly into a canvas collecting bag.

Other survey techniques included hair tubes, sand pads (to detect animal footprints) and spotlighting. In the 1980s and 1990s, hair tubes were routinely used to collect mammal hair for species identification, a labour-intensive exercise that required the use of sticky surfaces to collect the hairs, which were then teased off and prepared for microscopic analysis. ARI staff Dave Scotts, Steve Craig and Ross Meggs (who later founded Faunatech) were instrumental in refining field application of this technique. While hair tubes have been largely replaced by camera traps, they are still occasionally used to collect hair for DNA analysis.

Research themes and techniques

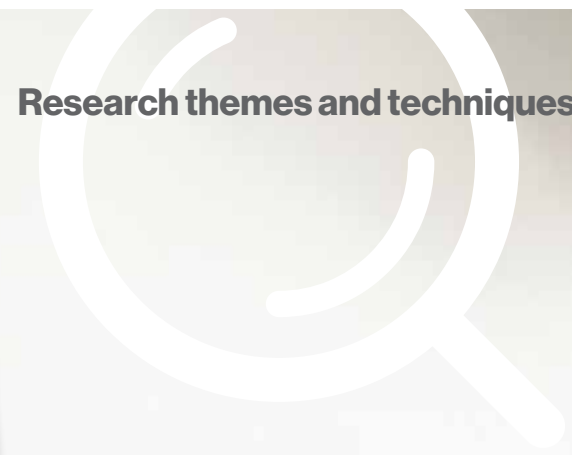


Various hair tube designs c1990s

Spotlights have been used for decades to monitor nocturnal wildlife. Many ARI staff recall the original large, heavy units, comprised of lead-acid batteries and incandescent globes. However, in the 2000s spotlight units became much lighter with the incorporation of LEDs, and longer battery life enabled longer surveys. Spotlights remain vital to surveys of nocturnal fauna, including surveys of threatened species, such as Leadbeater's Possum, Spotted Tree Frog, Greater Glider, forest owls and pest animals, such as rabbits.



Peter Brown spotlighting for Eastern Barred Bandicoots



A bat call detector

A remotely-triggered camera



Dave Scotts, a volunteer and Bill Bren radiotracking Long-footed Potoroos



Charlie Pascoe

Survey technology

While ARI still occasionally uses the more traditional manual survey techniques, these have largely been replaced by the following methods which are more technological and less invasive.

ARI has been at the forefront of using cameras ('camera traps') to monitor wildlife, from simple inventory counts to recording species behaviour and estimating population density. Camera traps are practical and cost-effective and can be left unattended for several weeks. ARI first trialled camera traps in the early 2000s to determine Spot-tailed Quoll distributions. However, unlike today's sophisticated digital cameras, the early camera traps were clunky devices that used modified digital cameras, and prior to that - celluloid film and fishing wire trip switches!

ARI helped progress the use of digital camera traps from qualitative (i.e. observations, presence/absence surveys) to quantitative (i.e. population estimation), revealing the versatility and efficiency of digital camera traps over other survey techniques. Camera traps are now widely used for monitoring a wide range of fauna, from small mammals - even arboreal species, such as Leadbeater's Possum - to large, introduced mammals, such as feral pigs and



Luke Woodford installing a camera

deer. While they have become the 'go to' tool for monitoring mammals, birds and reptiles are now also targets of this survey method. Over time, our staff have visually examined literally millions of images to identify species recorded. To help alleviate this task, ARI is investigating the development of machine-learning algorithms for automated camera trap image processing of Victorian mammal fauna.

ARI's first foray into acoustic monitoring was recording frogs 20 years ago, using a tape cassette player and wired-in timer mounted in an ammunition box. However, these units were heavy and unreliable with short recording

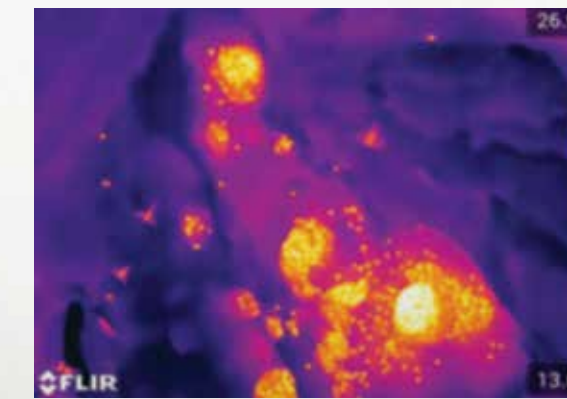
periods. In the 2000s, factory-built devices became available but were still cumbersome with external microphones. Nevertheless, they were used to record frog and bird calls and staff spent many hours listening to recorded calls in order to identify species. The recent availability of automated recording units, including AudioMoth acoustic loggers, has enhanced our survey efficiency. ARI staff successfully developed innovative AI software to read the digital signature of a call and compare it to known reference calls, making them a viable survey tool by saving countless hours of tedious work. ARI was an early adopter of devices to record the ultrasonic calls of microbats (bat detectors). Led by Lindy Lumsden, ARI scientists assessed the accuracy of the detectors in discriminating the calls of different genera and species. This work led to the development of keys for automated analysis of data collected by bat detectors.

Telemetry increased the Institute's ability to tag and track individual animals and collect detailed radiotelemetry data on individual habitat use, movements and home ranges. ARI has used radio-telemetry to track Squirrel Gliders, Long-footed Potoroos, Spot-tailed Quolls, koalas, Mountain Pygmy-possums, Smoky

Mice, Little Penguins, Orange-bellied Parrots, bats, Leadbeater's Possums and introduced predators, such as foxes and feral cats. Initially, ARI built simple VHF transmitters to attach to terrestrial animals. Today, commercial units complete with GPS location are available and suitable for various taxa. Attachment methods have improved thanks to modern ethics requirements, with some GPS collars dropping off the animal at a pre-determined time.

Tracking units and antenna arrays required to listen to tagged animals have advanced from simple hand-held antennae to large vehicle-mounted units. GPS tracking technology significantly increases accuracy and when combined with automated dataloggers, greatly reduces field time. Improvements in battery efficiency, power and recharging capacity have revolutionised GPS, radio and acoustic tagging, allowing their use on progressively smaller animals.

ARI successfully led the way in creating standardised monitoring methods using handheld heat-sensing devices for nocturnal arboreal mammals, such as Leadbeater's Possum and the Greater Glider.



A thermal image of Southern Bent-winged Bats roosting in a cave



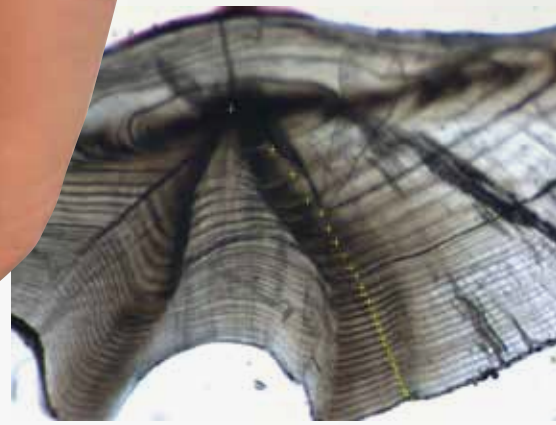
A Wedge-tailed Eagle captured by a remotely-triggered camera



Southern Bent-winged Bat



A fish earbone (otolith) from a Golden Perch



An otolith of a 25 year old Macquarie Perch under microscope



Radio transmitters which are surgically implanted into fish



Wayne Koster radiotracking



Dave Dawson fyke netting in search of eels



An example of an instream habitat map

AQUATIC FAUNA

The use of various nets (mesh, fyke, drum), set-lines, fish traps and even poisons (rotenone) was commonplace in the early days of ARI. Most of these techniques were labour-intensive and often caused damage or even death to captured fish. This changed with the introduction of electrofishing, a technique for the efficient and safe sampling of fish, and one that enabled the capture of a range of species that would have otherwise been missed. However, some forms of netting remain an important survey tool to target particular species and life stages (e.g. fyke, seine and drift nets, and bait traps).



Frank Amtstaetter and Leah Beesley seine netting in Barmah National Park



Jason Lieschke and Adrian Kitchingman on the Grassl electrofishing boat

Electrofishing involves passing an electrical current through water, stunning fish so that they can be netted and held in live wells on the boat; the fish quickly recover before being weighed, measured and tagged, then returned to their environment. Electrofishers comprise an electricity source (battery or generator), electronics that allow variations in electricity type (AC or DC), output type (pulsed, voltage, amperage, wave type) and frequency, which may be applied through backpack, bank-mounted or boat units. ARI has been at the forefront of this technology, having very early on used bank-mounted and backpack units, and was the first Australian institute to purchase an imported electrofishing boat (early 1990s). ARI now possesses a

fleet of electrofishing boats of varying sizes and a range of other electrofishing units.

Until recently, the use of electrofishing units has been limited to freshwater or areas of low salinity. As salinity increases, so does the demand on power needed to maintain a suitable electrical field; it is this power demand that has been the limiting factor. During 2010-20 ARI staff John McKenzie, Jason Lieschke and Andrew Pickworth, working closely with German electrofishing manufacturer Hans Grassl, developed a prototype boat-mounted electrofishing unit that has the capacity to operate in saline environments, such as estuaries. Over the past five years, ARI has tested this prototype electrofishing boat in a range of water salinities and enhanced this now vital fish sampling tool.

While radiotracking of terrestrial animals has been employed since the early 1980s, such tracking was only used for freshwater fish for the first time in Australia by ARI, in the early 1990s. The use of low-frequency radio transmitters to give a better range through water revolutionised our study of fish. Starting with larger species, such as Murray Cod, Trout Cod, Golden Perch and Carp, improvements in design and battery life enabled the study of much smaller and juvenile fish. Together with the use of considerably improved acoustic tags (used

by ARI since the 1970s), telemetry has become entrenched as a study method throughout Australia. Passive Integrated Transponder (PIT) tags (used to identify cats and dogs) allow us to detect fish passing through fishways. It is only since 2018 that GPS satellite tags have been used on Australian freshwater fish, exemplified by the identification of long-distance migration routes of eels from southern Victoria into the Pacific Ocean. Such tags can now record location, time and environmental data, such as temperature, depth light and movement speed - an exciting development.

ARI has always been keen to lead the way with innovative technology, its development and adaptation greatly enhancing the Institute's research capacity. ARI was first in Australia to use electrofishers, acoustic, radio and GPS tags on freshwater fish; capture larval fishes of the Murray-Darling; map habitat and velocity profiles and undertake large-scale resnagging. Genetic samples and the collection of DNA (e-DNA) from water samples now allow more precise species distributions and population analyses. ARI also analyses otoliths (fish ear bones) to provide information on life history. The microchemistry of otoliths provides vital insights into a fish's life, such as age, growth, its location at different life-stages and responses to environmental conditions.



James Shelley eDNA sampling



Justin O'Mahony inserting a transmitter into a Murray Cod



AQUATIC INVERTEBRATES

During the 1980s ARI was involved in many macroinvertebrate surveys, as well as using macroinvertebrates as indicators of water quality, pollution and dam impacts (e.g. high volume, cold water releases from Dartmouth Dam and weir desilting operations). Following the listing in the early 1990s of some invertebrates as threatened, there was a focus on surveys and management of some species of stoneflies and amphipods. The Australian River Assessment System (AUSRIVAS) was also launched, which included a rapid assessment process for the biological health of Australian rivers.



Dan Stoessel and Glenelg Freshwater Mussels



John Mahoney with Murray Crayfish



Shanaugh Lyon collecting invertebrates

ARI began monitoring the impacts of desilting operations of weirs operated by AGL electricity on the Kiewa River. More recently, surveys have been undertaken to monitor the distribution of a suite of threatened spiny and burrowing crayfish, particularly in the context of forestry operations. The Murray Crayfish has been studied, primarily to inform the management of their fishery; and the involvement of citizen scientists in monitoring the threatened Dandenong Burrowing Crayfish has highlighted the important contribution the public can make to science. Some surveys have also been carried out on threatened mussel species, including the Glenelg Freshwater Mussel.

ARI provides ongoing expert taxonomic advice for and data validation of invertebrates in the *Victorian Biodiversity Atlas*.



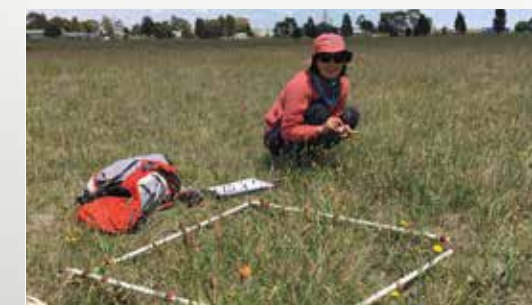
Phil Papas collecting invertebrate samples



VEGETATION

Vegetation surveys have ranged from small, site surveys to broad-scale mapping to determine Ecological Vegetation Classes and monitor the cover, extent, richness, and recruitment for both native and exotic plants.

Surveys have occurred in a wide range of habitats, across both terrestrial and aquatic environments (e.g. riparian, fringing, emergent, submerged aquatic vegetation), at times also measuring soil moisture, instream hydrology or assessment of suitable habitats. There has been a strong focus on monitoring and improving the knowledge, management and protection of rare or threatened plants species (e.g. the Wellington Mint-bush and a range of orchid species). Surveying individual species usually involves targeted searches



Khorloo Batpurev identifying plants

in known or predicted habitat and requires a good eye and plant identification skills.

Much vegetation monitoring has remained relatively low-tech and simple, especially compared to survey techniques for aquatic and terrestrial fauna. Monitoring is based on quadrats set out using tape measures or quadrat frames, which vary in size depending on the vegetation type. This has resulted in quadrats decreasing in size but increasing in number to improve statistical rigour. Point-intercept sampling became more commonly used from the 2010s to measure vegetation cover more accurately in short-statured ecosystems, such as the alps and in grasslands. Melbourne Strategic Assessment fieldwork employed the innovative 'golf ball method' for determining plant cover in grasslands by scoring how much of each randomly-placed golf ball (18 in total) is obscured by vegetation. Vegetation structure and the complexity of each stratum has also been examined in more detail in recent years, by using a height pole to obtain information about habitat for fauna.

However, remote sensing has more recently become a tool of choice for monitoring changes in the extent or quality of vegetation communities over broader scales and is much cheaper than manual techniques. Remote sensing is particularly useful in inaccessible



Sam Barron (cadet), Claire Moxham and Geoff Sutter undertaking vegetation surveys



Lyndsey Vivian conducts experiments on the survival of riparian plants under different watering conditions

or steep country and has now been used to assess or monitor a range of vegetation types, including floodplains, grasslands, alpine Sphagnum bogs and rainforests.

Modelling has been a useful tool to supplement field-collected data. For example, by the 2010s models of tree stand condition, based on remote sensing, were used to assess the health of wetland vegetation. Photo points can also provide a visual measure of change in vegetation composition or condition over time and are sometimes useful for reporting purposes.

While many vegetation sampling methods have not changed much over time, the experimental design and analysis of the data have evolved. Many recent projects were designed to inform management, such as assessing the response of plants to particular threats (e.g. grazing) or interventions (e.g. environmental watering, fencing). Through collaborations with universities, experiments have also been undertaken to assess the response of soil seedbank samples to water manipulations and pollinator studies for Button Wrinklewort.

The ARI Botanical Identifications Laboratory and herbarium have been crucial for flora surveys over many years, enabling botanists and field ecologists to identify plants using reference specimens.

THE AQUARIUM

ARI's substantial aquarium, originally designed for saltwater species, has undergone many refits and is now used mostly for freshwater species.

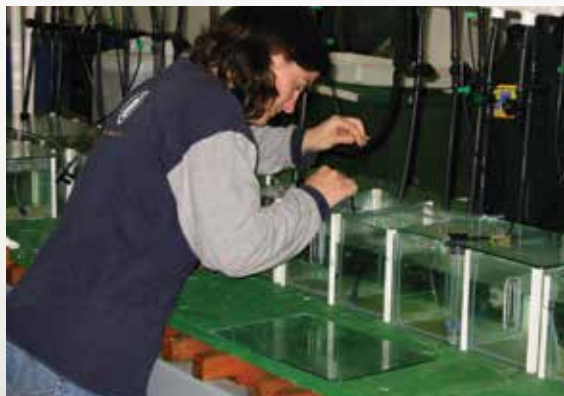
It has the capacity to filter, chill or cool incoming water and provide day/night lighting cycles so that natural environmental conditions can be simulated. During the 1970s chemical toxicology and tolerance work was mostly undertaken in the aquarium but its use since has been expanded to include a range of other projects: temperature, salinity and sediment tolerances; behavioural observations; artificial breeding of threatened small-bodied fishes (e.g. Murray Hardyhead), and the rearing of juvenile native fishes. More recently, the ARI aquarium has housed threatened fish, crayfish and mussels rescued from fire zones, which were eventually returned to the wild.



Dargo Galaxiid



A Spiny Crayfish



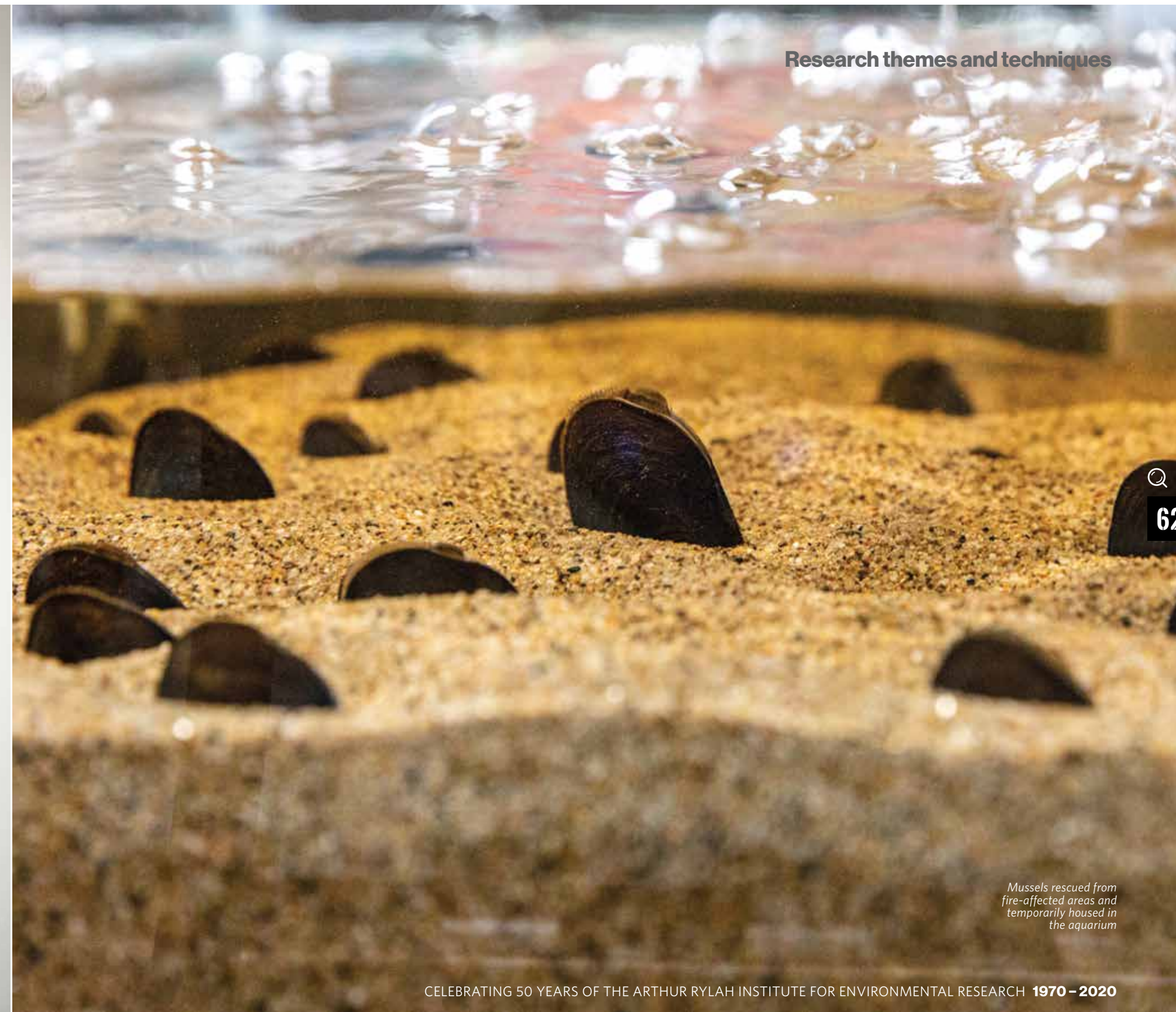
Trish Paradise



Ruth Lennie and Mike Nicol



Barred Galaxiids

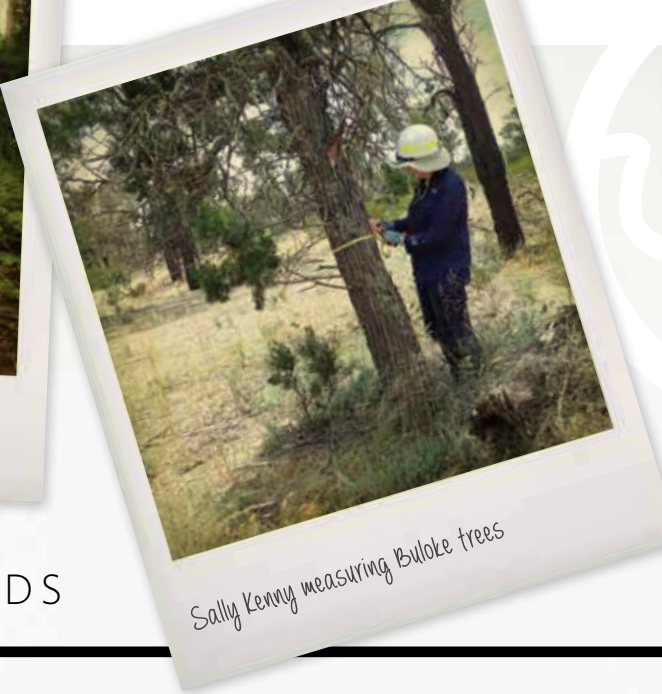


Mussels rescued from fire-affected areas and temporarily housed in the aquarium

Environments

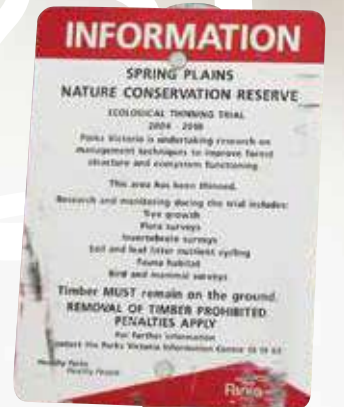


Botanist David Cameron celebrates his birthday in the field



Sally Kenny measuring Buloke trees

Environments



ALPINE

ARI has investigated many different aspects of the Victorian alpine region. Extensive surveys across Victoria's alpine and sub-alpine country have been undertaken since ARI's early days in the search for rare and cryptic species, such as the Mountain Pygmy Possum. The impacts of fire and grazing on alpine ecosystems (grasslands, shrublands, snow gum woodlands and alpine Sphagnum bogs) were assessed; post-fire surveys informed rehabilitation, weed control and protection from grazing.

Alpine Sphagnum bogs, which cover nearly 4,400 ha across their 10,000 km² range, were progressively mapped and assessed for condition and threats, with data incorporated into Geographic Information Systems (GIS) layers to guide management. The herpetofauna (reptiles and amphibians) in the area has also been studied during repeat visits to established transects for the endangered Guthega Skink and Alpine She-oak Skink. Threatened frogs, such as the Baw Baw Frog and Alpine Tree Frog, were monitored at various times with results sadly confirming their ongoing decline.

Based on recommendations from ARI's post-2003 and post-2007 fire assessments, Parks Victoria undertook the rehabilitation of alpine bogs on Mt Buffalo, the Wellington Plain and Bogong High Plains. This mostly involved inserting weirs into exposed drainage lines in burnt bogs to help spread and retain water. The weirs were usually made from wood chips wrapped in textile, coir logs, or bales of weed-free straw. Some revegetation experimentation using tube-stock and Sphagnum transplants was also carried out.



Ann Tolsma monitoring snow drift, Cope Saddle

GRASSLANDS

Grasslands have been a primary study focus for ARI for decades. Natural temperate grasslands were once widespread across Victoria but the arrival of Europeans in the 1830s saw a dramatic reduction in their extent and condition. Research into the restoration of degraded areas and the conservation of the remaining grasslands is of utmost importance and their management and restoration is a complex challenge. ARI, through long-term monitoring programs and experiments, has investigated the role of fire, livestock grazing and weed control on grassland and threatened species management (e.g. Melbourne Strategic Assessment), and completed mapping and predictive modelling of the extent of past and current natural temperate grasslands. This has been a substantial contribution to grassland conservation in Victoria; it is expected to continue with input from Traditional Owners guiding us in forming a more rounded understanding of natural temperate grassland dynamics.

In the Northern Victorian grasslands, threatened vertebrate fauna, such as the Hooded Scaly-foot, Striped Legless Lizard and Plains-wanderer, have also been the subject of research or monitoring by ARI. These species are habitat specialists and depend on uncultivated grasslands, represented in the Terrick Terrick National Park and Bael Bael Grassland Nature Conservation Reserve.

FORESTS AND WOODLANDS

Forests and woodlands make up most of Victoria's public land so they have been widely studied by ARI, with myriad projects examining many facets: forest management, silviculture, logging, fire (both wild and man-made), carbon and biodiversity.

One such study - the Forest Biodiversity project - developed an effective landscape approach to threatened species management in forests of eastern Victoria. It provided extensive new data on the distribution and habitat use of priority threatened fauna species to assist management.

Innovative survey methods were developed to detect the critically endangered Leadbeater's Possum. ARI teamed up with tree canopy specialists to install automated cameras high on tree trunks. At night, thermal imaging cameras were used to detect the heat signature of the animals and when used in conjunction with imitated calls, this greatly increased the chance of detection.

Regional Forest Agreement fieldwork (1990s) included extensive surveys and technique development. For a decade, ARI investigated the impacts of logging on vegetation to inform management strategies that promote flora and fauna conservation in forests designated

for timber harvesting. For many years the ecological impacts of clear-felling (the near-uniform cutting down of most trees across a designated 'coupe') were claimed to be similar to those produced by wildfire. However, ARI's research revealed long-term differences in floristic composition and structure of vegetation resulting from the two treatments. This resulted in modification to harvesting techniques which helped to protect biodiversity values.

ARI's forest research significantly informed the Victorian Government's 2019 decision to phase out native forest logging by 2030 and to immediately protect key old-growth forest in north-eastern Victoria and East Gippsland.

The Box-Ironbark woodlands of the Victorian Midlands were once extensive. Sadly, only about 15% of their original extent now remains, in a highly fragmented state. The vegetation and conservation status of the Box-Ironbark ecosystem was described in detail by ARI botanists in 1985 and this foreshadowed further work, including assessment of the impacts of ecological burning.

A major collaborative study between ARI and Museums Victoria, Deakin and Monash Universities, investigated the occurrence of terrestrial fauna in relation to vegetation and land use patterns, particularly habitat

fragmentation, supporting the Environment Conservation Council's Box-Ironbark Forests and Woodlands Investigation.

ARI was a key collaborator in an Ecological Thinning Trial established by Parks Victoria. The aim was to determine if the thinning of trees in the newly created Box-Ironbark Parks and Reserves could hasten the transition to a forest or woodland with older-growth characteristics - especially large diameter trees. The trial results indicated that such thinning is ecologically beneficial.

In 2007 ARI assessed the likely impacts of prescribed fire on the flora and fauna of Box-Ironbark remnants and determined broad criteria for the establishment (or otherwise) of an appropriate burning regime for privately owned Box-Ironbark remnants.



Box-Ironbark thinning, Spring Plains

MALLEE



Floodplain vegetation regeneration following environmental watering, Hattah Lakes

In the mallee region of north-western Victoria, vegetation comprises semi-arid woodlands, semi-arid heath, mallee eucalypt shrublands, chenopod shrublands, grassy plains, Black Box woodlands and River Red Gum forests and woodlands. Most vegetation growing on the heavier, more fertile soils has been cleared for agriculture.

Broad-scale fauna surveys started in the 1970s for the Land Conservation Council. Long-term monitoring programs were established to better understand the effects of stock exclusion, environmental watering, semi-arid woodland condition and restoration, and control of kangaroos, goats and feral predators.

ARI has examined tree population dynamics (age, size, regeneration), understorey vegetation (the abundance of small tree,

shrub and ground layer plants), grazing pressure (on both existing and revegetated vegetation) and weed abundance. From these studies, we can determine how management actions (e.g. stock exclusion fencing, environmental watering) may influence vegetation condition in conjunction with climate effects (e.g. rainfall). The monitoring of vegetation response to environmental watering at Hattah Lakes showed a positive response in water-dependent vegetation.



Mallee vegetation

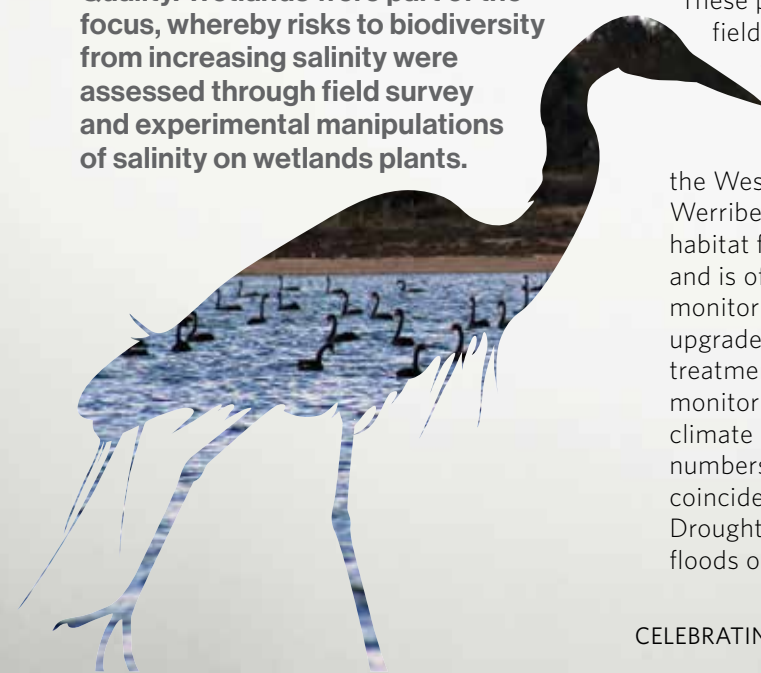
“ As a relative newcomer, ARI has been a great place to start my career. Learning the tricks of the trade from some of the ‘legends’ is a real privilege. There is so much experience in this place, well-known for its mix of expert knowledge and practical skills, even if the people here don’t realize sometimes!

Gabriel Cornell

”

WETLANDS

From the late-1970s to mid-1990s an extensive inventory of wetlands and their characteristics was compiled. This contributed to a state-wide geospatial map of Victorian wetlands and their extent, which was updated in 2013 by the Department of Environment, Land, Water and Planning (DELWP) wetland policy team. During the 2000s, ARI led projects funded by the Commonwealth under the National Action Plan for Salinity and Water Quality. Wetlands were part of the focus, whereby risks to biodiversity from increasing salinity were assessed through field survey and experimental manipulations of salinity on wetlands plants.



Between 2005 and 2015, the Index of Wetland Condition (IWC) was developed and implemented. ARI led two state-wide assessments of wetland conditions during 2009-11, primarily to inform wetland management. From 2010, ARI continued to work collaboratively with the DELWP wetland policy team to develop and implement projects that filled knowledge gaps - such as wetland connectivity - and addressed management issues, such as livestock grazing, wetland vegetation recovery and environmental watering. These projects took many forms, including field-based monitoring or experimentation, decision support tools and apps.

Waterfowl, shorebirds, ibis and cormorants have been monitored at the Western Water Treatment Plant (WTP) at Werribee since 2000. This area is an essential habitat for waterbirds during drought periods and is of international importance. The waterbird monitoring program assessed whether recent upgrades in the Plant’s sewage and wastewater treatment affected waterbird numbers. The monitoring revealed that habitat use, season and climate are dominant influences on waterbird numbers. Dramatic declines of many species coincided with the end of the Millennium Drought in 2009-10, when heavy rains and floods occurred across large parts of Australia,

providing waterbird feeding and breeding habitat elsewhere. Since then, populations at the WTP have returned to earlier levels or higher.

Monitoring the distribution and abundance of wading birds and waterfowl in Westernport Bay and at the WTP were long-term projects, and the latter continues today. ARI’s research also focused on habitat use by waterbirds (including a range of colony-nesting marine species), which contributed directly to conservation planning and management. This research highlights the importance of maintaining long-term monitoring to support conservation management.



Sabine Schrieber taking water samples in a wetland



Steve Davidson (contractor), Dan Purdey, Danny Rogers and Kasey Stamation monitor waterbird numbers at Gaynor Swamp

Making a difference



“What you do makes a difference and you have to decide what kind of a difference you want to make.”

Dr Jane Goodall

ARI's research is not undertaken for purely academic purposes; rather, it is applied research that aims to assist environmental management. The conservation and recovery of threatened species has been the Institute's stock-in-trade, but active management of habitats and communities is also needed, especially after catastrophic events such as fire and drought. Knowledge and planning are vital to ameliorating threats both over the short and longer term. ARI has evolved a more holistic and integrated approach to biodiversity management that accommodates appropriate time-frames and landscape scales. Furthermore, the communication of our science to a range of audiences, from the public to politicians, is essential to its usefulness — so that we can make a difference!



Community members help survey fish with Jo Sharley and Rusty O'Mahony



John Seebeck

“The best thing about working at ARI is the opportunity to work on issues that actually influence environmental policy. There is nothing more rewarding than when your research has real-world outcomes. That is why I still dig working here, despite the crap you sometimes have to wade through.”

Dave Ramsey

THREATENED SPECIES RECOVERY

ARI has always played a pivotal role in the management and recovery of many of Victoria's threatened species since the 1980s. Here we present a few examples that highlight the Institute's critical work.

One of our great success stories is that of Trout Cod. Reduced to only one natural population in the Murray River downstream of Lake Mulwala, this species was in severe trouble. Initial conservation stockings of the fish were unsuccessful but examination of these using population modelling proposed a new stocking regime with revised sites and stocking rates. The result was the establishment of new Trout Cod populations in the Ovens and lower Goulburn rivers in Victoria, and also the upper Murray and Murrumbidgee Rivers in NSW. This successful approach is being repeated for Macquarie Perch in the Ovens River. Modelling was used to design a program of translocations of hatchery-produced fish. There has been widespread community involvement, and monitoring indicates initial success.

The Long-footed Potoroo was formally described by John Seebeck and Peter Johnston as recently as 1980. This large Potoroo was of special interest given its mystery, limited distribution and perceived vulnerability. Initial work during 1986-87 in East Gippsland forests

assembled much new information crucial to its management. The Potoroo's distribution was extended to north-eastern Victoria when a carcass found on a logging road in the Barry Mountains was delivered to ARI for identification. Subsequent surveys revealed that the species is widespread in that region and in far East Gippsland. Further work in the 2000s measured the impacts of the 2003 fires, the effectiveness of fox control and of designated Special Management Areas.

The Mountain Pygmy-possum is restricted to highly specialised alpine environments and is the only Australian mammal that hibernates. Studies led by Ian Mansergh and others over many years were instrumental in establishing the 'Tunnel of love' in the mid-1980s - a corridor to provide a safe passage for the pygmy-possum under the Great Alpine Road at Mt Little Higginbotham, thus re-establishing connections between populations on both sides of the road.

In the 1990s, ARI commenced studies on bats at risk of extinction, including the rare South-eastern Long-eared Bat in north-western Victoria. Several projects were also undertaken outside Victoria, including in the WA Kimberley region and on Christmas Island. In recent years ARI has devoted particular attention to the critically endangered Southern Bent-

Making a difference



Zeb Tonkin releasing a Trout Cod



Helmeted Honeyeater



Ian Mansergh with a Mountain Pygmy-possum

wing Bat, monitoring numbers and identifying causes of decline and recovery options.

In 1971 the Helmeted Honeyeater was proclaimed Victoria's official faunal emblem. Its small, localised populations in the mid-Yarra and Western Port catchments render it extremely vulnerable, making it the focus of a sustained recovery effort over several decades. ARI has contributed much to knowledge and management of this bird through preparing recovery plans, chairing the National Recovery Team, modelling the potential effects of



Spotted Tree Frog



Golden Sun Moth

FIRE RECOVERY



Returning fish after the fires



Graeme Hackett with a backpack electrofishing unit surveys fish in Corryong Creek after the fires.



Jemma Cripps inspecting vegetation recovery after a fire

difference



ARI's research into the responses of flora and fauna across many ecosystems to both planned and unplanned fires has increased our knowledge of the role of fire management and guided management prescriptions used by public land agencies. This work followed several major, destructive bushfires in 2003, 2006-07 (Great Divide Fires), 2009 (Black Saturday), and 2019-20. The effects of other more localised wildfires have also been studied over the decades.

After the 2009 fires, the Victorian Bushfire Royal Commission recommended a biodiversity monitoring program, which was based at ARI. The Victorian Bushfire Reconstruction and Recovery Authority funded projects focused on threatened species of flora and fauna, 19 of which were led by Institute scientists. These projects concentrated on threatened terrestrial and aquatic species, and weeds and fire-sensitive vegetation.

They also introduced a new integrated approach to fire recovery: connecting communities with local ecological recovery, and recognising the trauma of affected human communities. ARI's expertise contributed to improved data management and geographical information systems displaying monitoring sites and

monitoring projects. The concurrent fire ecology program worked closely with ARI staff on consolidating knowledge about flora-tolerable fire intervals and faunal responses to fire, both fundamental to improved fire management.

ARI has also studied aspects of planned burning. A long-term monitoring project of threatened grasslands in Gippsland regularly burnt by planned fires, yielded information about fire impacts on plant community dynamics and guided the use of managed fire across the state. The Wombat Forest Fire Effects Study was a collaboration with the University of Melbourne that explored the impacts of regular prescribed burns on vertebrate fauna over two decades (1984-2003). Research on the lifecycle of the Hairpin Banksia and the fire responses of banksias helped determine minimum burn intervals to prevent population decline. This knowledge was used to maintain plant diversity in forests when applying fuel reduction burns.

Forest fauna was also targeted for study. A 2011 study of the threatened Smoky Mouse across Melbourne's strategic fuel breaks suggested fuel breaks did not act as a barrier to the rodent's movement. Other research on planned burns has focused on responses by foxes to burns and their impact on native animals already affected by fires.

The ARI fire ecology retrospective project assessed the influence of past fires on current occurrence and abundance of plants and animals in Victorian foothill forests, and this knowledge contributed to better planning of prescribed burns.

ARI and the University of Melbourne developed the Fire Analysis Module for Ecological values (FAME), an online analysis tool that considers the impacts of planned fire on biodiversity. It enables fire planners to easily evaluate the impacts of alternative fire regimes on a species.

Following the major fires of 2009 and particularly 2019-20, ARI was involved in many aspects of Victoria's bushfire emergency biodiversity response and recovery. This included providing strategic advice on appropriate actions, reconnaissance of priority species and sites, emergency extractions of affected species, translocation and the ex-situ management to prevent extinctions and limit decline. Considerable focus was placed on highly threatened species of reptiles, amphibians, fish, crayfish and mussels, as well as vulnerable habitats, such as alpine bogs.

Post-fire rainfall can be lethal to freshwater aquatic species through ash, debris and sediment runoff into waterways, suffocating or burying species. Chemicals used for

fire suppression can also be as harmful. Fires can place some species with highly localised distributions, at risk of extinction. Individuals of high-risk species (e.g. Glenelg Freshwater Mussel, Gippsland Blackfish and several species of galaxiids) were rescued and held in the ARI aquarium until their habitat had sufficiently recovered.



Jarod Lyon with a Macquarie Perch

climate change, investigating genetic rescue to alleviate inbreeding depression, and social research to explore the most effective ways to engage the community in the bird's recovery.

The endangered status of the Spotted Tree Frog was first put forward in 1991 by ARI in partnership with The University of Melbourne. Research identified threats, and monitoring revealed the species' decline at more than 50% of known historical locations. ARI staff have been key members of this frog's Recovery Team.

During the 2010s ARI led or contributed to several wide-ranging programs that focused on recovery actions for high-priority threatened species. For example, the monitoring of the Hooded scaly-foot (a legless lizard), and the Plains-wanderer (a native grasslands ground bird).

As part of the Threatened Orchid Recovery Program (1997), baseline data were collected that helped establish a program of continuous monitoring of threatened orchid populations across Victoria. This resulted in long-term datasets that reflect varying conditions, (drought, over-grazing, wildfire). These datasets assist management using fire to maximise recruitment for critically endangered orchid populations confined to single sites in eastern Victoria. The Threatened Orchid Recovery



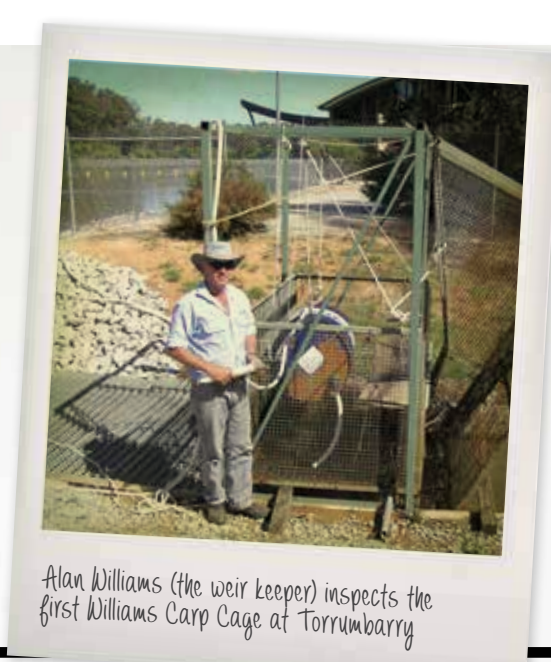
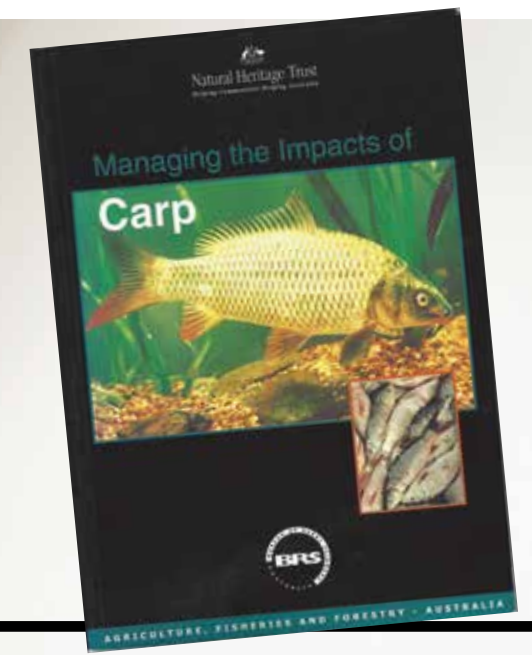
PESTS



Alan Robley and Angelo Taglierini (formerly Mallee CMA)



Sambar stag



Alan Williams (the weir keeper) inspects the first Williams Carp Cage at Torrumbarry



Ivor Stuart and Jason Lieschke holding a carp

Introduced mammals (Red Fox, cats, European Rabbit, several species of deer, feral goats, horses and pigs) contribute to habitat degradation and the destruction of native flora and fauna. In 2005, after the closure of the Keith Turnbull Research Institute, ARI welcomed staff who were experts in pest animals.

Example projects included the management of introduced predators, such as measuring the efficacy of toxic baits to control wild dogs and foxes, and the protection of farm animals by exclusion fencing and other techniques. The spread and effectiveness of Rabbit Haemorrhagic Disease (RHD-Boost) was assessed through predictive modelling and monitoring. Another project assessed best-practice rabbit management to enhance survival and biomass of tree seedlings planted for reforestation and led to more cost-effective methods of rabbit control and landscape restoration. Innovative methods for feral cat control included trialling best practice baiting techniques, toxin chemistry and bait delivery methods which avoided non-target species - a response to recent legislation allowing for aerial baiting of feral cats. The validation of baiting effectiveness was undertaken on several offshore islands around the country. A training course was developed and conducted to build

awareness of best management practice for rabbits, pigs, foxes and Carp in wetlands.

Project Deliverance monitored the response of medium-sized mammals to fox control over large-scales. The Glenelg Ark programs utilised planned burning to determine how fire and predation by foxes affected native mammals. Investigations into the success of fox baiting programs found that spatial scaling and bait layout, density and timing were all influential factors. ARI helped develop cutting-edge techniques to determine the likely distribution and abundance of a fox incursion into Tasmania. New statistical techniques were used to infer likely distribution and guide the eradication program. A control strategy to reduce fox predation on turtle eggs was developed and monitored for Hattah-Kulkyne National Park, a Ramsar-listed wetland of international importance.

Always a controversial topic with farmers, the development of non-lethal control tools for wild dogs and dingoes helped prevent attacks on sheep and the management of dingo populations. The bio-fence project identified the chemical signature in dingo urine that marks territory, sending the 'no trespassing' message to others. Wild dog movements were investigated using GPS collars and showed mostly short movements in a defined home



A tracking collar being placed on a Wild Dog/Dingo

range with occasional long movements over many tens of kilometres.

Several deer projects mapped and modelled the increase in deer distribution over time. Deer carcasses that mimicked those left by hunters were strategically placed close to livestock farms and monitored using camera traps to provide information on how predators and scavengers used them. Wild deer pose a biosecurity risk by potentially carrying diseases that may spread to livestock. Informed risk assessments of disease spread and approaches for responding to potential epidemics were gained by monitoring deer numbers and interactions with livestock along agriculture-forest edges.

Genetic profiling of feral pigs is being undertaken to help understand whether populations are self-contained or whether individuals are dispersing to create new populations across the state.

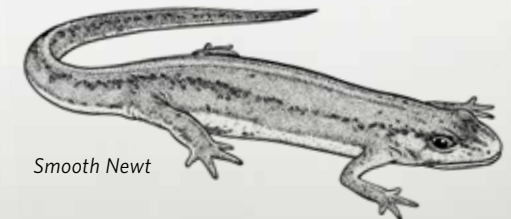
Carp are the major pest in Victorian aquatic environments and, although present in Australia since the mid- late-1800s, did not become established or widespread until the late 1960s when fish of the 'Boolara' strain' escaped from a farm in Gippsland. With the fish's occurrence in dams and enclosed waterways, ARI staff were involved in early eradication attempts, involving poisoning with the use of boats and helicopters. Unfortunately, this was unsuccessful and the Carp's invasion of the Murray-Darling River system, then many other locations in eastern Australia, meant that Carp became established as a vertebrate pest. ARI was involved in Carp research from its very beginning, studying their ecology, breeding, movements, impacts, and developing capture techniques and management plans.

The book *Managing the Impacts of Carp* (2000) reviewed the history of the species in Australia, its biology, environmental damage, and past and current management.

The award-winning Williams' Carp Cage was developed at ARI using the knowledge that Carp have an ability to jump low barriers

and hence can be separated from native fishes, which generally do not jump. The development, trialling and implementation of this removal technique represented a significant management achievement. Monitoring fishways and the use of radiotracking have identified Carp movements and contributed to population modelling. Modelling provided predictions of population growth under varying environmental conditions and management scenarios, greatly assisting managers. ARI also provided a national biomass estimate for Australia's Carp population.

ARI was involved in an Invasive Animals Co-operative Research Centre project to review the management of incursions of introduced freshwater fish and progress a national emergency response system. Staff have also provided advice and guidance on Victorian aquatic pest plants and animals, including the Smooth Newt and Marron.



Smooth Newt



Gambusia in hand



Exclusion fence to protect a colony of the threatened Heath Skink, Wyperfeld NP



Renee Ayres electrofishing around instream woody habitat



Bryea Thomas carrying out an aquatic vegetation survey



Making a difference

“ARI has a reputation for doing excellent science AND making a difference to the world. After several collaborations with ARI researchers while at a University, I could see that this reputation was entirely deserved, earned by people with a passion for science and biodiversity.”

Jian Yen

HABITAT REINSTATEMENT

Following the introduction of threatened species listings there was a move from conservation to species recovery. While a good deal of ARI's research has tried to quantify aspects of ecology for many species, there has also been a strong focus on developing measures to remediate threats, restore habitats, and facilitate dispersal.

One way to remediate specific threats to wildlife is the artificial creation of habitats, one of the simplest being nest boxes. ARI not only measured the efficacy of these, but undertook real world applied science by its active involvement in their creation, from the monitoring of artificial hollows for Red-tailed Black-Cockatoos in the 1990s to the creation of specialised chainsaw hollows for arboreal mammals in the 2010s. ARI also conducted a survey of community groups deploying nest boxes (98 groups covering nearly 10,000 boxes) to inform the management and efficacy of nest boxes.

ARI actively assisted in the establishment of predator-proof havens for threatened fauna through evaluating predator-

proof fence designs and designing monitoring programs. Recent examples include the design and installation of predator-proof fences to aid the recovery of the threatened Heath Skink in Wyperfeld National Park and the Eastern Barred Bandicoot in western Victoria.



Sugar Glider in nest box

INSTREAM WOODY HABITAT

Fish use trees that fall into the water in ways similar to terrestrial animals using trees on land: for nesting sites, habitats, refuges, feeding sites and velocity shelters. Many instream trees (snags) have been removed from rivers, and many streamside trees have been cleared, thus denying fish the ecological functions they provide and contributing to reduction in populations.

Re-instating trees in rivers is a key form of aquatic restoration and was pioneered by ARI. In 2006, Jarod Lyon led a project that undertook a large-scale habitat restoration project to install 4,450 large snags into the Murray River between Lake Hume and Lake Mulwala. This project is currently the largest of its kind in Australia. Monitoring from 2007-13 assessed the effectiveness of the program at increasing populations of Murray Cod, Trout Cod, Golden Perch and Silver Perch. One result was a three-fold increase in the Murray Cod population within re-snagged reaches. This study also increased community awareness and actively engaged multiple stakeholders in building knowledge around healthy habitats for native fish and river health.



Fish hotel being put in place



Snags being transported to site for instream habitat restoration

WATER FOR THE ENVIRONMENT

The storage and delivery of river water for irrigation and consumption places major burdens on river systems and their biota. Since its inception, ARI has conducted research and provided advice on 'environmental flows', making significant contributions to this politically contentious area of natural resource management.

Originally determining the 'minimum' flows for release downstream of new dams (Thomson and Dartmouth), this science evolved into complicated flow plans designed to target critical fish life-stages to restore populations. Research on a range of fish species revealed the reproductive, habitat and movement requirements in relation to flows. Flow-rates, depths and water velocities were once manually measured across river transects; today these are gathered by sophisticated equipment, and fish population models are used to predict the likely benefits of flow restoration.

Considerable 'environmental water' allocations (water for the environment) are now held by both Victorian and Commonwealth agencies and delivered to rivers and wetlands based on scientific advice. This advice is provided primarily by ARI staff, who contributed to many Environmental Flows Technical Panels and Streamflow Management Plans. The latter include The Living Murray Program (TLM), the Commonwealth Environmental Water Office's on-ground Monitoring, Evaluation and

Research program, water under the Murray-Darling Basin Plan, the Victorian Environmental Flows Monitoring and Assessment Program, and the Wetlands Monitoring and Assessment Program for environmental water.



Annique Harris returning a Murray Cod to the water

FISH PASSAGE

Fish live in largely linear habitats and need to move up and down the river as well as sideways, into anabranches, tributaries and onto floodplains to feed, breed and complete their lifecycles. Unfortunately, there are many barriers that have been imposed on river systems that prevent such movements.

Improving fish passage through the design and building of fishways has become an important aspect of ARI's fish ecology expertise. Although the initial focus was on upstream movements of large fish past large barriers, the downstream and lateral movements for fish of all sizes, across various barriers (e.g. road crossings and culverts) are now included.



Torrumbarry vertical slot fishway

“ A major achievement of my time at ARI was the ‘Freshwater Circus’-an information and training exercise for non-ARI river management staff. Bill O’Connor, Steve Saddler and I ran field days with local Department and CMA staff, Landcare, and other groups, explaining the ecology behind river management decisions. Showing attendees the fish and invertebrates that live below the river surface was always satisfying, especially when the reaction was ‘I never knew these things existed!’ ”

Tim Doeg

COMMUNICATING OUR SCIENCE

ARI’s approach to communicating science to the world has altered significantly over the years. Traditionally, technical reports were a key method and you can find over 300 of these reports at <https://www.ari.vic.gov.au/publications>. These were augmented by regular articles in Australian natural history and biological journals.

There has been a continuing trend towards publishing in higher-ranked and international scientific journals, as well as books, book chapters, biological or species syntheses and management papers; ARI ultimately led or contributed to hundreds of peer-reviewed journal papers. To communicate scientific results more easily to the wider world, non-technical summaries, fact sheets and newsletters led the way through traditional print media, followed by television and radio.

And of course, changing technology has offered our stakeholders and the general public, wider accessibility to the work we do. Today, ARI is present on all social media including Facebook, Twitter, YouTube and Instagram. Other forms of communication include videos, seminars, public events, conference presentations, quarterly updates and the ARI website (www.ari.vic.gov.au).

Communication of ARI’s work has evolved strategically: communication and engagement planning are integral to research plans, with careful consideration of goals, relevant audiences, the best ways to reach those audiences, and how to evaluate communication and engagement success.



Ivor Stuart being interviewed at Gumbower about restoring environmental flows to benefit fish



Brad Farmilo and Dave Ramsey provide training to Parks Victoria staff (Credit: Nick Esser- Parks Victoria)



Kay Morris talking to landholders at a wetlands field day



Kids colouring in fish

Making a difference



Tarmo Raadik (ARI) and Mick Hall (Australian Trout Foundation) agree to work together on river and native fish restoration



Luke Woodford at a public event displaying terrestrial animal survey techniques

COLLABORATIONS

ARI collaboratively works through many project teams that include universities (across diverse disciplines); consultants; indigenous and government organisations, local and interstate agencies; international organisations; community and stakeholder groups. For example, ARI has teamed up with overseas agencies, such as New Zealand’s Department of Conservation and has been a key partner in many interstate projects and committees for the Murray-Darling Basin Authority; Catchment Management Authorities; Melbourne Water; Parks Victoria; Birdlife Australia and the Victorian Fisheries Authority.

ARI undertakes applied research to inform policy development and on-ground management outcomes.

ARI’s involvement in the management of fisheries has varied over time according to the politics and agency structure of the day. However, fish surveys, research and inputs to fisheries management have continued. Two major changes over the past 50 years have been the reduction then closure of commercial fisheries for freshwater fish, and the subsequent increase in the importance of native species to the recreational fishery; ‘catch and release’ is now widespread, particularly for large native species such as Murray Cod.

ARI has studied many of the species important to recreational fishers (e.g. Murray Cod, Golden Perch, Macquarie Perch, River Blackfish). This has led to collaborations between ARI, the Victorian Fisheries Authority and anglers to determine angler regulations, and how and when to undertake stocking programs to enhance populations. Trout angling groups, previously antagonistic to native species and ‘conservation’, now actively contribute to threatened species and river restoration programs and participate in discussions about environmental water allocations. Anglers now recognise the links between rehabilitating aquatic and riparian (rivers, wetlands, and streams) environments, and the consequent benefits to the native fish that they utilise them.

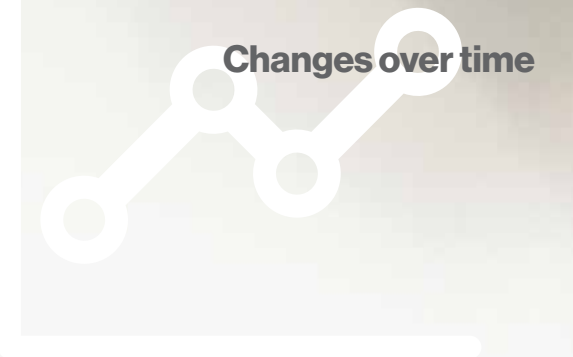


Changes over time

The world moves on and as technology has evolved so has ARI's work. Departmental restructures have resulted in many name changes at higher levels (ARI's name has remained immutable, despite many suggested alternatives) and Ministers have come and gone. However, some social and technological changes have made a great difference. Computing power alone has significantly boosted all sorts of capabilities, including statistical analysis, databases, decision tree matrices, mapping (with multiple-layers) and modelling. Desktop computers came to ARI, mainly as word-processors, around 1990. By 2020 all ARI staff routinely carried with them several high-level computers in the form of laptops, mobile phones, Global Positioning Systems (GPS), data loggers and readers. Improved batteries have greatly enhanced the efficacy of such equipment and techniques such as telemetry tagging.



Paddock bomb used while counting kangaroos



GENERAL TRENDS OVER TIME

Over time, ARI progressed from priorities relating to fishing, hunting and pest animals to those of biodiversity conservation and natural resource management. These changes will have been evident in the preceding sections of this book. Some research topics have endured (such as Carp, forests and threatened species), but others, such as remote sensing, modelling and environmental flows, were barely on the horizon in the 1970s. There is also a clear recognition now that environmental issues are not purely ecological, so we have added social sciences to our skill set and human dimensions to our environmental work. Politics, society and technology have changed and have altered not just what we do but how we do it. It is easy to forget these changes, but they are significant. Here we summarise some of the major trends over the past 50 years.

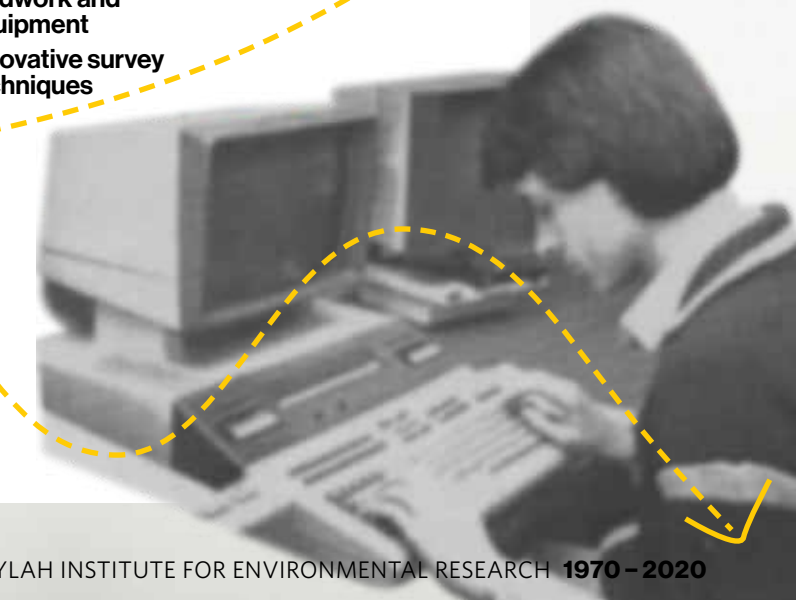
Increases

- Study of native species
- Science quality and publications
- Female staff
- Training, skills and qualifications
- Work outside of Victoria
- Communication, collaborations and partnerships
- Recognition of Indigenous culture
- Modelling and remote sensing
- Consideration of OH&S
- Contract staffing and external funding
- Business practices and administration
- Complexity of fieldwork and equipment
- Innovative survey techniques
- Digital technology
- Genetics research

Decreases

- Ongoing funding and staffing
- Purely technical staff
- In-house equipment development
- Natural history
- Work-life balance
- Invasive or destructive sampling methods

Biometrician Mike Mobley using his new desk-top mini-computer

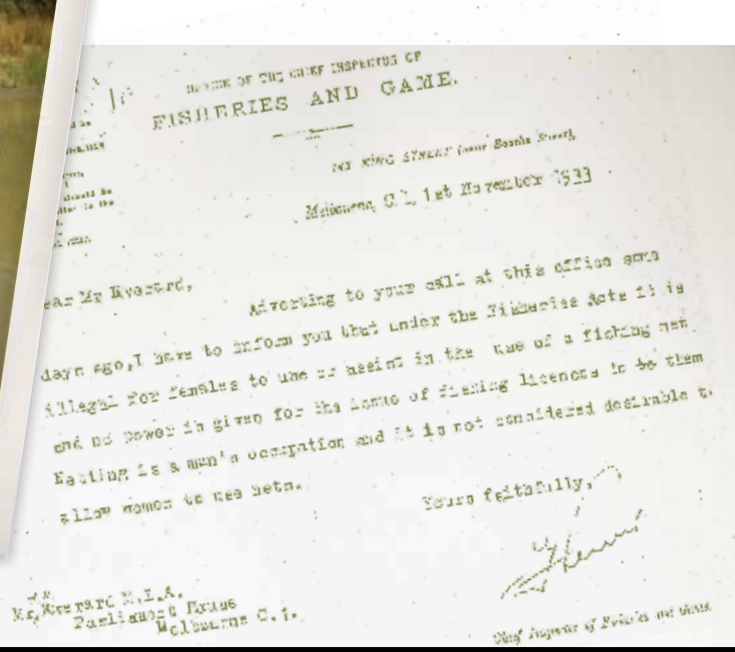




Lauren Johnson and Annique Harris on an electrofishing boat



Women holding nets



Mr. Everard M.L.A.,
Parliament House
Melbourne C. I.
Chief Inspector of Fisheries and Game

WOMEN IN SCIENCE AT ARI

ARI is proud to be an inclusive workplace where expertise and diversity are highly valued and discrimination of any kind is unwelcome.

When established in 1970, like many other institutions, ARI's workforce was male-dominated, but it is proud to have progressively increased numbers of female staff. A 1933 edict from the then Chief Inspector of Fisheries and Game provides valuable historical context and reveals how far we've come. The Chief Inspector sternly advised a Mr Everard on the role of women in the fisheries:

"... under the Fisheries Acts it is illegal for females to use or assist in the use of a fishing net and no power is given for the issue of fishing licences to them. Netting is a man's occupation, and it is not considered desirable to allow women to use nets."

Naturally, these days ARI's expert female employees not only use all manner of nets but also pilot electrofishing boats and undertake all types of challenging fieldwork and leadership roles as part of their professional and scientific lives – just like their male colleagues.



Jenny McCoy, Jenny Alexander and Perpetua Blanks



Fiona Coates



Michele Kohout and Keely Ough



Lindy Lumsden and Amanda Bush



Phoebe Macak installing a remote camera



FACILITIES TO SUPPORT SCIENCE

Library

The ARI library today bears little resemblance to its early days where a dot matrix printer was considered modern technology. Who can forget the joy of removing the perforated side strip from the long roll of parchment-like paper? The endless photocopying of journal articles (no electronic access then) or, waiting days – even weeks – for a hard-copy to arrive through inter-library loans?

ARI is fortunate to have had a succession of excellent on-site librarians through the years to maintain its extensive collection and assist staff. None more so than Carol 'Gouger' Harris – a fanatical North Melbourne Kangaroos supporter who also organised the ARI footy tipping competition (in hard copy!). Gouger ran the library as a lively place, with laughter, expletives and passionate good will, creating a hub of much fun. Today, with on-site library staff a thing of the past, ARI continues to fight to retain a small collection of specialist texts and journals so vital to its function and part of its history.

Caretaker

A house at the rear of ARI (in Wimport St) provided on-site accommodation for Alan Fisher, the ARI Caretaker for many years and his family. Alan was supported by a small number of maintenance staff (Andy Forbes, Andy Novak, Paul Dempsey and others) who undertook a variety of duties.

After Alan Fisher's retirement in the early 1990s the residence was adapted to office space known as 'The Annexe' and housed the recently-arrived Flora Section and editors. In the early 2010s the Annexe was demolished and replaced by a new workshop.

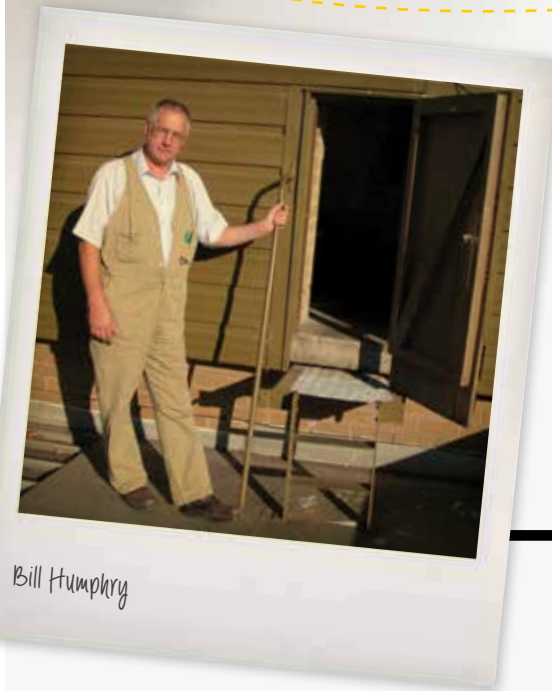
"The 'Annexe' housed botanists who installed a 'Bullshit Meter' with different bands, ranging from Low to Extreme. Davids Cameron and Cheal would have long conversations, referring to all plants in Latin names and leaving most other staff lost, and pushing the BS meter rating higher."

Geoff Sutter



"Some of my happiest working days were at ARI."

Carol Harris



Bill Humphry

“ If we needed anything fixed or made, we'd go and ask Bill Humphry. He'd design and construct fantastic equipment, not only functional, sturdy and better than anything that could be bought, but he'd also paint it bright colours and stencil your initials on it. ”

Keely Ough



Michelle Dalton, Steve Werner, Eddie Buzinskas, Corrinne Wong, Joel Gregorio and Quan Chau



ARI's original word-processor circa 1990



Danuta Karpow in the chemistry laboratory



Autopsy of road-killed Tasmanian Devil. Andrew Bennett, Gary Davey, Bob Warneke and David Middleton (Healesville Sanctuary vet)

clubhouse building was dismantled to make way for a larger storage shed which was used to house boats and field equipment. With the subsequent closure of the Hellier St store this consolidated ARI at the Brown St address.



Andrew Pickworth

Administration

The administration of ARI has changed significantly over time. In the 1970s a 'timekeeper' was in charge of the sign-in book to ensure that all employees worked their daily allocation of 7 hours and 36 minutes. At 8:30 each morning a red line was ruled under those who hadn't signed in to work by then, requiring an explanation to their supervisor. Knock-off time was 4.36 pm - prior to the introduction of flexi-time. For purchase orders you saw Maurice Farey and for stationery you saw the ever-relaxed and cheerful Jack Evans, who would grab the keys to the store, whistle on his way down the corridor, then

dole out pencils or note pads. Field equipment was held under similarly tight security by Lindsay Bright at the St Hellier Street store.

Today, an administration team supports staff with respect to budgets, IT and building maintenance. This key group manages project contracts, runs complex project costings and budgets, issues invoices, manages the ARI vehicle fleet, and administers OH&S requirements. ARI Reception provides an immediate impression for visitors and the Institute has been blessed with many efficient and welcoming receptionists, including the perennially effervescent Joy Sands.



Front (L to R): Brad Dale, Judy Firman, Maurice Farey, Eddie Buzinskas, Diane Romari, Sue Howley, Jack Evans
Rear (L to R): Peter Christie, Debra De Lacy, Linda Watson, Tony Seals, Alan Fisher, Dorothy Muscat

Typing pool

Today's generation is probably unfamiliar with the term 'typing pool'! Prior to word processing, all correspondence was prepared using manual typewriters (later updated to electric models). Letters, orders, reports and papers were all transcribed from hand-written notes by the typing pool staff. It is now unimaginable that the 1983 *A Guide to the Freshwater Fish of Victoria* was painstakingly written in long-hand and converted to text on a typewriter. In the late 1980s, the typing pool became the word-processing pool. Text for *Biological Information for the Management of Freshwater Fish in Victoria* (1990) was prepared with word-processors, but changes were made by cutting and pasting - literally - with scissors, glue, sticky-tape, and red pen editing of successive hard copy versions!

Laboratories

Laboratories were always required for sorting, identifying, storing samples, equipment preparation and specimen examination. The freezers were once always full of frozen fish, small mammals, birds, reptiles and even deer! These were stored for later studies or, in the case of fish and occasionally other animals, examination on the dissection table. Stephen Platt recalls in the 1980s watching the post-mortem of a young dolphin that had been hit by a boat propeller. Many staff still vividly remember the stench of larger dolphin and whale examinations undertaken in the vehicle washing bay in the rear car park, right next to the air conditioning intake! Happily (or perhaps unhappily), such work is no longer routinely undertaken at ARI.



Rodney Ferdinans

Cleaner

Originally, ARI also had its own dedicated cleaner, a role that has long since been contracted out. The cleaner made daily rounds to sweep, mop, dust and empty the rubbish bin in each office - no recycling then. One long-term cleaner was Laszlo ('Les'), a gentle man who had left Hungary to escape political turmoil. His arrival at your office door usually included a convivial chat that sometimes evolved into discussions of life under either capitalist or communist regimes, often ending with scathing comments on how bosses treated their workers poorly under both political systems. So, cleaning and dusting often came with a free European history lesson.

FIELDWORK



Gunn's Alpine Buttercup
Ranunculus gunnianus
Illustration by Michele Kohout

Who would send a young, untrained recruit alone into a remote area for two weeks in their second week of employment, with no communication capability? Or undertake summer fieldwork in a 'uniform' that consisted of just a pair of shorts! This was not uncommon in the early days of the Institute. Note the field gear of Ray Donald in the boat, not very sun-smart but he was wearing shoes and a cap, which is more than some staff! Even into the 1980s, fieldwork, including boat launching, was often conducted in 2WD vehicles.

How things have progressed! ARI now provides a safer workplace, with mandatory training, protective equipment, risk assessments, improved communications and recovery equipment. Today, ARI has dedicated Health and Safety Representatives, incidents and near-misses are recorded on a central database, and there is extensive staff training. Courses include: chainsaw use and maintenance; defensive and 4WD driving; vehicle maintenance and recovery; First Aid (including Psychological First Aid and Remote First Aid); safe storage and use of chemicals; electrofishing certification and medicals; remote location communication protocols and hazardous tree assessments. The Institute has a fleet of 4WDs, properly outfitted with vehicle trackers, canopies, boat racks, trunk/two-way radios, winches and diff locks. All field trips are logged, with trip and site risk assessments undertaken. This has all made our fieldwork more efficient and much safer. Well-trained drivers in good vehicles can go anywhere! Well, almost. Sometimes incidents still happen!



Katie Howard making baits to trap Smoky Mice in the Grampians

“ After a long day mapping near Benambra, we decided to camp in an old hut rather than return to base. After an evening of cooking, we settled for the night only to be driven out by the large population of active rats. The exception was one colleague who kept them at bay with his very loud snoring. ”

Michele Kohout



Practicing 4WD recovery: Michele Kohout, Dan Purdey, Luke Woodford and Tarmo Raadik



Jenny Nelson radiotracking Spot-tailed Quolls

“ Back in 1989 when I knew nothing about anything and lived in Kinglake, I was doing surveys in closed water catchments that weren't too far from home, so I was given a key to the gates, a 4WD, chainsaw, hand recovery gear, survey gear, and did day trips – including spotlighting at night. No PPE, safety equipment (mobile phones weren't invented and I don't think there was even a trunk radio), no call-in, and often on my own unless I could find a volunteer to come along. On returning to work one day my boss said: “Ahh, I wondered where you'd got to, how'd you get on? ”

Jenny Nelson

Changes over time



Ray Donald having a relaxing break



Jane Dickens, Jenny Alexander, Geoff Sutter and Jenny McCoy 1998 in the Alps



Peter Menkhorst at Mud Island



David Hespe radiotracking Squirrel Gliders throughout the night

THE FUTURE

While ARI has changed over the past 50 years, it remains uniquely positioned to make a crucial contribution to the future of Victoria's biodiversity. The extraordinary body of ecological knowledge and expertise built by the Institute, supported by its ever-increasing range of collaborators and the continuing emphasis on expanding staff skills in science and leadership, provide a strong foundation to achieve this.

While ARI remains an entity of the Victorian State Government, most of its income is now sourced competitively on a full cost-recovery basis. This has made ARI very client-focused and means its reputation as a highly respected leader in ecological research is more important than ever. ARI's research aims to answer ecological questions and solve management problems. It has the capacity to provide high-quality, multi-disciplinary teams, needed to answer integrated questions. ARI is also building capacity in emerging fields, such as behaviour change and the human dimensions of conservation.

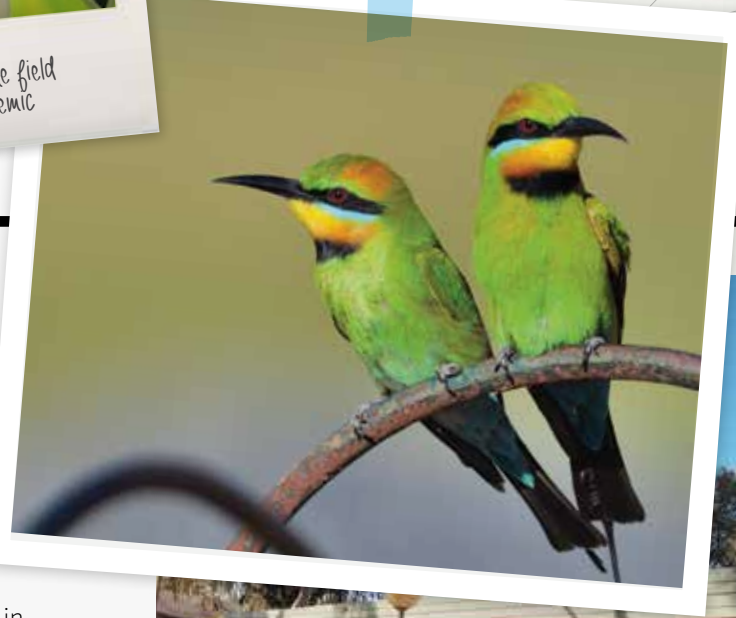
ARI's focus is no longer solely Victorian, with many Australian and international connections enabling us to work with the very best scientists and managers. This increases our skill sets, drives important collaborations, and yields high-quality science. The arrival of the COVID-19 pandemic in 2020 had significant impacts on our work as well as our wider lives, triggering a major shift in work practices. However, coping with these necessary

changes again demonstrated the Institute's resilience and capacity to adapt and innovate.

ARI has impressive scientific capacity in staff, facilities and equipment. In 2020, ARI had about 90 science staff, half of whom have a PhD, with a combined professional experience of two thousand years! ARI will continue to deliver robust science, addressing emerging ecological and conservation questions, and is looking forward to the next 50 years.



Gabriel Cornell & Lauren Johnson in the field with masks during the COVID-19 pandemic



“ Growing up on the banks of the Goulburn River in Northern Victoria we loved fishing and the outdoors which led to careers in conservation at ARI. Working and living together with people in the field formed lifelong connections and bonds far stronger than for regular workmates. We come away with great memories and a band of brothers that extends far beyond our family. ”

Damien (Damo) and Justin (Rusty) O'Mahony

Changes over time



Staff

ARI's most important asset is, without doubt, the dedicated staff who have been formed the backbone of the Institute for the last 50 years. Every ARI employee, together with contractors, collaborators and volunteers, has made an invaluable contribution. It is their knowledge, dedication and application, whether in the field or at their desk, that has ensured ARI's success.

Here we proudly highlight many of these wonderful achievements and people, acknowledge long-serving staff and Directors, and provide an extensive photo gallery with a comprehensive staff roll-call. We've endeavoured to recognise the contributions of everyone, because it is the combined efforts and camaraderie of the ARI 'family' that has made the Institute a special place to work. The gallery reflects the many attributes that form our team culture. Let us savour it!

Minister for Energy, Environment and Climate Change Lily D'Ambrosio (centre) visits ARI in 2017



People Passion Science

The importance of teams

Much of what you have read in this book has been about projects and work environments, but ARI is really about the people, their many roles and contributions. Working at ARI involves being part of a team at various levels – ARI overall, Sections, project and field teams. The importance of teamwork cannot be overstated, and the success of that teamwork is due to personal traits as well as technical skills. ARI functions successfully not just because of its project staff, but also because its science leaders, managers, business, administrative and other staff provide essential and exceptional support.

Field teams at ARI are multi-skilled - typically with science and technical staff combining complementary skills to realise project outcomes and learn from one another. Early on, technical staff conducted most of the fieldwork, but now the distinction between science and technical roles is much more blurred. Field techniques and sampling regimes are more complicated, necessitating a shift from 'bush skills' to higher level scientific expertise, such as more complex

data collection technologies and protocols, including electrofishing, electronic tagging and remote data downloading. There is also a much higher level of safety awareness and training.

ARI fieldworkers regularly work together in remote locations, often for extended periods, and thus must endure everything that fieldwork generates: heat, cold, wet, dry, dust, breakdowns (physical, emotional and vehicular), bogging, accidents and long hours, often working unsociable nocturnal hours! Being together 24 hours a day can strain friendships - but also build enduring camaraderie. Personal disputes are rare, despite the large number of staff and field-trips conducted during ARI's lifetime, this being testament to the professionalism and patience of the individuals involved. Field teams build resilience and trust that endures back in the office and even beyond ARI itself.

Box-Ironbark collaboration: Kim Lowe, Ralph Mac Nally (Monash Uni), Todd Soderquist, Richard Loyn, Marilyn Grey, Jenny Wilson (Deakin Uni), John Silins, Alan Yen (Museum Victoria), Jerry Alexander, Peter Johnson, Andrew Bennett (Deakin Uni), Lindy Lumsden, Greg Horrocks (Monash Uni), Geoff Brown

“ Working at ARI was a formative experience, where young staff were fostered by both technical and scientific specialists. This model of camaraderie and conservation has underpinned highly-regarded scientific research that is integral to the management and conservation of aquatic ecosystems. **”**

Brenton Zampatti



Terry Glenane, Rod Green, Tim O'Brien and Lachy McKinnon at lunch





Tracey Regan and Josephine MacHunter BAME Award (with Dr Michael Runge, United States Geological Survey) (Co-recipient Nevil Amos not present)



Excellence in science

Many ARI staff have been the recipients of various state, national and international awards recognising their excellence in science. While some of these awards were achieved through collaborations with others, we have only highlighted ARI staff here. Such awards were not as frequent during the early years, despite so much good work being undertaken, but we have endeavoured to include as many as we could find. Of course, there are other forms of achievement not listed, notably thousands of publications, recognition amongst peers, and great careers and contributions made by staff after their time at ARI. The Institute is also proud to have been a productive training-ground for environmental scientists and managers, academics, regional staff and consultants across Australia.



Richard Loyn and Ed McNabb accept the inaugural David Ashton Award in 1999



Simon Nicol (right) accepting the David Ashton Award

International Awards

2018 INFORMS Decision Analysis Practice Award The Fire Analysis Module for Ecological values (FAME) project, a collaboration between ARI, DELWP regions and the University of Melbourne: Tracey Regan - Josephine MacHunter

2019 United Nations Public Service Award The Victorian Rabbit Action Network team: Fern Hames

National Awards

1997 Banksia Gold Award and Banksia Catchment Management and Inland Waterways Category Award: John Koehn

1997 RiverCare 2000 - Gold Award Science and Research Cod Radiotracking Project Team: John Koehn - John McKenzie - Damien O'Mahoney - Bill O'Connor

1998 The Australian Natural History Medallion: Peter Menkhorst

2000 RiverCare 2000 - Award for Excellence in Science and Research Cod Radiotracking Project team: John Koehn - John McKenzie - Damien O'Mahoney - Bill O'Connor

2004 Land and Water Australia Eureka Prize for Water Research The Carp Separation Cage: Ivor Stuart

2009 National Emergency Medal - Victorian Bushfires: Fern Hames

2014 The D.L. Serventy Medal An Award of the Royal Australasian Ornithologists Union (now BirdLife Australia): Richard Loyn

2015 National Recreational Fishing awards Excellence in Support for Research Outcomes - The Murray River Re-snagging Project: Jarod Lyon and the ARI team

2017 River Basin Management Society Awards - Outstanding Waterway Management Project Coastal Fish Habitat Hotspots - government and community partnering to rehabilitate fish habitat in Victorian estuaries: Renae Ayres and the ARI team

2017 The Whitley Medal for The Australian Bird Guide: Peter Menkhorst - Danny Rogers

Australian Public Service Medal

- 2019 Peter Menkhorst for outstanding public service to science and biodiversity conservation in Victoria

- 2019 Lindy Lumsden for outstanding public service to environmental conservation in Victoria

- 2020 Fern Hames for outstanding public service to nature conservation in Victoria

Departmental Awards

2006 DELWP Secretary's Award for Outstanding Achievement: *Removal of Cattle Grazing from the Alpine National Park project:* Arn Tolisma

David Ashton Biodiversity Science Awards

- 1999 The Study of Distribution and Ecology of Large Forest Owls: Richard Loyn - Rolf Willig - Ed McNabb

- 2000 The Box Ironbark Partnership: Andrew Bennett - Geoff Brown - David Hespe - Steffan Krasna - Lindy Lumsden - John Silins

- 2003 The River Rehabilitation Team: Simon Nicol - John Koehn - John McKenzie - Justin O'Mahony - John Mahoney - Jason Lieschke - Jarod Lyon - Charles Todd - Andrew Bearlin

- 2004 Carp Separation Cage: Ivor Stuart - Matt Jones - John McKenzie - Justin O'Mahony - John Mahoney - John Koehn

- 2005 Conservation of Insectivorous Bats in Rural Landscapes: Lindy Lumsden - Andrew Bennett - John Silins

- 2008 Restoring Habitat for Fauna in Rural Landscapes *Roles of remnant forest, plantations and revegetation:* Richard Loyn - Ed McNabb - Phoebe Macak - Josephine MacHunter

- 2009 Excellence in Scientific Research and Influencing Management on the Effectiveness of Environmental Flows for Fish Recruitment: Alison King - Zeb Tonkin - John Mahoney

- 2014 The Native Fish Strategy: John Koehn - Pam Clunie - Fern Hames - Matt Jones - Jo Kearns - Jarod Lyon - Justin O'Connor - Scott Raymond - Tarmo Raadik - Charles Todd - Zeb Tonkin

- 2019 Improved regulation of Koala impacts during Blue Gum harvesting: Paul Moloney

- 2020 Rapid analysis of the impacts of the bushfires on Victoria's biodiversity and the identification of priorities for action: Matt White - Fern Hames

2019 DELWP Water Science Award Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) team: 13 ARI staff

Other

The Australian Mammal Society John Seebeck Travel Award is named after ARI's eminent mammal ecologist John Seebeck

The Northern Freetail Bat *Ozimops lumsdenae* is named after ARI stalwart and bat ecologist Lindy Lumsden

ARI Directors

ARI has not always had a dedicated on-site Director. In the early days, senior Head Office staff shared the responsibility at various times. These staff included: Alfred Dunbavin Butcher, Jim Wharton, Mike Sanders, Dudley Kurth, Graham Schwartz, Garth Newman, Max Kitchell, Michonne van Rees, Diana Patterson and Rod Gowans. ARI's first on-site Director (Ian Cumming) was appointed in 1982, but the position has only been occupied continuously since 2000.



- Dr Ian Cumming (1982-83)
- Dr Wayne Chamley (1983-85)
- Mr Ed Hilliard (1995)
- Dr Tim Clancy (2000-05)
- Dr Robert Begg (2005-08)
- Dr Sze Flett..... (2009-12)
- Dr Kim Lowe (2012-20)



Dr Kim Lowe



Dr Tim Clancy



Dr Robert Begg

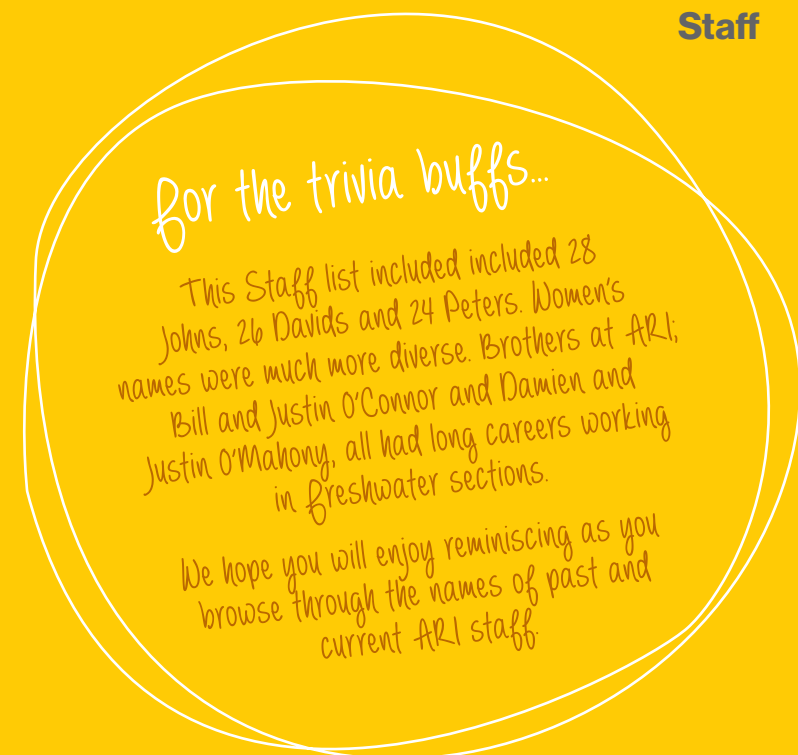


Dr Sze Flett



The ARI staff list – from Adrian to Zilli:

Over 750 staff have contributed to ARI's success over the past 50 years. Sadly, there were no consolidated records or historical Human Resources database to access, therefore the list below is a compilation from telephone lists (some hand-written or manually typed), photos, reports, sundry documents and ageing memories. We have ordered these alphabetically by first names as this seemed friendlier. We have tried to include everyone employed by ARI but we realise there may be some omissions or mistakes (misspellings, variations in spellings or name changes), for which we apologise. However, please be assured that everyone's contributions were highly valued. We would also like to pay tribute to the staff members whom we have lost over the years. Staff that resided at ARI but were not in ARI line management, such as those in the Centre for Tree Technology, regional and occasional Head Office staff, do not appear on this list.



- | | | | | | |
|---------------------------|--------------------------|---------------------|------------------|-----------------------|------------------|
| Adrian Kitchingman | Andrew Corrick | Baslo Baxter | Billy Luckovich | Carol Palmer | Cindy Hauser |
| Adrian Moorrees | Andrew Gormley | Belinda Cant | Birgita Hansen | Cath Byers | Cindy McKenzie |
| Alan Baxter | Andrew Kaus | Ben Fanson | Bisho Swedjze | Cath Caddle | Claire Moxham |
| Alan Brooks | Andrew (Panda) Pickworth | Ben Kefford | Bob Warneke | Cathy Molnar | Clare Millen |
| Alan Jones | Andy Forbes | Ben Reddiex | Bob Weekes | Cathy Rich | Claudine Wallace |
| Alan Lowe | Andy Geschke | Bernice Dowling | Brad Dale | Celeste Garthwaite | Colin Sinclair |
| Alan Robley | Andy Novak | Bernie Morris | Brad Farmilo | Cengiz Altinors | Con Makroyiannis |
| Alan Webb | Andy Smout | Bertram Lobert | Brenton Zampatti | Changhao Jin | Corrinne Wong |
| Alan Yen | Angela Duffy | Beth Ibbetson | Brett Ingram | Charles Anderson | Dale Tonkinson |
| Alasdair Grigg | Angus Webb | Beverley van Praagh | Brett Goodman | Charles Barnham | Damien McMaster |
| Alasdair Macdonald | Anna Foley | Bhumika Dave | Brian Walters | Charles Todd | Damien O'Mahony |
| Alec Dacre | Anna H. Murphy | Bianca Stirling | Brian Weavers | Charlie Melke | Dan Purdey |
| Alex Caughey | Anna M. Murphy | Bill Barrett | Bronwyn Cumbo | Charlie Pascoe | Dan Stoessel |
| Alex (Sandy) Gilmore | Ann Mills | Bill Bren | Bronwyn Price | Charlie Silveira | Daniel Bucher |
| Alicia Lucas | Annette Cavanagh | Bill Dixon | Bruce Allsop | Chris Belcher | Daniel Corrie |
| Alicia McShane | Annette Di Natale | Bill Emison | Bruce Houghton | Chris Brett | Danny Rae |
| Alison King | Annette Muir | Bill Francis | Bruce McBeath | Chris Fisher | Danny Rogers |
| Alison Oates | Annie Preece | Bill Humphry | Bruce McCarraher | Chris Jones | Danuta Karpow |
| Alistair Brown (Campbell) | Annique Harris | Bill Johnson (1) | Bruce Theodore | Christine Clune | Darryl Emerson |
| Allan Black | Anthony (Rex) Conallin | Bill Johnson (2) | Bruce Withnell | Christine Hall | Daryl Nielson |
| Allan Fisher | Arn Tolsma | Bill O'Connor | Bryan Mole | Christine Letts | Darwin Evans |
| Allison Pouliot | Arnold Forrester | Bill Peel | Cam Beardsell | Christine Lever | Dave Dawson |
| Amanda Bush | Ashley Sparrow | Bill Sherwin | Canran Liu | Christine Sigley | Dave Forsyth |
| Andrea Brumley | Barb Baxter | Bill Smith | Carlo Pacioni | Christopher Robertson | Dave Ramsey |
| Andrew Bearlin | Barbara Gleeson | Bill Thomas | Carol Bathie | Chrys Margellis | David Algar |
| Andrew Bennett | Barry Turnbridge | Billy Geary | Carol Harris | Cindy Clare | David Bryant |

Long-serving staff

ARI has had many long-serving staff members. The following staff have committed much of their working lives to the Institute:

Over 40 years of service

Terry Glenane, John Koehn, Lindy Lumsden, John McKenzie

Over 30 years of service

Geoff Brown, Eddie Buzinskas, Peter Fairbrother, Des Harrington, Peter Menkhorst, Ian Norman, Jenny Nelson, Graeme Newell, Tim O'Brien, Justin O'Connor, Tarmo Raadik

Over 20 years of service

Leigh Ahern, John Alderson, Jim Bacher, Charles Barnham, Alan Baxter, Barbara Baxter, Sue Beattie, Bill Bren, Keith Cherry, Peter Christie, Nick Clemann, Pam Clunie, Andrew Corrick, Di Crowther, Judy Downe, Bill Emison, Jack Evans, Fern Hames, Bill Humphry, Matt Jones, Wayne Koster, Ruth Lennie, Jason Lieschke, Richard Loyn, Jarod Lyon, Phoebe Macak, John Mahoney, Jane Marcus, Dorothy Muscat, Damien O'Mahony, Justin O'Mahony, Phil Papas, Andrew Pickworth, Alan Robley, Peter Rogan, Stephen Saddler, John Seebeck, Geoff Sutter, Charles Todd, Barry Tunbridge, Stuart Vallis, Bob Warneke, Matt White



David Baker-Gabb	Elspeth Wingham	Graeme Gillespie	Jason Lieschke	John Monting	Katie Taylor	Lindy Lumsden	Maurie Smith	Paul Foreman	Rich Faulkner	Sandra Grant	Tim Curmi
David Cameron	Eric Savage	Graeme Hackett	Jean-Marc Hero	John Morrongiello	Katrina McMahon	Lisa Bueilhaz	Max Kitchell	Paul Humphries	Richard Gasior	Sandy Morison	Tim Doeg
David (Peter) Cheal	Erin Lennox	Graeme Newell	Jed Macdonald	John O'Toole	Kay Morris	Liz James	Megan O'Shea	Paul Lieuw	Richard Hill	Sara Johnson	Tim Fernando
David Choquenot	Erin Steel	Graeme Rennie	Jeff Davies	John Perry	Keely Ough	Liz Wemyss	Melinda Newham	Paul Moloney	Richard Loyn	Scott Leech	Tim O'Brien
David Crook	Erin Webb	Graham Gray	Jeff Drier	John Pertile	Keisha Atchison	Louise Murray	Melissa Hatty	Paul Petraitus	Richard Mounsey	Scott Raymond	Tina Davis
David Duncan	Eva Muthaya	Graham Pooley	Jeff Yugovic	John Seebeck	Keith Cherry	Louise Grgat	Melissa Webster	Paul Ramos	Rick Burbury	Selina Peters	Todd Welsh
David Geering	Evan Chesterfield	Grant Hull	Jeffrey Boote	John Silins	Keith Dempster	Lucille Turner	Meredith Kirkham	Paul Reich	Rick Edwards	Shanaugh McKay (Lyon)	Tom Daniel
David Hespe	Eve Barret	Greg Barnes	Jemma Cripps	John Stuwe	Keith Fruvall	Lucy Clausen	Micaela Main (Jemison)	Paul Tinkler	Rick Fallu	Shane Critchley	Tom Ryan
David Lindenmayer	Eve McDonald-Madden	Greg Holland	Jenny Alexander	John Tossol	Ken Bode	Luke Collins	Michael Basson	Pauline (Susie) Duncan	Rob Hale	Shirley Frawley	Tony Albers
David McNamara	Evelyn Braybrook	Greg Hollis	Jenny McCoy	John Towers	Ken Bodinner	Luke Einoder	Michael Blumenthal	Pennie Coleman	Rob Price	Sid Cowling	Tony Amarant
David Meagher	Evelyne Scott	Greg Horrocks	Jenny Nelson	John Turner	Ken McKoy	Luke Emerson	Michael Duncan	Penny Greenshields	Rob Richards	Sid Savage	Tony Cable
David Milledge	Ewen McLean	Greg Ivone	Jeremy Hindell	John Urquhart	Ken Norris	Luke Woodford	Luke Johnston	Pep Blanks (Turner)	Rob Shepherdson	Silvana Acevedo	Tony Herridge
David Parkes	Felicity Nicholls	Greg Sharpe	Jerry Alexander	John Wainer	Ken Rowe	Lyall Naylor	Michael Lake	Peter Brown	Robert Begg	Cattaneo	Tony McCarthy
David Powell	Fern Hames	Guido Kuserens	Jessica Kovassy (Fero)	John Westaway	Kerry Carr	Lyn Bezemer	Michael Lindeman	Peter Christie	Robert Gibb	Simon Bennett	Tony Reynolds
David Ramm	Fiona Coates	Harold Bradley	Jessica Millett-Riley	Jon Walls	Kevin Chipperfield	Lyn Keetch	Michael Saxon	Peter Fairbrother	Robert 'Bluey' Hosking	Simon Nicol	Tony Seals
David Rankin	Fiona Cross (Young)	Harry Parnaby	Jian Yen	Jordan Hampton	Kevin Porter	Lyn Peel	Michael Scroggie	Peter Grant	Robert Sly	Steffan Krasna	Tracey Franco
David Scotts	Fiona Haasz	Harry Wright	Jill Smith	Jordi Ryall	Khorloo Batpurev	Lynn Sharp	Michael Smith	Peter Griffioen	Robert Timms	Stephen Platt	Tracey Hollings
David Semmens	Fiona Hamilton	Heidi Zimmer	Jim Bacher	Josephine MacHunter	Kim Louen	Lyndsey Vivian	Michael Steneman	Peter Hescroft	Robyn Fowler	Stephen Ray	Tracey Regan
David Sharley	Fiona Warry	Helen Kosmos	Jim Blackney	Josh Barrow	Kim Lowe	Lynlee Tozer (Smith)	Michael Sverns	Peter Higgins	Rod Cheetham	Steve Craig	Trevor Hunt
David Thomas	Frank Amtstaetter	Henry Wooton	Jim Cooper	Josh Dorrough	Kirrily Berry	Maarten Hulzebosch	Michele Kohout	Peter Holbeach	Rod Gowans	Steve Gaffney	Trevor Pearce
David Venn	Fred Baum	Hugh Bramwell	Jim Crosthwaite	Joy Sands	Kirstin Long	Malcolm Macfarlane	Michelle Armstrong	Peter Jackson	Rod Green	Steve Henry	Trevor Williamson
Dean Chamberlain	Fred Craig	Ian Cumming	Jim Maguire	Judy Downe	Konrad Beinssen	Mandy Doyle (Muzzin)	Michelle Arundell	Peter Johnson	Rod Morrison	Steve Mueck	Trish Kevin
Dean Hartwell	Fred Leslie	Ian Foletta	Jim Porter	Judy Firman	Kris Pitman	Marcel Griekspoor	Michelle Dalton	Peter Lansley	Rodney Ferdinans	Steve Saddler	Trish Paradise
Deb Brown	Freya Thomas	Ian Frigerio	Jim Pribble	Judy Hill	Kylie Singleton	Maret Jarv	Michelle Drew	Peter Lillywhite	Rodrick Huisman	Steve Sinclair	Truda Howard
Deborah De Lacy	Gabriel Cornell	Ian Hastings	Jim Smith	Julia Hillman	Kym Saunders	Marg Allan	Michelle Tumino	Peter Menkhorst	Roger Bilney	Steve Werner	Vanessa Craigie
Declan Leever	Garreth Kyle	Ian Kuhne	Jim Thomson	Julia Reed	Lachlan Francis	Marg Beilharz	Mick Haley	Peter Moulton	Roger Reilly	Stewart Gilmore	Vaughn Kingston
Denise Deerson	Garth Newman	Ian Lunt	Jim Wharton	Julia Taranto	Lachlan McKinnon	Margie Gaynor	Mick Walker	Peter Quinlan	Rolf Weber	Stuart Vallis	Vicki Anceschi
Dennis Moy	Gary Backhouse	Ian Mansergh	Joanne Doherty	Julie Mehegan	Lance Williams	Margaret Knorr	Mike Mobley	Peter Riley	Rolf Willig	Sue Beattie	Vicki Paris
Derek Falconer	Gary Barnes	Ian Miles	Joanne Kearns (Sharley)	Julie Mounsey	Lauren Johnson (Dodd)	Maria Bonfa	Mike Nicol	Peter Robertson	Romy Muthaya	Sue Berwick	Vikki Cail
Derek Turnbull	Gary Davey	Ian Norman	Joanne Potts	Juliette McCallum	Lauren Stoot	Maria Constanzo	Mike Sanders	Peter Rogan	Ron Brown	Sue Clegg	Victor Barrington
Des Harrington	Gavin Cerini	Ian O'Neill	Joe Benshemesh	June May	Lawrance Ferns	Maria Franco	Nadia Lapidula	Peter Ryder	Ron Davies	Sue Ferguson	Victor Hurley
Di Crowther	Geoff Brown	Ian Temby	Joe Gresik	Justin O'Connor	Lawson Willoughby	Maria Taranto	Natasha Schedvin	Peter Stapleton	Ros Wickson (Watson)	Sue Howley	Vince Hurley
Di Romaro	Geoff Carr	Irene Prentice	Joe Harrigan	Justin (Rusty) O'Mahony	Leah Beesley	Marian Burbury	Neil Harris	Peter Stephenson	Ross Meggs	Sze Flett	Virginia Thomas
Dianne Bennett	Geoff Edwards	Ivor Stuart	Joe Vandenberg	Kae Winch (Kallinikos)	Leah Sabransky	Marion Batty (Merritt)	Nevil Amos	Peter Tossol	Ross Winstanley	Tammy Wilson	Vivienne Turner
Diane McPherson	Geoff Gooley	Jack Evans	Joel Gregorio	Kathy Preece	Leigh Ahern	Mark Collins	Neville McKenzie	Peter Towers	Rowena Myers	Tanya Rankin	Warren Davies
Dick Brumley	Geoff Heard	Jack Hitchens	John Alderson	Karen Stevenson	Leigh Anderson	Mark Nelson	Nick Bond	Peter Volleburgh	Ruby Campbell-	Tarmo Raadik	Warwick Papst
Don Buckmaster	Geoff Lucas	Jacqui Crockford	John Anderson	Karen Swain	Leigh Morison	Mark O'Sullivan	Nick Clemann	Petina Pert	Beschorner	Te Ao Marama Eketone	Wayne Chamley
Dorothy Muscat	Geoff McDonald	Jae Mistica	John Barker	Karin Sluiter	Leonie Mumford (Corrick)	Mark Seddon	Nick Williams	Phil Cadwallader	Russell (Gus) Strongman	Teo Van Der Veen	Wayne Koster
Doug Frood	Geoff Sutter	Jaimie Mavromihal	John Beumer	Karina Menkhorst	Leissa Kelly	Martin O'Brien	Norm Kilpatrick	Phil Papas	Russell Thomson	Teresa Devetak	Wendy Chorley
Doug Hall	George Appleby	James Glover	John Douglas	Karl Gleeson	Len Ashburner	Martin Schulz	Oberon Carter	Philip Du Guesclin	Ruth Lennie	Terry Co	Wendy Moore
Doug Hume	George Canale	James Shelley	John Garnham	Karl Pomerin	Len Quigley	Mary Quinlan	Oliver Field	Phoebe Macak	Ryan Chick	Terry Glenane	William Burns
Doug Lamb	George Grosseck	Jan Hunt	John Hull	Kasey Stamation	Les Havarti	Mary Servinis	Pam Bryce	Quan Chau	Sabine Schreiber	Terry Jordan	William McEvoy
Doug Robinson	George Naidos	Jan Shaw	John Johnson	Kate Sandiford	Les Sault	Matt Bruce	Pam Clunie	Raditya Santoso	Sally Allen	Terry Walker	Yvonne Anson (Orlando)
Douglas Quigley	George Reynolds	Jane Dickins	John Kilpatrick	Kate Stothers	Libby Woodward	Matt Westway	Pat Sedmack	Randall Robinson	Sally Dwyer	Therese Brady	Yvonne Hesse
Ed Hilliard	Georgina Lee	Jane Jackson	John Koehn	Katherine Harrison	Lilian Spencer	Matt White	Patrick Cox	Raquel Ashton	Sally Edwards	Thomas Daniel	Zeb Tonkin
Ed McNabb	Geraldine Richards	Jane Marcius (Starr)	John Mahoney	Katherine Kelly	Lily van Eeden	Matthew Allen	Patrick O'Leary	Ray Brereton	Sally Jacka (Pribble)	Tia Navanteri	Zilli Abedi
Eddie Buzinskas	(Lowe)	Jane Wilson	John Mason	Katherine Rawlinson	Linda Grootendorst	Matthew Dale	Patrick Vaughan	Ray Donald	Sally Kenny	((Chesterfield))	
Edward Tryslin	Gill Earl	Janet Holmes	John McCoy	Katie Gordon	Linda McKenzie	Matthew Jones	Paul Bennett	Renae Ayres	Sally Koehler (Kimber)	Tiarne Ecker	
Ellen Splittgerber	Glynn Aland	Janet Pritchard	John McGuckin	Katie Howard	Linda Watson	Maureen May	Paul Close	Rhiannon Stanford (Apted)	Sally O'Connor	Tim Brown	
Elisa Unson	Graeme Apps	Jarod Lyon	John McKenzie	Katie McClaren	Lindsay Bright	Maurice Farey	Paul Dempsey	Rhys Griffiths	Sally Wolfs	Tim Clancy	

Photo gallery



A



B



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D



F



Cam Beardsell



E

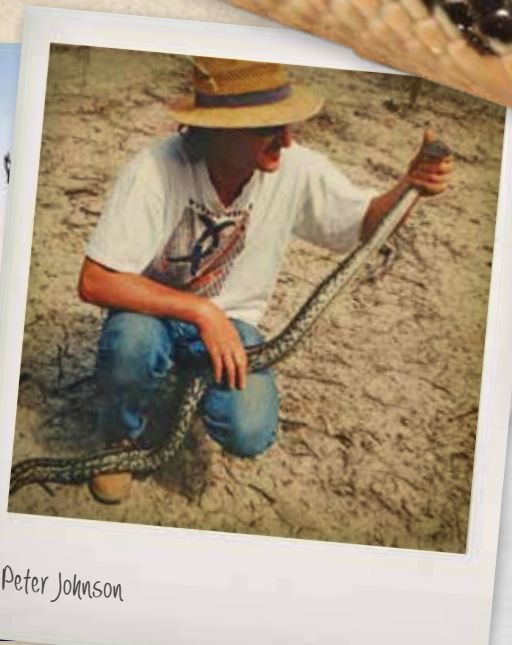


Chris Jones

Bryna Thomas



G



Peter Johnson



H



I



J



K

A Sue Howley, Gill Earl, Charlie Silveira, Lance Williams, Kathy Preece, Greg Horrocks

B Charles Todd and Scott Raymond

C Michael Johnston

D Pete Fairbrother

E Juliet McCallum, Jim Pribble, Claudine Wallace, Sue Beattie, John McKenzie, Peter Rogan (seated), John Koehn, Yvonne Anson, Bill O'Connor, Terry Glenane, Ruth Lennie, John Anderson (partly hidden), Don Buckmaster

F Rear: Greg Horrocks, Steve Henry, Martin Schulz, Caroline Lucas (volunteer), Ross Meggs; Front: Geoff Brown, Vince Hurley

G Brenton Zampatti

H Barry Tunbridge

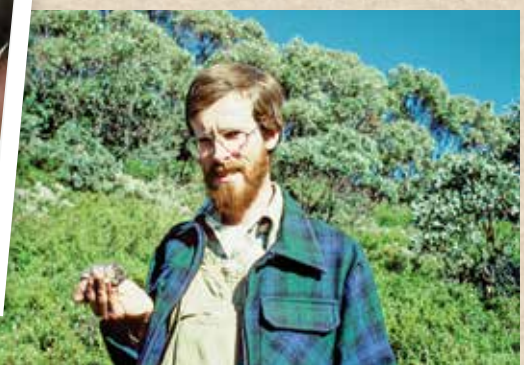
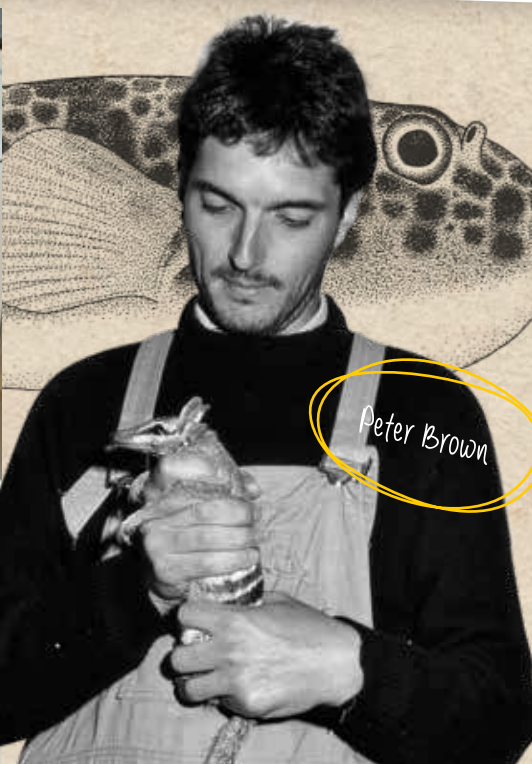
I Tammy Wilson

J Alan Baxter

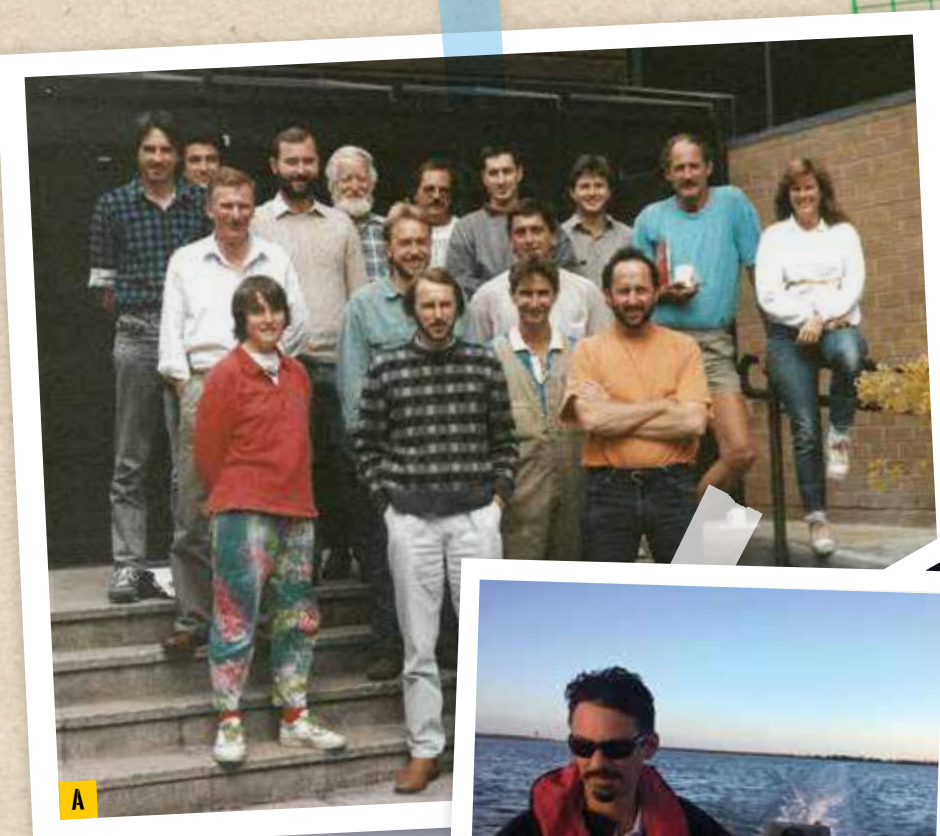
K Staff 2017

Front row (crouching, L to R): Jarod Lyon, Phoebe Macak, Mike Nicol, Nevil Amos, Alan Robley, Andy Pickworth, Zeb Tonkin,

Eddie Buzinskas, Jemma Cripps, Chris Jones, Louise Durkin, Justin O'Mahony, Katie Howard, Quan Chau, Bryan Mole, Canran Liu
Middle row: Andrew Bennett, Ashley Sparrow, Michele Kohout, David Bryant, Corrinne Wong, Steve Platt, Joel Gregorio, Steve Werner, Raditya Santoso, David Dawson, Josephine MacHunter, Peter Fairbrother, Jim Thompson, Bob Richards, Tracey Regan, Katherine Harrison, Luke Collins, Tim O'Brien, Kim Lowe, Frank Amtstaetter (behind fence), Claire Moxham, Annette Muir, Jenny Nelson, Kasey Stamation, Judy Downe, Steve Sinclair, Wayne Koster, David Cameron, Carlo Pacioni (obscured), Graeme Newell, Ben Fanson, Dan Stoessel, Dave Ramsey, Mike Duncan, Fern Hames, Paul Moloney (obscured), John Koehn, unknown, Geoff Sutter, Christine Hall
Back row (on brick fence): Peter Menkhorst, Adrian Kitchingman, Dan Purdey, Luke Woodford, Arn Tolsma, Jason Lieschke



A Staff 1995
Front row (L to R): Bill Humphry, Tim Doeg, Suzy Duncan, Bill O'Connor, Felicity Nicholls, Fiona Cross, Martin O'Brien, Michelle Arundel, Lucille Turner, Kevin Porter, Kate Blood, Anna Murphy, Jenny Nelson (crouching), Gill Earl, John Seebeck, Natasha Schedvin (crouching), Lindy Lumsden, Sue Berwick, David Rankin, Joy Sands (crouching), Jerry Alexander (crouching), Ruth Lennie
Back row (on brick fence, L to R): Jill Smith, Malcolm Macfarlane, Keely Ough, Phil Wierzbowski, David Meagher, Steve Saddler, Petina Pert, Tim O'Brien, Dave Hesper, Peter Menkhorst
B Paul Moloney
C Ron Brown
D Arn Tolsma and George Naidos
E Vivienne Turner and Heidi Zimmer
F Ashley Sparrow
G Ride to Work day:
Back row (L to R) Luke Woodford, Frank Amtstaetter, Nevil Amos, Dan Purdey, Phoebe Macak
Front row: Josephine Machunter, Phil Papas
H Rowena Myers, Bernice Dowling, Cathy Rich
I Peter Menkhorst Ken Norris Bill Bren Sandy Gilmore Wildlife Survey team 1977 Wilsons Promontory
J Sze Flett and Lilian Spencer
K Jack Rhodes, Joe Gresik, Peter Christie
L Eddie Buzinskas
M Christine Lever
N Martin O'Brien



A



B



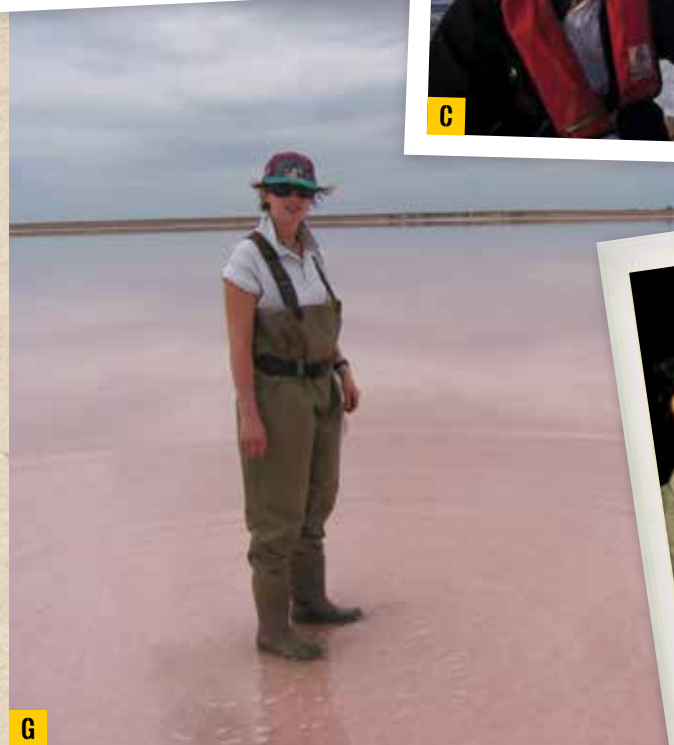
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Phil Du Guesclin & Andrew Bennett 1993



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M

- A Rear** (L to R): John Koehn, Patrick O'Leary, John Garnham, Des Harrington, Tim Doeg, Tim O'Brien, Steve Saddler, John McKenzie, Ruth Lennie;
- Middle:** Alistair Brown, Tarmo Raadik, Justin O'Connor
- Front:** Julia Reed, Terry Glenane, Damien O'Mahony, Bill O'Connor

- G** Belinda Cant
- H** Rod Gowans
- I** Randall Robinson
- J** Ryan Chick and Spot-tailed Quoll
- K** Rob Hale
- L** Jemma Cripps
- M** Kerry Carr and Marg Allen
- N** Sid Cowling and Andrew Corrick
- O** Luke Woodford, Louise Durkin, Michele Kohout
- P** Barb Baxter
- Q** Zilli Abedi



P



Q





A



B



C



D



Andy Geschke



John Douglas



E



F



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L

A Graeme Hackett
B Bill Sherwin
C Andrew Pickworth and Katie Howard
D Tim Doeg, Bill O'Connor, Steffan Krasna
E Staff 2012
Front row (L to R): Dave Bryant, Matt Bruce, Claire Moxham, Bhumika Dave, Joanne Kerns, Judy Downe, Renae Ayres, David Cameron, Terry Glenane, Kaye Morris, Jenny Nelson, Ed McNabb, Kim Lowe, Vivienne Turner, Josephine MacHunter, Mike Nicol, Justin O'Connor
Middle row: Lauren Johnson, Charles Todd, Scott Raymond, Michael Johnston, Phoebe Macac, Matt Allen, Annette Muir, Graeme Newell, Lilian Spencer, Geoff Sutter, Dave Ramsey, Nick Clemann, Richard Loyn, Andrew Blackett, Arn Tolsma, Geoff Brown, Sally Kenny,

Paul Moloney, Alan Robley, Jarod Lyon, Graeme Hackett, John McKenzie, Peter Fairbrother
Back row (on fence): Jason Lieschke, Dean Hartwell, Katie Howard, Leah Beesley, Adrian Kitchingman, Zeb Tonkin, Justin O'Mahony, Ruth Lennie, Tim O'Brien, George Naidos
F Chris Jones and Ben Fanson
G Katherine Harrison
H Nevil Amos
I Justin O'Mahony, Pete Fairbrother, Terry Glenane, Justin O'Connor, Charles Todd, (obscured), Ben Kefford, Phil Papas, Mike Nicol, Louise Grgat, Belinda Cant, Di Crowther
J Mick Haley, Robert Begg, Malcolm Macfarlane
K Lachlan Francis
L Sir Arthur Rylah (left) and others



Steve Werner George Naidos Joel Gregorio mad hat day



A



B



C



D



G



E



H



F



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J



K



Bob Warneke



L



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R



O

A Richard Hill and Jane Wilson
B Jed Macdonald
C Dave Forsyth
D Claudine Wallace
E Dave Duncan
F Steve Henry and Graeme Gillespie
G Fred Baum, Bob Warneke and Kevin Chipperfield on Seal Rocks
H Jim Thomson
I DELWP Science Awards 2014 (L to R): Adam Fennessy (DELWP Secretary), Steve Smith, Lindy Lumsden, Jenny Nelson, Jarod Lyon, Fern Hames, Joanne Sharley, Kim Lowe

J Stu Vallis
K Elisa Unson and Chris Margellis
L Kay Morris, Khorloo Batpurev, Louise Durkin
M Peter Menkhorst, Lindy Lumsden, James Todd (DELWP, Biodiversity Exec. Dir.)
N Original Kaiela (Shepparton) Carp crew: Sandy Morison, David McNamara, Sue Ferguson, Peter Towers, Andrea Brumley (Fletcher), Dick Brumley
O Geoff Brown and Sugar Glider
P Jeff Yugovic
Q David Meagher
R Christine Letts, Dorothy Muscat, Joy Sands, Carol Harris

123



A



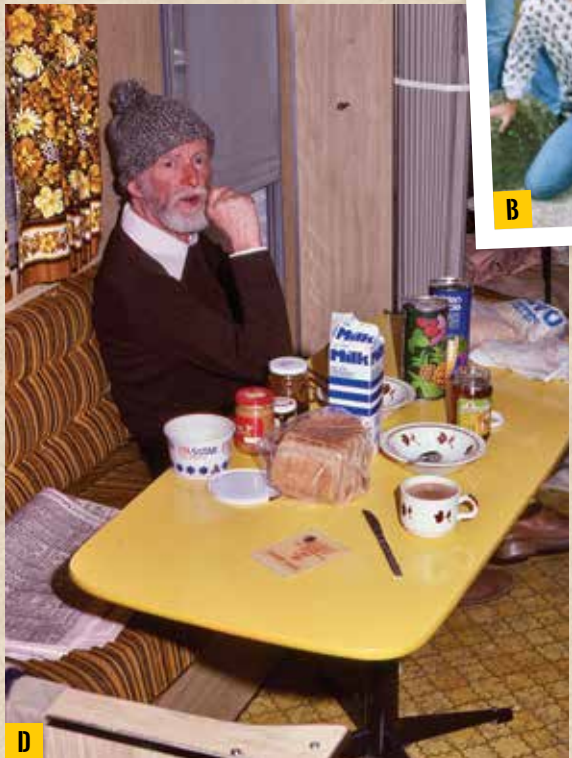
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C



F



D



E



Garth Newman

G



H



I



Maurice Bary



J



K



L



M

- A John Morrongiello
- B Geoff Brown, Malcolm Macfarlane, Dave Scotts, Rhys Griffiths, Ross Meggs, Greg Horrocks, Steve Henry
- C Jenny Nelson, Felicity Nicholls, Mary Servinis
- D Fred Baum
- E Leadbeater's Possum project: David Lindenmayer and Bob Lacy (Brookfield Zoo)
- F Ian Norman
- G David Cheal

- H Michael Scroggie
- I Maria Franco
- J Jan Shaw
- K Michele Kohout, Mike Duncan, Claire Moxham, Sally Kenny
- L Aquatic staff (L to R): Paul Close, Di Crowther, Ruth Lennie, Colin Hughes, obscured, Trish Paradise, Shanaugh McKay, Patrick Driver, Phil Papas, Pam Clunie
- M Long-footed Potoroo project (1989): Michael Saxon, Liz Dovey (NSW NPWS), Charlie Pascoe

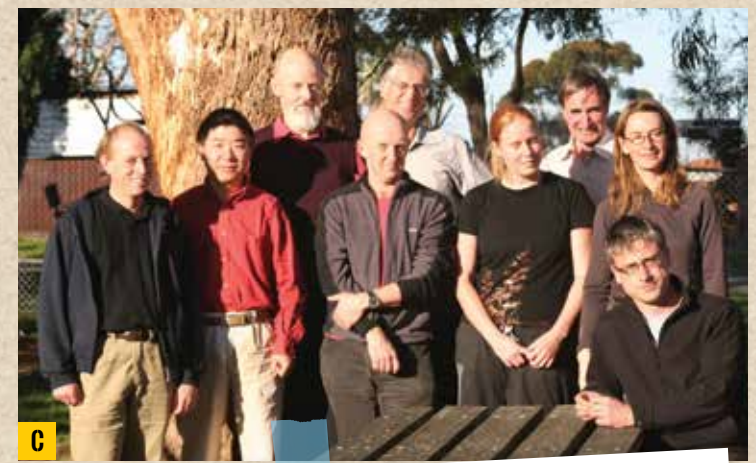




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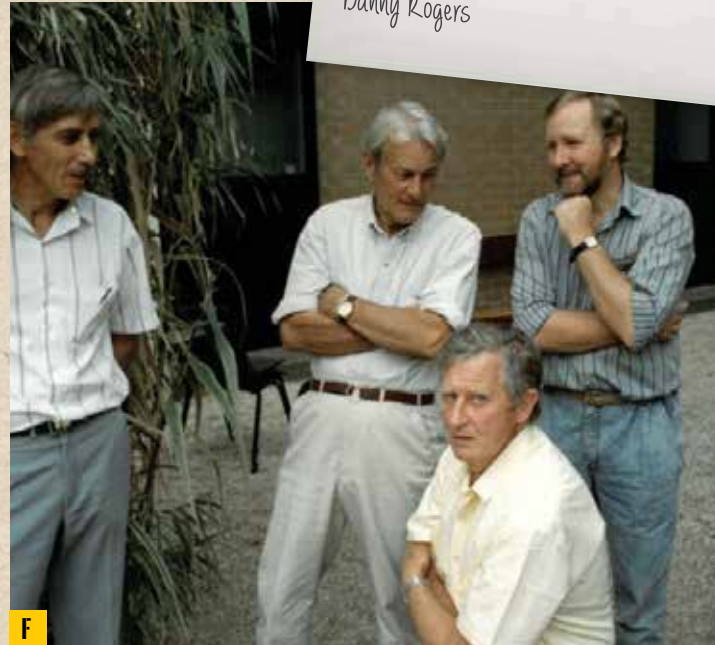
D



Danny Rogers



E



F



G



H



George Grossek

A ARI 40th anniversary (L to R): Bill O'Connor, Mark Collins, Malcolm Macfarlane, John McKenzie, Peter Menkhorst, Dave Hespe

B Bryan Mole

C Danny Rogers, Canran Liu, Ed McNabb, Graeme Newell, Peter Menkhorst, Birgita Hansen, Richard Loyn, Josephine Machunter, Matt White

D Brad Dale

E Tracey Regan, Jim Thomson, Claire Moxham

F Geoff Gooley, Derek Falconer, Phil Cadwallader, Len Ashburner

G Freshwater Fisheries Management Branch (early 1980s). Back Row: Richard Gazior, John Beumer (hidden), Geoff Gooley, Alan Baxter, John Koehn, Len Ashburner, John Turner, Peter Rogan, Colin Sinclair

Front Row: Andrea Brumley (Fletcher), Bill Johnson, Peter Jackson, Doug Hume, Phil Cadwallader, Sandy Morison, John Urquhart, Jim Pribble (far right)

H Bill O'Connor, Peter Jackson, John Alderson, Bill Bren

I Bruce McBeath

J Greg Sharpe, Sandy Morison, Dave McNamara, Tony Meakes

K Michael Lindeman

L Simon Nicol



I



J



K



L



Charmian Ahern

Leigh Ahern

Ian Temby



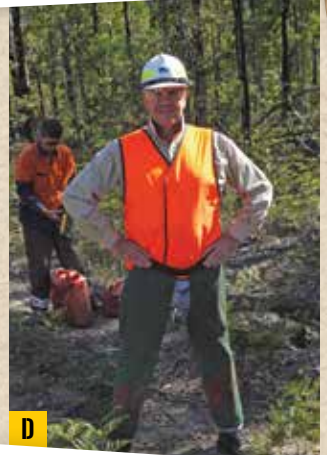
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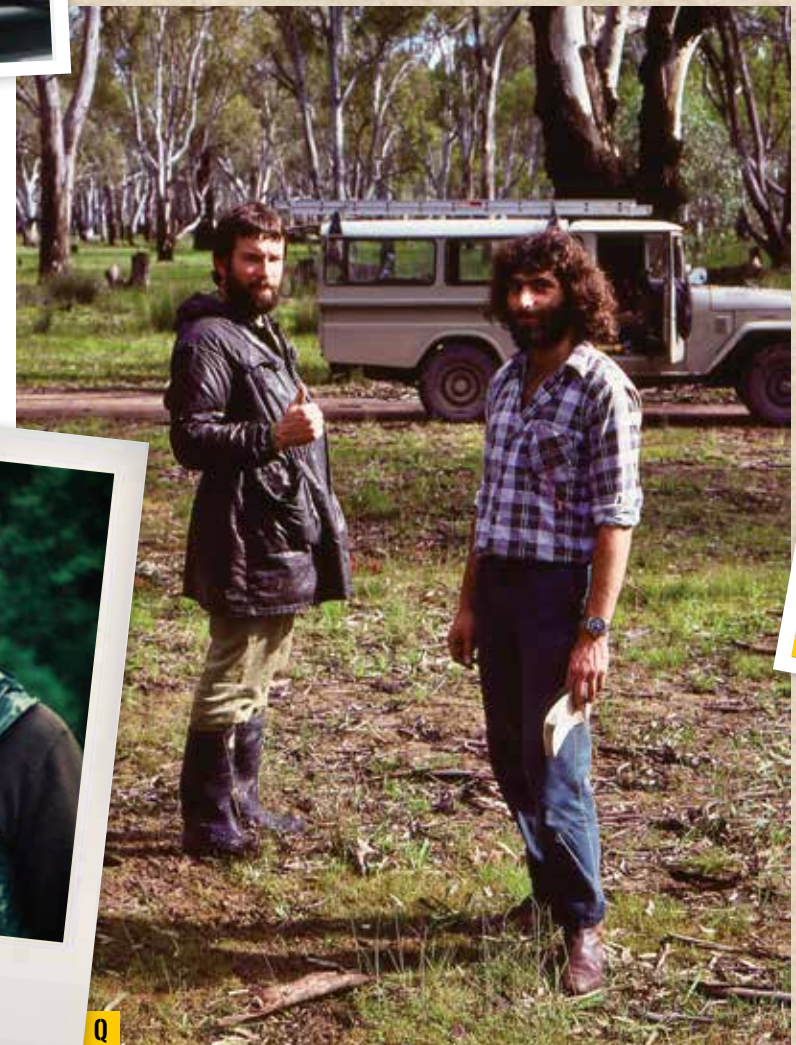
N



O



P



Q



Bill O'Connor and John McKenzie

- A** Administration staff 2018 (L to R): Quan Chan, George Naidos, Steve Werner, Joel Gregorio
- B** Annette Muir, Tim O'Brien, Dan Purdey, Eddie Buzinskas
- C** Tom Ryan
- D** Arn Tolsma
- E** Terry Glenane and Bill O'Connor
- F** Con Makroyiannis
- G** George Canale
- H** Jian Yen
- I** Peter Robertson
- J** Claudine Wallace and Ray Brereton
- K** Steve Craig
- L** Michelle Drew
- M** David Baker-Gabb
- N** Michelle Tumino
- O** Peter Rogan
- P** Darwin Evans
- Q** Brian Weavers and Jerry Alexander
- R** Jane Marcuis
- S** David Choquenot, Geoff Brown and Nick Clemann



R



S



Kirstin Long



A



B



C



D



E



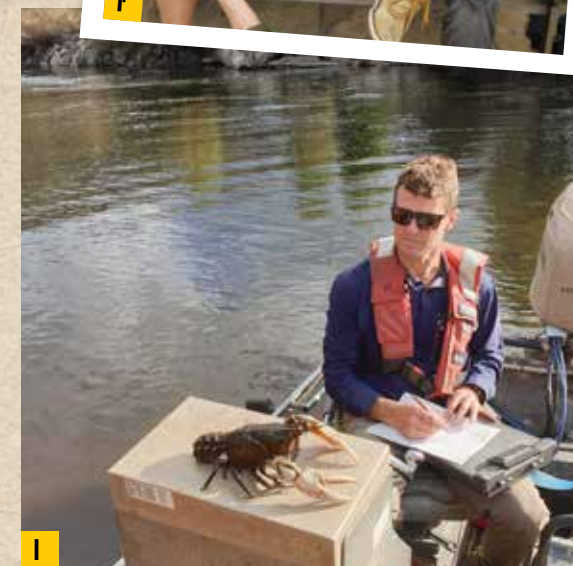
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Belicity Nicholls, Geraldine Richards, Petina Pert



K



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O



P

- A** Natasha Schedvin
- B** Katie Howard and Leah Beesley
- C** Paul Tinkler
- D** Jason Lieschke and Lauren Johnson
- E** Mandy Doyle
- F** Jim Thomson and Matt White
- G** Nevil Amos, Matt Bruce, Brad Farmilo, Billy Geary, Tim O'Brien, Steve Sinclair
- H** Judy Downe
- I** Zeb Tonkin
- J** David Cameron and Adrian Moorrees

- K** James Shelley, Jenny Nelson, Sally Kenny, Jemma Cripps, Lyndsey Vivian, Chris Jones, Brad Farmilo, Louise Durkin, Gabriel Cornell, Annique Harris, Andy Geschke, Luke Collins, Khorloo Batpurev
- L** Cengiz Altinors
- M** Ian Kuhne, Margie Knorr, Barry Tunbridge, Leigh Ahern
- N** Carol Harris and Jarod Lyon
- O** John Koehn, Matt Jones, John Mahoney, Ivor Stuart, John McKenzie, Tim O'Brien, Justin O'Mahony
- P** Matt Bruce



A



B



H



I

- A** Changhou Jin, Michele Kohout, Keely Ough, Mike Smith
- B** Jill Smith, Ross Meggs, Keith Cherry, Jenny Nelson
- C** Andrew Gormley
- D** Mike Nicol
- E** Sue Berwick, Ruth Lennie, Mark Seddon, John Silins, Max Kitchell, Fiona Cross, Victor Hurley
- F** Mick Haley, Selina Peters, Judy Firman, Ruth Lennie, Kae Winch
- G** Geoff Sutter
- H** Janet Holmes, Andrew Corrick, Alicia Lucas
- I** Charlie Silveira and Steve Platt
- J** Peter Robertson, Alan Webster, Vanessa Craigie
- K** Jim Crosthwaite
- L** Micaela Main
- M** Peter Christie and Jim Bacher
- N Rear:** Tim Doeg, Pat O'Leary, Bill O'Connor, John Koehn
- Front:** Steve Saddler, Justin O'Connor, Damien O'Mahony, John McKenzie, Tarmo Raadik



C



D



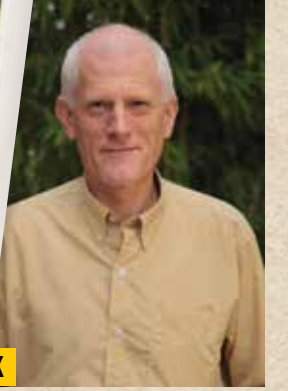
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Dave Bryant, Fiona Warry, Paul Reich



K



L



F



Dave Bryant



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M



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“ I know of no pleasure deeper than that which comes from contemplating the natural world and trying to understand it. ”

David Attenborough





**Arthur
Rylah
Institute**
for environmental
research

