

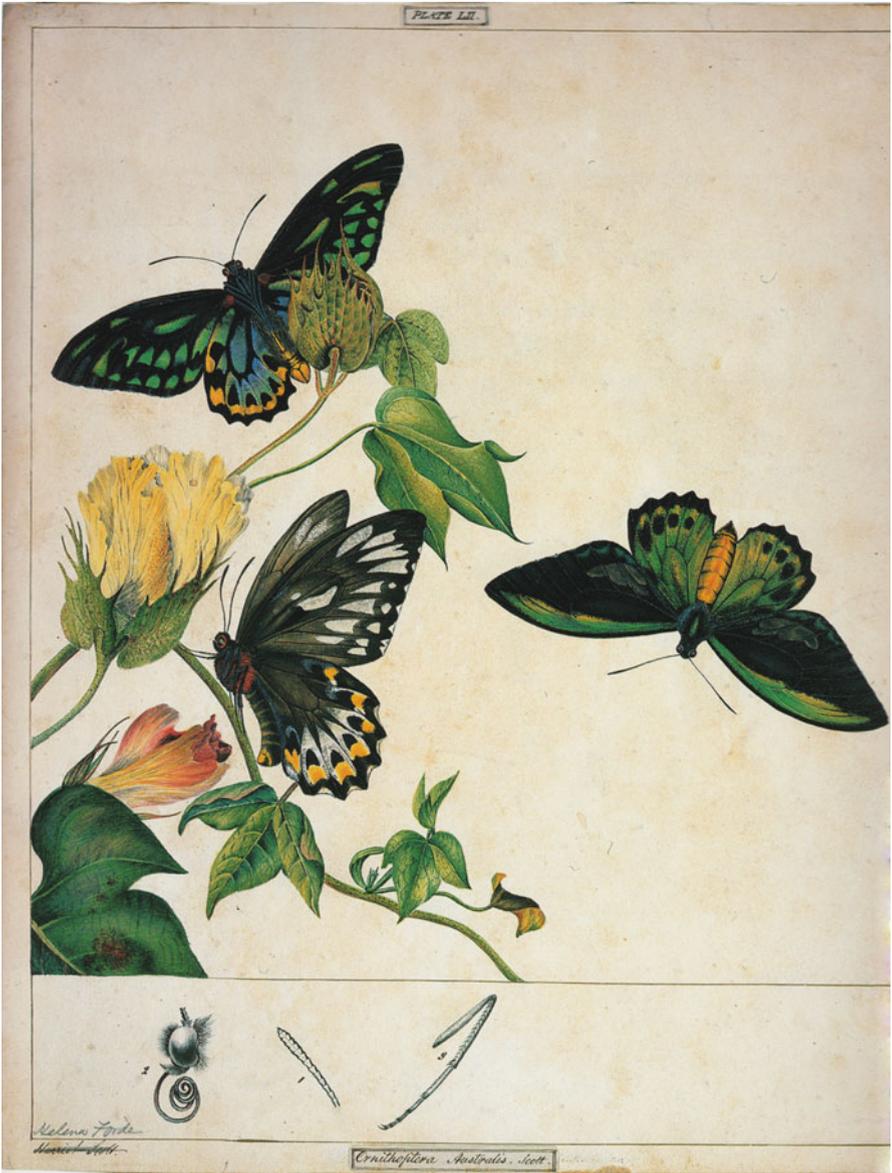
Donald P.A. Sands · Tim R. New

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# Conservation of the Richmond Birdwing Butterfly in Australia

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(see Fig. 1.10)

Donald P.A. Sands • Tim R. New

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Donald P.A. Sands  
Ecosystem Sciences  
CSIRO, Brisbane  
Australia

Tim R. New  
Department of Zoology  
La Trobe University  
Melbourne  
Victoria, Australia

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# Preface

Members of the butterfly family Papilionidae, the swallowtails and their allies, are amongst the most generally admired and popular of all insects – rivalled, perhaps, only by some of the larger beetles as foci for collection and as important flagships for conservation advocacy and garnering public approval of invertebrates. Amongst these, the colourful and spectacular ‘birdwings’, the largest of all butterflies, are the most charismatic and have gained a unique reputation amongst naturalists since their discoveries from the nineteenth century. Reflecting their rarity and restriction to remote and difficult-to-access parts of the Indo-Australian tropics and subtropics, several birdwing species became objects of wonder, as well as of desire, and also commercially rewarding – so that supply of cabinet specimens of rare species to wealthy collectors, mostly in Europe, was a popular and lucrative activity for explorers, aided by the perceived ‘romanticism’ of the butterflies and their largely unknown tropical forest and montane environments. However, many of these butterflies, depending on the resources furnished within primary tropical forests, have become increasingly vulnerable as those forests have been cleared or otherwise changed, and are now of serious conservation concern. Conservation of birdwings must occur largely in regions in which resident entomologists and conservation biologists are few, political and social sensitivities may be acute, and in which such activities necessarily have low priority in relation to solving the needs of human welfare.

These scenarios differ fundamentally from the more familiar contexts for butterfly conservation in temperate regions, areas peopled by those both sympathetic to conserving insects and having the resources and drives to do so, under conditions that can be coordinated, monitored and publicised effectively. Conservation measures must draw on biological knowledge and understanding, but progress also depends heavily on the goodwill and support of local people.

Approaches to conserving poorly known and rare taxa in remote areas contrast markedly with many of the more familiar site-specific conservation exercises for relatively well-understood butterflies in accessible temperate regions. Simply gaining the foundation information for action and the capability to pursue the aims of any conservation management plan are formidable obstacles. Understandably, adding further to difficulty, conservation of strongly flying birdwings – their popular

name reflecting both appearance and activity – has tended towards the landscape scale rather than focusing on small sites. It has emphasised the need for security of the parental forest environments on which the butterflies depend, through formal protection and sympathetic management to prevent their destruction.

These themes are discussed further in this book, in which we summarise and describe the continuing conservation programme developed for an unusual birdwing, the Australian endemic *Ornithoptera richmondia* (Gray), the Richmond birdwing butterfly, that has undergone substantial decline due to habitat loss and resource alienation but for which coordinated and persistent effort has done much to redress these impacts. The project has been pioneering in many ways and has an important place in the development of insect conservation in Australia; it also provides information of considerable value for related species. The enduring commitment and support of people over the entire historical range of the butterfly has been (and remains) pivotal to progress.

More broadly, butterfly conservation in Australia has advanced considerably in recent decades, and a national Action Plan for Australia's Butterflies (Sands and New 2002) remains the only such compilation for any invertebrate group. In that document, we reviewed the conservation status and needs of all Australian species and subspecies and included individual dossiers on all taxa then of possible concern. Many of these taxa were then poorly known. The bulk of subsequent activity has emphasised ecologically specialised butterflies with restricted ranges and which are perceived as threatened in the south-east of the continent (New 2011c). The long-running conservation campaigns for the Eltham copper (*Paralucia pyrodiscus lucida* Crosby) and Bathurst copper (*P. spinifera* Edwards and Common) (Lycaenidae) are the only long-term parallels in Australia to that for *O. richmondia*. Each focuses on a notable regional flagship taxon, for which public support and local pride have been garnered and sustained, and for which a strong sense of 'community ownership' remains of key importance. However, the contrast between focusing on the tiny isolated urban remnant sites – such as those on which the Eltham copper persists near Melbourne – and on entire landscapes is immense. Together these examples span the range of scale of species-orientated conservation exercises and of constituent and political influences that can occur.

One purpose of this book is to document how such problems of scale can be addressed in attempting to study and conserve a wide-ranging flagship taxon, and how interest in doing so has been encouraged over more than two decades. It is also the first such account for any birdwing butterfly in Australia. The only related programme is the very different scenario for Queen Alexandra's Birdwing, *Ornithoptera alexandrae* Rothschild, noted in the introductory chapter. Interest in that magnificent insect continues, and unlike the remote areas of Papua New Guinea where this birdwing is endemic, *O. richmondia* occurs within an Australian region in which conservation sensitivities are well understood and where tangible support is available (although in a politically complex context, in which individual priorities are very varied), and the lessons learned have far wider relevance. Any such exercise becomes one of continuing compromise. To quote from New et al. (1995), referring to New Guinea birdwings, 'practical involvement of local communities is an integral

facet of conservation management for these “rare butterflies” and *O. richmondia* in Australia represents a similar strategy in a more developed country’. That story is the core of this book.

Following a general introduction to the birdwing butterflies and their conservation needs, the history of interest in the Richmond birdwing is reviewed and its biology and decline summarised. The critical importance of larval food plant resources and their propagation and use for habitat extension and rehabilitation are discussed, together with the ecology and composition of biotopes within which these vines occur. The development of conservation interest and the progressive involvement of community groups, culminating in a dedicated volunteer network, are the major themes of the second half of the book. We attempt to display how biological knowledge, public goodwill and political support have been integrated towards this common endeavour, and to discuss the complex issues and conflicts that have arisen. Implicit in the entire project has been a variety of community efforts, through which well-coordinated activities and effective communication and education have helped to assure the future of one of Australia’s most charismatic endemic butterflies. The lessons contribute widely to more general progress of butterfly conservation.

Brisbane  
Melbourne

Donald P.A. Sands  
Tim R. New



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Sands' initial interest was supported as part of his professional duties at CSIRO, where the then Chief Executive (the late Malcolm Macintosh) and the successive Chiefs of the Division of Entomology (most recently Deputy Chief, Dr. Gary Fitt) fully recognised this role. Concerns were raised by, and opinions and advice received from, the most leading lepidopterists in the region who also responded generously to our queries over the years; many are acknowledged by name in the text, but others include A.N. Burns, I.F.B. Common, M. DeBaar, E.D. Edwards, A. & K. Hiller, M. Horak, J.F.R. Kerr, R.L. Kitching, J. Macqueen, R. Mayo, J. Nielsen, A.G. Orr and G. Sankowsky. Likewise, botanical and ecological advice throughout the project came from leading botanists and ecologists, amongst them P. Grimshaw (whose enduring interest spans the entire life of this campaign), G. Gymer, W. McDonald, E.M. Ross, J.G. Tracey and L.J. Webb.

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# Contents

<b>1 Birdwing Butterflies and Their Conservation Needs</b> .....	1
1.1 Introduction.....	1
1.2 The Birdwing Butterflies .....	3
1.3 Birdwing Relationships and Distribution .....	6
1.4 Australian Birdwings and Their Identities.....	8
1.5 Conservation Concerns .....	18
1.5.1 <i>Ornithoptera alexandrae</i> .....	22
1.5.2 <i>Troides aeacus</i> .....	23
1.5.3 Other Non-Australian Birdwings.....	24
1.6 Conservation of Australian Birdwings .....	25
<b>2 The Richmond Birdwing Butterfly</b> .....	29
2.1 The Richmond Birdwing: Distribution and Decline.....	29
2.2 Biology .....	33
2.2.1 Effects of Plant Nutrients on Larval Development and Adults.....	35
2.3 Times of Appearance, Dispersal, Population Changes and Migration of Adults.....	37
2.3.1 Lowland and Coastal Localities.....	38
2.3.2 Lower Slopes and Mountains .....	39
2.3.3 Migrations.....	39
2.4 Life History, Recognition of Early Stages.....	40
2.4.1 Natural Enemies.....	45
2.5 Introduction to Concerns and Detection of Threats.....	45
2.6 History of the Richmond Birdwing Conservation Project.....	48
<b>3 The Food Plants of the Richmond Birdwing</b> .....	49
3.1 Introduction: Historical and Biological Background.....	49
3.2 Taxonomy and Ecology of the Food Plant Vines.....	52
3.3 Biology of the Vines: Pollinators, Seed and Capsule Development .....	54

- 3.4 Identities of the Subtropical *Aristolochia* and *Pararistolochia* Vines..... 57
  - 3.4.1 The Lowland ‘Birdwing Butterfly Vine’: *P. praevenosa* (F. Muell.) Michael J. Parsons ..... 57
  - 3.4.2 The ‘Mountain *Aristolochia*’, *Pararistolochia laheyana* (F. M. Bailey) Michael J. Parsons ..... 61
  - 3.4.3 Other Food Plants for the Richmond Birdwing Butterfly ..... 63
- 3.5 The ‘Stepping Stone’ Hypothesis ..... 65
- 3.6 Recording the Distribution of *Pararistolochia praevenosa* and *P. laheyana* ..... 68
- 3.7 Distinguishing the ‘Look-Alike’ Vines from *Pararistolochia* spp..... 69
- 3.8 Food Plants: Central Importance in Conservation Planning ..... 71
- 3.9 Propagation and Cultivation of the Food Plants ..... 75
- 4 The Natural Habitats and Resources for the Richmond Birdwing..... 77**
  - 4.1 Introduction: Ecosystems Supporting the Richmond Birdwing and Its Food Plants..... 77
  - 4.2 The Bioregions and Limited Distribution of Vines..... 79
    - 4.2.1 Flowers as Nectar Sources for Adult Birdwings ..... 83
  - 4.3 Subtropical Plant Communities Associated with *P. praevenosa* in New South Wales and Queensland ..... 86
  - 4.4 Possible Impacts from Climate Change..... 86
  - 4.5 Locating Habitats with the Birdwing Food Plants and Protecting Their Tenure: What Is Now Needed? ..... 88
  - 4.6 Needs for Remnant Habitat Conservation ..... 89
  - 4.7 Restoring Bushland Habitats on Private and Public Land ..... 90
  - 4.8 Cultivation and Distribution of the Birdwing Butterfly Food Plants: A Core Recovery Activity ..... 95
  - 4.9 Other *Aristolochia* Species as Possible Food Plants for the Richmond Birdwing ..... 98
- 5 Conservation Needs and Early Concerns ..... 99**
  - 5.1 Summarising the Scenario: An Initial Perspective ..... 99
  - 5.2 Threats ..... 100
    - 5.2.1 History of Rainforest Destruction..... 101
    - 5.2.2 Prolonged Drought and Floods ..... 103
    - 5.2.3 Corridor Fragmentation ..... 104
    - 5.2.4 Natural Mortality ..... 105
    - 5.2.5 Collecting Specimens ..... 105
    - 5.2.6 Invasive Woody Weeds and Grasses..... 106
    - 5.2.7 The Dutchman’s Pipe Vine and Other Weed Vines ..... 108
    - 5.2.8 Altered Fire Regimes ..... 110
    - 5.2.9 Inbreeding Depression ..... 111
  - 5.3 The Draft Recovery Plan (1996)..... 112

- 6 Foundation of the Programme: Engaging the Community** ..... 115
  - 6.1 Perspective ..... 115
  - 6.2 Education Programmes: School Involvement and Publicity..... 116
    - 6.2.1 Cultivation of Food Plants in School Grounds ..... 117
    - 6.2.2 Recognising the Poisonous Dutchman’s Pipe Vine ..... 118
    - 6.2.3 Seed Germination and Propagation  
of the Birdwing Butterfly Vine ..... 119
    - 6.2.4 Leaf Toughness and Survival of Larvae..... 119
    - 6.2.5 The Richmond Birdwing ‘Adopt-a-Caterpillar’ Scheme..... 121
  - 6.3 The Birdwing Propagation House ..... 122
  - 6.4 Increasing Awareness..... 122
  - 6.5 The Environmental Caretaker Network for the  
Richmond Birdwing Butterfly (1999–2000)..... 124
  - 6.6 Overseas Collaboration..... 125
  - 6.7 The Roles of Government Agencies and Local  
Community Groups ..... 125
    - 6.7.1 Working with Conservation Agencies: Legislation  
and Its Effects on the Programme..... 126
    - 6.7.2 Permits for Propagating Protected Food Plants ..... 127
  - 6.8 Development of Wider Community and Agency Interests ..... 128
- 7 Expanding the Programme. The Development of Community  
Networks: Their Achievements  
and Roles in Conservation and Recovery** ..... 129
  - 7.1 The Richmond Birdwing Networks..... 129
    - 7.1.1 Network Meetings, Workshops, Displays,  
Publications and Database ..... 131
    - 7.1.2 Developing the RBRN Database ..... 133
    - 7.1.3 Recording ‘Wild’ and Planted Vines ..... 134
    - 7.1.4 Activities and Influences: Sustaining Interest  
and Effective Coordination ..... 134
    - 7.1.5 Publicity and Sponsorship ..... 134
  - 7.2 Richmond Birdwing Conservation Network ..... 137
    - 7.2.1 Birdwing Network Newsletters and Related Activities ..... 137
- 8 Habitat Restoration and Outcomes**..... 141
  - 8.1 Planning Habitat Restoration..... 141
  - 8.2 Reducing the Detrimental Attraction of Dutchman’s Pipe Vine ..... 143
  - 8.3 Priority Sites ..... 144
  - 8.4 Outcomes of Flagship Sites and Corridors ..... 145
  - 8.5 Monitoring and Recording..... 153
  - 8.6 Internet Website ..... 154
  - 8.7 Addressing Inbreeding Depression and Ex Situ Conservation..... 154
    - 8.7.1 Captive Rearing Facilities..... 155

**9 Revising the Draft Recovery Plan**..... 161

9.1 Introduction..... 161

9.2 Reviewing What Has Been Accomplished..... 162

9.3 Research Needed ..... 165

9.3.1 Monitoring Birdwing Populations  
and Maintaining Permanent Records..... 166

9.3.2 Continuing Propagation of the Food Plant ..... 166

9.3.3 Stations, Links, Corridors and Stepping Stones ..... 167

9.3.4 Core Recovery Sites and Flagship Sites ..... 167

9.3.5 Alternative Food Plants: Addressing Potential Toxicity..... 168

9.3.6 Managing Weeds..... 169

9.3.7 Addressing the Impacts from Climate Change..... 169

9.3.8 Genetic Studies on the Richmond Birdwing ..... 171

9.3.9 Aristolochiaceae: Pollination Studies ..... 172

9.4 Planning for the Future ..... 172

**10 Broadening Perspective** ..... 177

**Appendices**..... 189

Appendix 1: Propagation of *Pararistolochia praevenosa*:  
*Summary of Advice; See Also Sands and Grimshaw (2013)* ..... 189

Propagating *P. praevenosa* from Seeds..... 189

Potting Up Seedlings and Growing the Vines Up Stakes ..... 190

Propagating *P. praevenosa* from Cuttings ..... 190

Potting Struck Cuttings of *P. praevenosa*  
and Growing Up Stakes ..... 191

Planting Vines in the Ground..... 191

Planting *P. praevenosa*..... 192

Watering..... 192

Planting Out Vines to Encourage Healthy Climbing Growth..... 193

Appendix 2: Subtropical Plant Communities and Soil Types  
Associated with *P. praevenosa* in New South Wales  
and Queensland (Northern Tablelands Excluded)..... 194

Appendix 3: Workshop Series, Hosted by the Richmond  
Birdwing Networks..... 196

**References**..... 199

**Index**..... 207

# Chapter 1

## Birdwing Butterflies and Their Conservation Needs

### 1.1 Introduction

Butterflies are undoubtedly the single most popular group of insects, and this status has fostered considerable and widespread sympathies for their conservation in many parts of the world. The foundations of butterfly conservation – indeed of wider invertebrate conservation – have been set amongst studies of butterflies in northern temperate regions, predominantly those of the United Kingdom, parts of western Europe and North America. These foundations have most commonly reflected concerns for individual butterfly species (or subspecies) that are perceived to have declined in distribution and abundance and for which management can be based on reasonably sound biological and distributional information in well-documented faunas. They have led to emulative projects in southern temperate regions, predominantly South Africa and Australia, the latter additionally encompassing the sub-tropical and tropical forest regions that are the major focus of this account. For many individual butterfly species and subspecies in parts of the northern temperate regions, detailed conservation programmes and recovery plans can be based on an understanding of their ecology, distribution, and threats to their welfare, accumulated over many years.

Some butterfly conservation cases are models of how the minutiae of ecological information can be incorporated into practical and successful management, with the success of conservation depending heavily on attention given to ecological detail, as well as community and political support. Most such focal taxa (species or subspecies) have been threatened predominantly by loss of habitat, both in extent and quality, and much remedial effort has necessarily focused on the few small sites on which the threatened taxa have been known to occur. Many of the threatened species and subspecies involved have demonstrably declined to the extent that their distributions have become fragmented and confined to small habitat patches, on which they now occur only as small remnant populations that are increasingly vulnerable to processes such as bush fires, invasions by alien animals and plants, and stochastic loss. Much of the development of butterfly conservation has been driven by

'crisis-management' exercises for taxa that have already suffered substantial loss and, in many instances, have become highly susceptible to inbreeding effects, extirpation or even extinction. Habitat security and restoration of critical resources are recurring themes in butterfly conservation.

Over much of the rest of the world, including the tropics, far higher butterfly species richness and far less biological knowledge go hand-in-hand. Resident lepidopterists are almost invariably fewer in tropical regions than in northern temperate regions. Societal demands, capabilities and priorities are commonly very different, so that 'conservation' is an activity far secondary to meeting human needs. Very few individual butterfly taxa have been the focus of serious conservation efforts, despite the clear needs for these. The most familiar global scenario of butterfly species-level conservation in a region has thus become largely site-based conservation management, with token acknowledgement that the wider landscape provides an enveloping context for this, and thus that landscape-level manipulations may then be critical in countering the consequences of site or population isolation. Although many butterflies are indeed relatively sedentary, not all species are strictly site-bound and the above emphasis on species that are ecologically specialised and those presumed to be poor dispersers, represents only one facet, albeit an important one, of butterfly conservation. For most taxa, the form and dynamics of any metapopulation structure remains unknown and can only be inferred. Other taxa may range widely as strong flyers (and closely related butterflies may differ dramatically in their dispersal ability), and their conservation necessitates a wider perspective on landscapes to reflect major vegetation types and their dispersion. Some are now restricted to remnant corridors or patches, and to habitats that are vulnerable – so that, of greatest relevance here, tropical forests have been extensively cleared in the interests of agricultural, forestry, industrial and urban development. Both site-based and landscape-based conservation measures are needed.

Forest loss has undoubtedly become the major threat to a considerable variety of forest-dwelling animals and plants. Practical consequences include the inevitable transition to site-focus as such formerly extensive biotopes become reduced to discrete fragments remaining as their only representatives. This site focus couples with need to maintain connectivity on a wider scale wherever possible, to facilitate normal dispersive behaviour between those remnant patches. One outcome of habitat fragmentation and loss of connectivity is change of population structure, whereby previously functional metapopulations may be transformed into residual closed populations. Some migratory butterflies have had their dispersive behaviour disrupted by habitat loss. For example, the Brown awl (*Badamia exclamationis* (Fabricius) (Hesperiidae)) in Queensland is believed to have suffered from progressive isolation of populations on small habitat patches (Valentine 2004), so that its characteristic long distance migrations can no longer take place. Declines in abundance, or extirpation, can potentially result through genetic isolation and inbreeding depression in this, and many other species.

Within any habitable area, the critical, and often specific, consumable resources needed are food plants for the larvae and nectar sources for the adult stage. Birdwing larvae feed exclusively on forest vines of the family Aristolochiaceae, and many of

the species of birdwing butterflies only develop on one or two species. These vines usually grow in rainforest where they have suffered heavily from extensive forest clearing. In addition, very few vines remain protected in national parks. The food plant vines used by Australian birdwings often occur on steep slopes and prefer basaltic soils, but grow also on rich alluvial loams bordering rivers and streams. Unfortunately, in many countries where the birdwings occur, the areas with such rich soils were eagerly sought and disturbed in various ways for forest timber plantations, agricultural purposes or oil palm plantations.

## 1.2 The Birdwing Butterflies

The birdwings are one of the paramount groups of flagship insect species, believed to have suffered very severely from extensive forest clearing over many parts of their collective range. They include the largest and most spectacular of all tropical strongly-flying butterflies, as a much-admired group of swallowtail butterflies (Papilionidae). They are restricted to the Indo-Australian region of the Old World tropics and subtropics, with species occurring from northern India and southern China, extending from Indonesia, Malaysia, Philippines, the Solomon Islands (Tennent 2002) and Papua New Guinea to tropical and sub-tropical eastern Australia. Females of Queen Alexandra's birdwing (*Ornithoptera alexandrae* Rothschild) are the largest butterflies known, with wingspans sometimes approaching 30 cm! Within their broader generic ranges, most species are very restricted in distribution.

The birdwing butterflies (now generally appraised as comprising members of three genera, *Ornithoptera* Boisduval, *Troides* Hubner and *Trogonoptera* Rippon) have aroused wonder amongst generations of naturalists since they were first known, and the writings of pioneer collectors (such as Meek 1913) reveal the excitement and emotions accompanying sightings and capture of these remarkable insects. That sense of wonder is summarised well by accounts of early collectors, whose words have been quoted repeatedly to convey the sentiments to more recent readers. Thus, Wallace (1869) recorded his reaction to his discovery and initial capture of the first golden-orange coloured male of *Ornithoptera croesus* Wallace as one of 'intense excitement', as (p. 336) 'On taking it out of my net and opening the glorious wings, my heart began to beat violently, the blood rushed to my head, and I felt much more like fainting than I have done when in apprehension of immediate death. I had a headache for the rest of the day, so great was the excitement produced by what will appear to most people a very inadequate cause'. He went on to describe his endeavours to capture a series of specimens 'obtaining on an average one specimen a day' for a long time, but 'on good days two or three specimens'. Meek's (1913, p. 142) reaction to receiving a captured male of *Ornithoptera chimaera* Rothschild rivals Wallace's sentiments, as 'I felt more pleased than if I had been left a fortune ... A fine discovery of that sort stirs the heart of a collector. He forgets hardships and troubles ...'. Collecting series of such elusive species is hard work, and even viewing

individuals in remote areas is notoriously unreliable. As another famous quotation, Meek (1913, p. 161) again reported that, having encountered a female of *Ornithoptera alexandrae*, ‘...it was not until a year or two afterwards that I obtained a male specimen’. The appeals to collectors based on appearance, size and rarity, and the romanticism associated with exploration and unusual collecting methods, such as shooting high-flying specimens with dust shot (the method used to obtain the type specimens of both *O. alexandrae* and *O. victoriae* Gray), commenced from the earliest years of their discovery, and has persisted.

Parsons (1999) used the term ‘mystique’ to help convey the fascination of the birdwing butterflies for the people of Papua New Guinea, who have traditionally cultured their food plants to attract the butterflies into their gardens (Parsons 1992a; Sands and Scott 2002) and to use them for ornaments (Barrett and Burns 1951). Vividly coloured and often considered the most attractive of all butterflies, birdwings have long been desired by collectors, and specimens have been sought for displays and mounting in cabinets; their financial worth has long been a component of conservation inducement, initially puzzling but later appreciated by local people. Their ‘mystique’ has undoubtedly been fostered by their occurrence in some remote parts of the world (such as parts of Indonesia and Papua New Guinea), that have long been considered exotic and untamed to visitors, so that (other than the most intrepid explorers), many early expatriate collectors seeking specimens had little realistic chance even of seeing the rarer species in the wild, let alone of capturing them. Even the more common birdwings, spectacular to observe when visiting flowers, are equally impressive when seen in flight, and can be difficult to catch. Most have high-flying and colourful males, while the larger females are mostly brown/black and white, and often secretive in behaviour, and well camouflaged while they seek suitable larval food plants in the understorey, on which to lay their eggs. Fewer than 40 species of birdwings are recognised widely, but the precise number is debated continually, as the various local colour forms of species have been regarded subjectively as ‘varieties’, subspecies, or at times full species. The taxonomic identities of several species, status and combinations have often been modified – and will assuredly continue to be debated both objectively and at the more transient whims of collectors and dealers.

The birdwings are a potent group of insects to represent the ‘small animals’ in conservation advocacy, with conservation values fostered by their massive appeal both to experienced naturalists and conservationists and to people encountering them anew – including those whose directives may affect changes in land use (New 2011a, b). The limited distributions of most taxa, accompanied by severe threats to their habitats, and sometimes highly emotive debate over effects of over-collecting and illegal trade to satisfy collector demand, have given them a very high profile in insect conservation issues, as ‘flagship’ species. Not least, birdwings are amongst the relatively few tropical butterflies to gain high prominence in the wider discussions of insect conservation need. In Dennis’ (1997) terms, birdwings have a ‘high conservation load’ fostered by concerns and advocacy from many parts of the world. Somewhat unusually, much of the concern for birdwing conservation has arisen from people who have not seen the butterflies in the wild but nevertheless accept the

importance of conserving them, both for their own sake and as umbrella symbols for the myriad taxa associated with tropical rainforest habitats.

Outside Australia, most concerns for birdwing conservation have been for species on the mainland and islands of New Guinea (western section Papua, previously referred to as West Papua or West Irian [Indonesia]; eastern part, Papua New Guinea) where forestry activities continue to have a massive impact on their habitats. A detailed history of conservation efforts for the Papua New Guinea fauna was summarised by Parsons (1992a), Parsons (1999), drawing on his extensive earlier studies and involvement. Several features are central to constructive conservation concerns for the birdwings, and indicate how practical salvatory measures might be pursued (New 2002), as:

1. The primary habitats for many species, particularly those at higher elevations, are remote and difficult to access. This restricted access is sometimes exacerbated by the sentiments of local people and traditional landowners, who see imposed expatriate interests by visits to traditionally-owned land as interference, or threatening and exploitative to their life styles, whilst also providing landowners with little or no financial return.
2. Threats to birdwings are often unspecified beyond general comments on habitat loss through deforestation and implications of overexploitation for commercial sale of specimens.
3. Information on conservation need and the impetus for conservation management mostly arises from studies by visitors to butterfly habitats, based on relatively short-term field work that is sometimes viewed by local landowners with suspicion – notwithstanding some notable examples of conservation partnerships built on mutual trust.
4. Biological and ecological knowledge of each species is sparse, and butterfly population sizes, fluctuations and structures are extremely difficult to estimate over ranges of tens to hundreds of square kilometres of poorly explored terrain, often with unknown densities of food plants in dense forests where the levels of birdwing mobility are unknown, although inferred to be considerable, and
5. Continued pressures to circumvent well-intentioned regulations that have been instigated to counter possible overexploitation for commercial purposes.

Even the best-documented species of birdwings of conservation concern in Papua New Guinea are difficult to survey and study and, despite wide acknowledgement of needs for conservation, the lack of local priority and within-country logistic support renders local progress difficult. In this book we deal with a major exception to this scenario – the biology and conservation of a birdwing butterfly that has proved accessible to study, and is in serious need of conservation in Australia, and where conservation interests and expertise have been fostered to develop a conservation programme now in operation for more than 20 years. The endemic subtropical Richmond birdwing, *Ornithoptera richmondia* (Gray), has become a cause célèbre in Australian butterfly conservation, and the story of progress toward its conservation has much wider relevance in the development of insect conservation interest in