Chapter 10
Broadening Perspective

The story of the Richmond birdwing conservation project so far contains some very pertinent messages for advancing butterfly conservation. It has been undertaken in a milieu that contrasts markedly with most butterfly species conservation campaigns in Europe or North America, in which a groundswell of interest, goodwill and involvement has been evident for decades, or longer. Under those circumstances public support can commonly be presumed, and garnered easily, in any such initiative, as an invaluable component of the conservation programme. In Britain, for example, concerns for butterfly wellbeing extend from the nineteenth century, with the continuing campaigns for the Large copper (*Lycaena dispar* (Haworth)) and more recently the Large blue (*Maculinea arion* (Linn.)) amongst the leading global efforts for individual taxa and supported by wide community interest and concern throughout their history, leading to effective international cooperations over the European ranges of these taxa. The ongoing efforts to re-introduce *L. dispar* (from European stock of closely related subspecies) to Woodwalton Fen and more recent consideration for extending this effort to the Norfolk Broads (Pullin et al. 1995), and the dramatic success of bringing *M. arion* back to southern England from a Swedish stock (Thomas et al. 2009) have both had wide benefits in advancing appreciation of the subtle biological idiosyncrasies of these taxa, and the care needed to provide for these in the receiving environments. These two projects have also demonstrated that such exercises are not to be regarded as a 'quick fix', but that enduring effort and commitment may be needed over several decades, or more. Those benefits have extended to important widening of awareness to a broad public constituency in which appreciation of natural history has strong traditional foundation, and amongst whom the detailed biological idiosyncrasies of individual ecologically specialised species can also be appreciated and catered.

Likewise, concern for some North American butterflies, such as the, now-extinct, Xerces blue (*Glaucopsyche xerces* (Boisduval)) in the United States (Pyle 2012) and the major campaign to save the El Segundo blue (*Euphilotes battoides allyni* (Shields)) on coastal dunes adjacent to Los Angeles International Airport (Mattoni 1992, for history) has done much to introduce such ecologically specialised

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butterflies to the public, to stimulate their interest and assure their place on wider conservation agendas and legislation. The extensive publicity wrought by some important campaigns with strong political aspects has been effectively coordinated, in recent years increasingly through organisations such as Butterfly Conservation in the United Kingdom (expanded recently to found Butterfly Conservation Europe) and the Xerces Society in North America. With the former, for example, membership is such that it enabled 10,000 people to participate in a single butterfly count in Britain in 2010 (Warren 2012). The interest is complemented by, sometimes controversial, legislation that lists species deemed in need of individual protection as their status becomes parlous. Listing commonly leads to preparation of 'recovery plans' of varying scope and levels of commitment (New 2009; New and Sands 2004), but despite ambiguities over the listing process and its intended outcomes, this step is often a prerequisite for eligibility for government funding or agency support, as over much of Australia.

As in the above examples, most such intensively pursued cases of butterfly conservation have been strongly site-focused, with efforts directed primarily to protecting and restoring small sites occupied by highly localised focal species or subspecies. Whilst landscape issues have indeed been acknowledged for dispersive species – for example the need for nectar supplies during the migratory flights of the Monarch (or Wanderer, *Danaus plexippus* [Linn.]) in North America (Brower 1995; Brower et al. 2012) – almost all butterflies of greatest conservation concern have been those regarded as relatively sedentary, with ranges reflecting narrow range endemism or the outcomes of extensive landscape fragmentation that has left them only on small, often isolated, remnants of formerly more extensive habitat. Some taxa are known from only single sites, so that initial management must be site-focused. In some examples, later efforts have involved translocations from either captive-reared or field stock, to increase numbers of field sites or viability of populations. Increased appreciation of the roles and diversity of metapopulations (flowing largely from the parallel pioneering studies on checkerspot butterflies undertaken in northern Europe and the United States: Ehrlich and Hanski 2004) has also been pivotal in understanding the importance of local extirpations and how to address these in conservation management. In contrast, and despite long awareness of range-wide declines and changes in many species, practical conservation of butterflies that range widely over the landscape has only rarely been addressed in detail – in part reflecting the difficulties of effective coordination and the need, in some, to transcend political or administrative boundaries, rather than focusing on management of bounded, definable and restricted sites. 'Whole of range' conservation for the large and showy Richmond birdwing is very different from 'whole of range' conservation for many small and restricted lycaenids found, for example, on a single site or in a few urban remnant patches. Attempts to restore a species over its entire known historical range, covering several hundred kilometres of latitude, can raise many problems when integrating political variance and landscape ecology with the biology of a species. Yet *O. richmondia* is indeed an ecological specialist, with its consumable resource needs just as constraining and precise as those of many smaller and supposedly more sedentary butterflies. Whilst dispersal capability and ecological specialisation

are frequent predictive correlates for vulnerability and conservation need, this combination of features is relatively unusual.

Ornithoptera richmondia has been important in the development of butterfly conservation awareness and practice in Australia, for several reasons. First, the campaign described here is the largest and most enduring programme undertaken so far in the country for any insect species, and particularly so when being considered as occurring in a landscape scale, rather than confined to small isolated habitats, as above. Second, it has focused on an incontrovertible flagship species, long impressive and of interest, and for which widespread public sympathy has been apparent throughout the period of conservation concern, so that its plight has received sympathetic attention from many quarters. It is a member of what is arguably the most charismatic family of insects, attracting wide international interest and having regional relevance well beyond a strictly Australian focus. Third, linked strongly with this, practical community interest has been fostered and sustained throughout the project, contributing to welcome publicity and advocacy, to successes based on increasing biological understanding and to defined inspection procedures accepted and understood by the participants.

It is important to note that such high community involvement for butterfly conservation, whilst relatively commonplace in parts of the northern temperate regions, is not so in Australia and generating that support has itself been a pioneering exercise. The programme has provided lessons of much wider relevance both in butterfly conservation and in the wider context of an umbrella role for threatened subtropical forests that support numerous endemic and characteristic fauna and flora. The Project also transcends state boundaries, with Queensland and New South Wales legislations influencing processes, and so also the outcomes of conservation activities, with potential for fragmentation of effort unless these are coordinated effectively.

Public support for butterfly conservation in Australia must be applied and nurtured carefully. There is no societal equivalent in Australia to the North American and European organizations noted above, each having thousands of dedicated members, and the number of lepidopterists in Australia, whether professional or hobbyist, is small. Several States have a regional Entomological Society, or interested Landcare or natural history groups, that have been important in fostering awareness of biodiversity conservation, but much of the support for any individual species has come from local ‘friends groups’ or some functional equivalent of local concern, in many cases initiated and sustained through the zeal of individual proponents. For any wide-ranging species, the network of individuals or affected constituents is likely to be far greater than those concerned with a single small site, although the latter may have strong local support in dealing with a tangible context that can increase chances of support for local administrative attention and funding. It is pertinent also to note that the extent of government agency expertise and especially financial support for invertebrate conservation, is very low in Australia, so that much of the practical work involved, as well as major impetus for actions, is community driven rather than agency dictated and continues to rely heavily on community support.

Prominent flagship taxa have the potential to enlist and stimulate support from all levels of society – so that education and publicity on species such as *O. richmondia* conveys strong public messages. The values of this programme thereby extend to a broad increase in awareness of butterflies and other invertebrates and needs for their conservation. In conserving the Richmond birdwing, many participants have come face-to-face with the problems of butterfly conservation for the first time, with many young people introduced to insect biology, taxonomy and conservation through school participation and the regional integration and dissemination of information and advice. In this regard 'flagship' or 'icon' species are an important theme in invertebrate conservation. The vast array of species that may need conservation in some way cannot all be treated individually with the very limited resources and expertise available. Selection of the major focal species for conservation should ideally take this into consideration in anticipating the widest possible benefits, and with realisation that any form of triage that leads to selection of one (or some) species for attention may be effectively depriving others of support and, possibly, increasing risk of their demise. Whereas such selection is often subjective, based on individual appeal of the species or zeal of the proponents, more objective assessment against agreed criteria of risk may be important. This dilemma is central to suggestions that the 'species level' of insect conservation should increasingly be replaced by ecosystem, wider 'community' or 'habitat' focus, whereby numerous resident species might benefit from the equivalent endeavours. However, to many people 'species' provide a meaningful level for conservation attention, by focusing on an identified taxon: a particular butterfly or beetle (or mammal or bird) is a tangible and understandable entity, whereas 'a rainforest' or 'an alpine grassland' is more difficult to understand in such circumscribed terms. People relate more easily to species – in particular, spectacular, unusual or otherwise notable species can promote wide sympathy and interest and become important in conservation advocacy well beyond their immediate individual fate. In such cases, species level focus can often be seen to have wider benefits in conserving complex habitats, so that 'a rainforest' is indeed seen as a tangible critical resource for less heralded biodiversity and publicised as such within a species' conservation programme. In such instances, as for the Richmond birdwing, the individual appeal and recognition of vulnerability according it flagship status also confers these wider 'umbrella' values.

Flagship butterfly taxa in Australia, as commonly elsewhere, are associated strongly with local pride, and a sense of local community 'ownership'. It is no accident that many such species have received patronymic common names aiding this local proprietorship. In Victoria, the Eltham copper (*Paralucia pyrodiscus lucida* Crosby) and the Altona skipper (*Hesperilla flavescens flavescens* Waterhouse) are both named for the outer suburbs of Melbourne where they have received most conservation attention; in New South Wales, *Paralucia spinifera* Edwards and Common, is known as the Bathurst copper or the Lithgow copper, after the two major towns within its circumscribed range. These, and others, tend to be geographically much more restricted than the wide-ranging *O. richmondia* and most are considered poor dispersers. Their conservation requirements have strong site-focus, with the habitats presumed to be remnants of a formerly wider extent of habitats but

now clearly within the governance of one or more towns or suburbs, as above. The species involved are almost all members of diverse endemic radiations, mostly within Lycaenidae or trapezitine Hesperiidae, but with some Nymphalidae: Satyrinae also of considerable interest (New 2011c). Practical conservation for most of these has involved assuring site security and maintenance, and augmenting supply of local resources. In contrast, conservation of *O. richmondia* has necessitated a much wider geographical perspective, but still focuses on key patches with characteristic plant communities within the range – either as those currently occupied or those targeted for restoration as core recovery sites or lesser stepping stones.

The spatial configuration of habitat patches across a landscape can affect the conservation of a species. A fundamental principle in conservation biology, this linked with the dispersal capabilities of the species of interest and its population (or metapopulation) structure and dynamics. Two related contexts arise for the Richmond birdwing, with the recognition that dispersal prowess itself is unlikely to be limiting within the region of interest. The figure used as a reference guide in this project, of a 30 km linear flight distance between sites, is based on the confirmed identity of a gravid female approximately this distance from the nearest available breeding site. These contexts are that the physical and biological features of interpatch areas over much of the range are not (other than through major alienations such as urbanisation) major deterrents to that dispersal, but may influence survival, and that colonisation and establishment can be fostered by management once butterflies arrive by either migration or longer-term diffusion. As Dover and Settele (2009) noted, the interaction of the physical structure of the arena with processes affecting a species – such as whether the landscape poses 'barrier effects' – can constrain colonisation. The strongly flying *O. richmondia* clearly has the capability to move through landscapes that would be impenetrable to many other butterfly species. However, areas of urban development and absence of consumable resources are putative barriers, and have fundamentally reduced the range of occupation from historical times. Dennis (2010), drawing on his numerous earlier papers, has developed the concept of resource-based habitat, essentially more continuous and graded than the more traditional dichotomy of 'habitat' (occupiable) and 'matrix' (not occupiable) long appealing to butterfly ecologists. The recent discussion by Dover and Settele (2009) provides sound introduction to these topics, together with listed key points for each of the many interacting themes. They point out that the habitat/matrix division 'may actually impair our understanding of landscape–level processes', with the resource-based concept a far more useful paradigm for the future. Under discussion of corridors, they noted that (1) corridors do not necessarily involve continuous unbroken physical links, and 'stepping stones' may be sufficient; and (2) a corridor is not necessarily the shortest route between two patches. Both these principles have been important for the Richmond birdwing – with resource-enriched stepping stones dictated largely by availability of sites where plantings could be undertaken and nurtured under secure conditions. If, as supposed, butterfly dispersal is not itself limiting, patch quality may be more important than patch size (assuming that smaller patches can be protected, with additional potential edge effect problems such as increased weed invasions demanding increased

attention), as indicated by threshold numbers of *P. praevenosa* vines recommended for restoration, although individually large vines when mature cannot each provide sufficient foliage for more than very few larvae, due to cannibalism, so that multiple vines are critical.

Restoration of habitat networks is a critical aspect of connectivity in conserving any species within a highly fragmented landscape. As McIntyre et al. (2007) emphasised, any such effort necessitates combining biological information on the species involved with 'the landscape, economic and social realities of the restoration effort'. Within the constraints of the landscape (such as condition, topography, and land tenures and ownerships), restoration commonly involves providing enhanced or new potential habitat that can aid connectivity or persistence. *O. richmondia* exemplifies well the values of both enhancing already occupied habitats, and of providing new patches (many on private land) between those already existing. The roles of modelling in such enterprises are complex and, perhaps, of greater importance for relatively sedentary butterflies than for wide-ranging ones. Some of the problems were described for Fender's blue (*Icaricia icarioides fenderi* Macy, in prairie remnants in North America (Schultz 2001), with that study extending over 14 years (McIntyre et al. 2007). It remains simplistic to imply that the current practices for *O. richmondia*, undertaken without formal modelling, are ideal – but, due to the willing participation of many people in the activities (largely overcoming the economic and resource constraints evident in many similar projects), the outcomes have been highly encouraging.

The aesthetic and popular appeal of this spectacular butterfly has been instrumental in engendering and sustaining concerns and interest, with effective cooperation between scientists, conservation agency personnel and the wider community initiated early in the programme and demonstrating some ways in which this mutual involvement can be fostered. Such support is critical (New 2010) but is often far easier to deter than to sustain. The *O. richmondia* programme has been particularly instructive in encouraging sustained interest, which continues to increase and diversify. Major elements for successful community participation in conservation include communicating a sense of ownership and identification with the project, rather than more remote 'direction', and the factors noted more generally by Williams (1996, Table 10.1) convey well its focus – with wide consultation from the project's commencement ensuring that the 'encourage' factors were implicitly addressed. Planning at all stages involved the constituency and, although not planned deliberately to do so, the early phases also involved the parameters emphasised by Craig et al. (1996) and successively and successfully incorporated these as the project progressed. The pivotal role of education and the importance of initiatives, including a draft recovery plan (1996), involving young people cannot be overstated. Much of the subsequent habitat enhancement and monitoring flowed from that impetus, and the driving of interest through involvement of schools. The 'Double Helix Science Club component' of the *O. richmondia* programme was of critical significance in fostering lasting appreciation and interest over a wide area.

The later, more complex, recovery networks emphasised further the central importance of trust and a 'belief in ownership', not least through regular communications

Table 10.1 Points to help foster community interest and involvement in species conservation programmes (after Williams 1996)

1	Have a focus for conservation interest that the community or community group identifies with personally (effective focus)
2	Encourage community involvement from the earliest developmental stages of a conservation or species recovery initiative (sense of ownership)
3	Develop programmes that are beneficial to the community as well as to conservation (what does the community 'gain' from the exercise and effort)
4	Listen to the community's concerns (constructively incorporate them into the conservation goals)
5	Gain the community's trust (personal interactions and considerations important)
6	Provide the community with the appropriate information at the appropriate level and at the appropriate time (regular review and feedback; effective communication)

and group meetings. Thus progress and problems could be assessed without undue delay, and ideas exchanged to provide opportunity for adaptive management as knowledge and field results become evident. Sustained interest from the public in single species conservation is a valuable but fickle commodity, and effective communication is vital to retain this – as Nally (2003) demonstrated effectively for the Bathurst copper, without this communication public support can decline rapidly. In a community-based programme all relevant interest groups need to understand what is expected from them, how they can participate effectively and be involved, and be acknowledged properly. For continued confidence, the progress in any conservation programme should be both documented (with permanent records) and communicated effectively. Ideally the entire enterprise should flow from a well thought-out but adaptable 'management plan' that incorporates both research and practical needs and aims, and sets these out clearly together with the means by which they will be pursued and progress will be measured.

Species management plans for insect conservation vary widely in scope and complexity, as well as attainability, and in part this often reflects legal obligations brought about by 'listing' the species (New 2009) and which vary considerably in their specific demands. It is still rare for prior planning to be fully comprehensive, not least because many exercises flow from rapid need for 'crisis management' and for urgent ameliorative measures. Nevertheless, whenever possible, the factors noted in Table 10.1 and discussed by New (2009) merit early consideration in planning management, as collectively serving to guide the project, foster support, sustain progress and plan for accountability and monitoring of outcomes. No such plan is likely to proceed unaltered. Additional information, varying unpredictable changes in levels of support, and changes of agency personnel and priorities are among the many influences that may advise or dictate changes of project direction and priority. Management should thereby be adaptable, and responsive to such influences, whilst not deviating from the primary conservation aims and recovery actions, and objectives. However it is incumbent on the initial planning team to assure comprehensiveness of approach, and that all the affected constituencies within the community and management groups have been consulted adequately at

Table 10.2 Factors that may discourage community interest and participation in species conservation programmes (after Williams 1996)

1	Failing to recognize the community's understanding of ecological concepts can create resentment
2	Failing to appreciate what the community hopes to gain from participation can dampen enthusiasm
3	Failing to provide appropriate support after community-based programmes have been initiated can threaten continued commitment
4	When an agency starts to behave as if management belongs only to it, the community may be discouraged from developing a personal responsibility for conservation

this stage. Ideally, also, the various objectives are set out clearly at this stage, with realistic assessment of how they will be achieved, and who will be responsible for each of them, together with an indicative budget. Increased use of 'SMART' objectives is recommended strongly, to help progress being monitored rather than allowing the project to 'drift' and in some cases not to be sufficiently accountable. Perhaps the two most difficult parameters to assure are 'time-bound', as the final component of 'SMART', and sustaining external interest over the long period needed for completion. The first is particularly sensitive when working with community groups and volunteers who, understandably, may object to imposed deadlines for tasks which are seen as completely unrealistic or dictatorial, and be alienated by any such demands on their time and (often, self-funded) contributions. Second, whilst initial interest may be aroused by novelty and perceived urgency, sometimes with an accompanying flurry of media publicity, sustaining that interest over a decade or more may be complex. The Richmond birdwing project is a prime example of how this can succeed through cooperative endeavour and activities such as newsletters and regular meetings or field days to sustain interest. In contrast, some other projects have floundered within much shorter periods, and the 'discourage' factors listed in Table 10.2 should be avoided carefully if possible. Difficulties are confounded if leading agency or scientist personnel change, their primary duties are changed, new constituencies of interest arise, changes in political/administrative boundaries affecting the species occur, or anticipated funding or other support is lost. It is not unusual in Australia for a species supported by a government agency to effectively become 'orphaned' due to retirement or transfer of a single supporting officer. Membership of management teams is also likely to change, and good record-keeping is important in aiding smooth and sympathetic transitions and succession without impetuous revision of existing plans.

The early Richmond Birdwing Recovery Plan (1996, p. 112) has provided sound guidance, and was based on sufficient foundation knowledge and experience to render it of enduring relevance and importance. The major aims have remained current, and the intervening years have seen many of these pursued diligently, with changes in emphasis reflecting adoption of adaptive management as information from monitoring data accumulated and dictated changes in emphasis or priority. The twin strands of (1) threat reduction by removal of a toxic alien plant and increasing security of remnant habitat patches and (2) enhancing a key resource food plant to

increase both population sizes locally, and availability of this within the wider landscape, have proved highly complementary in generating favourable outcomes that have been combined progressively with consideration of additional stressors such as inbreeding depression and climate changes as these have become apparent.

Success of any species conservation plan depends on acceptance that the species is indeed worth saving, a judgement in which aesthetic and ethical appeal can be enhanced markedly by some 'official recognition' that its conservation is needed. Most commonly, this is by election to some formal schedule of 'Threatened Species' or 'Endangered Species', based on risk of extinction. In the past, many species have been listed in this way on grounds of rarity, without evidence of any actual threat. The two conditions must be distinguished carefully in conservation planning, in order to avoid commitment of the very limited support resources to numerous non-threatened taxa that have low abundance, small distributions and are ecological specialists but whose condition and range is apparently stable and wholly natural. For butterflies, including birdwings, the emotional connotations (however sincerely intentioned) of over-collecting as a threat, are an important and influential syndrome in conservation. The Queensland birdwings were amongst the first butterflies to be fully protected by listing and total prohibition of take in Australia. Together with the spectacular *Papilio ulysses* L. (the Ulysses swallowtail, a notable tourist icon for tropical Queensland), they were listed under the Queensland Fauna Conservation Act in 1974, intriguingly with the then formal need to declare them by government decree as 'fauna' because the Act defined this as indigenous mammals and birds only! The major stated reason for listing these species was to control the perceived threat by illicit trade. *O. richmondia* has indeed been identified in trade (Hawkeswood et al. 1991), with importing countries including Colombia, Japan, France and the United States, but large numbers of butterflies were probably not involved. All birdwings were listed on CITES, but the Queensland listing led to two major concerns (Monteith 1980; Hill and Michaelis 1988), namely (1) that over-collecting was not a threat and that the legislative protection itself deterred hobbyist interest in contributing to knowledge of the species, and (2) that the listing in itself was viewed by many people as 'real conservation' rather than as a facilitating mechanism or tool, and was not accompanied by adequate measures to protect habitat. Parallels elsewhere are not uncommon – one relevant here is the listing of 'all jewel beetles' for protection in Western Australia, whilst condoning clearing of large areas of their prime mallee habitat (Douglas 1980). Hill and Michaelis (1988) did not report any Australian Papilionidae as 'Threatened' amongst the 260 arthropods listed as of concern by respondents to their nationwide survey. Nevertheless, losses of subtropical rainforest in southern Queensland were substantial by that time, and concerns over decline of this prime habitat for *O. richmondia* led to its rapid adoption as a flagship species for this complex and poorly-known habitat. Its striking appearance was undoubtedly an influence in its acceptance as 'worthy' of conservation, and the initial impetus from activities in New South Wales spread rapidly in Queensland.

Major outcomes of the Richmond birdwing conservation project include important initiatives that have contributed significantly to wider understanding of butterfly conservation. At one level, the recovery programme focused on consumable resource

enhancement, coupled intimately with removal of the alien, toxic vine from the areas of interest within the historical range of *O. richmondia*. The essential conservation module was thus the usual bipartite one of 'insect plus food plant', a far more straightforward template than the complex tripartite association of 'insect plus food plant plus mutualistic ant' needed for some Lycaenidae. However, this limited interpretation is often deceptively simplistic, and the module of core species more extensive. In this case, pollination of the vines appears to depend on very specific associations involving particular Diptera, including species of Phoridae and, possibly but needing confirmation, of biting midges (*Forcipomyia* spp., Ceratopogonidae). The recognition of species in both these groups is complex. As Debenham (1987) noted, *Forcipomyia* are amongst the most commonly encountered members of the family in Australia, and a complex array of flies have been allocated uncritically to the genus. The biology of most is unknown in any detail, although the *Aristolochia*-associated forms are suspected to occur in wet leaf litter. In her revisions of the genus in Australia, Debenham (1987 and later papers) recognised around 25 subgenera. Disney's (2008) checklist of Australian Phoridae shows the apparent predominance of *Megaselia*, the genus implicated as pollinators here, but also the potentially enormous richness of species awaiting diagnosis and formal recognition. Other than obvious need for the pollinators to be active during the flowering season of the aristolochias, namely late spring to early summer, the dynamics of these vectors are unknown. As noted earlier, many other saprophagous Diptera have been suggested also to be pollinators of Aristolochiaceae, as they have been found within the flowers in many other parts of the world. Clarification of this aspect of the vines' biology may have considerable relevance in future conservation planning, as an augmentation to the module of species of functional concern. It is a clear priority for future research, and also exemplifies the much wider scenarios of unknown factors that need urgent clarification to underpin more 'obvious' conservation factors, and without which the long-term effort may be seriously deficient.

Largely as a consequence of this project, the ecology of the butterfly and its foodplants are reasonably well understood, and sufficient for well-informed management on resource manipulations to be undertaken. Further work on genetic constitution and inbreeding effects, and the butterfly's climatic tolerances in relation to future anticipated range changes may be worthwhile. For example, with global warming, it is likely that upland sites may become less marginal for habitation than at present, and become parts of the species' permanent range. It may become important to provide connectivity of lowlands with the upland areas now colonised only sporadically and temporarily as they become progressively suitable for permanent occupation with changing climate. However, phenological changes may also eventuate, and the synchrony with resources alter, together with compositional changes in local communities as additional taxa are also driven upward. The strong dispersal capability of *O. richmondia* may indeed prove advantageous, with the present programme owing much to the butterfly's ability to track scattered resources dispersed widely in a landscape, over tens of kilometres or more. With an adult female lifespan of 4–6 weeks, dispersal potential may be considerable, and the butterfly's conspicuousness facilitates accurate recording of incidence, in a region where confusion

of identity is unlikely because no other similar taxa occur. The delight of people discovering the butterfly on vines they have planted locally, perhaps several years previously, is clear from a number of comments in the various network newsletters

Increased sightings of *O. richmondia* in recent years, clearly demonstrates some recovery within the natural range, linked with availability of *P. praevenosa*, and progressive linking and enrichment of forest habitat patches. They give cautious optimism for the butterfly's future wellbeing and indicate that *O. richmondia* has been at least in part recovered from being seriously threatened and is no longer amongst the most threatened species in the region. The apparent recovery can be attributed largely to the conservation measures described in this account, and possible only through the continuing high levels of community interest and support. Sands and New (2002) commended the provision in much Australian conservation legislation to de-list taxa once they were regarded as secure. Two scenarios dominate any such decision. First, that increased survey and investigation following formal listing (and in many cases possible only after listing has enabled support for those activities) reveal that the taxon is more secure or more widely distributed than initially supposed, so that threat status is not warranted. Second, that those conservation actions have restored a genuinely threatened species to a state of security, again so that it is no longer threatened and should not qualify for listing. The second of these is relatively unusual, and may represent the outcome of considerable effort, perseverance and expense over a long period.

The campaign described in this book is one such example in which a case for de-listing could now be made. However, should such a species be de-listed, there is always some risk that threats might recur, without special provisions for on-going actions, and possibly unnoticed the butterfly could again become endangered. Sands and New (2002) suggested that such 'conservation investment' could be safeguarded by signalling such species for post-delisting monitoring or regular inspection to, at the least, provide for early detection of any such renewed risk whilst releasing the major resources committed previously to conservation measures for other, now higher priority, taxa. The term 'rehabilitated species' was suggested to designate such taxa, and a case could be made for *O. richmondia* to enter this category, but such recognition has not yet been made possible. It would need very careful consideration, not least to prevent the current emphasis on its conservation from dissipating. Discussion of this dilemma at a recent (October 2012) workshop on recovery planning in Queensland elicited very mixed responses and several related issues were raised, for example, whether a 'recovery plan' should be an 'automatic' consequence of listing for threatened taxa, and if delisting following recovery actions, might lead to re-emergence of threats. Indeed, need for the formal obligation for recovery plans of the kind central to this campaign is widely queried. Planning is seen to confer obligations beyond what is possible or practicable, and some authorities prefer not to have such 'millstones', as noted below.

O. richmondia is only one of a range of butterflies acknowledged as threatened in Queensland, but is the only one for which wide landscape-level planning was needed, and has proved feasible. The focus on corridor construction and enhancement is a key component and, whilst each corridor has been under the watchful eye

of an individual 'coordinator', the need for constructive liaison and range-wide coordination will need to continue. Commercial production of *P. praevenosa* for restoration activities also continues, and is likely to do so and maintain the conservation impetus, notwithstanding the apparently increased security of the butterfly. Much of the butterfly's historical range is still to be re-occupied, particularly the original northern range, and continued monitoring to detect range recovery or expansion and changes in abundance are activities that are sufficiently cohesive to sustain interest for the future.

The diversity of views reflects considerable variation in opinions of the value of (and need for) recovery plans of any kind for formally recognised threatened species. Throughout Australia, many critically endangered and endangered animal and plant taxa do not have recovery plans. Burbidge (1996) listed reasons for this, and believed that 'Having hundreds of recovery plans and hundreds of recovery teams is not possible with present or anticipated resources.... it would not be cost-effective and should not be contemplated'. The four reasons were (1) numerous taxa are threatened; (2) conservation agencies have been slow to prioritise threatened taxa in terms of degree of threat; (3) 'flagship taxa', or taxa for which research data are available, tend to be treated first; and (4) there are insufficient data on the limiting factors for many taxa and defining recovery actions is often difficult or cannot be done with any degree of certainty. *O. richmondia* is an excellent example through which to endorse the third of these, and the attention paid to it over more than 20 years does not mask that numerous other taxa are at least equally deserving of parallel conservation attention. The interest and knowledge evident from the commencement of conservation interest in the butterfly ensured that the Draft Recovery Plan was indeed well-informed and reasonably comprehensive. Both (1) that such a plan was initiated to guide management efforts, and (2) that it has not been found seriously deficient, are unusual features, and endorse that more recent adaptive management continues to build on strengths of purpose and approach. Dependence of the birdwing on climax and near-climax forest biotopes, has added important umbrella roles for the species and accompanying educational exercises. Whilst *Ornithoptera richmondia* appears to be well on the road to recovery, due largely to the efforts discussed in this book, it is salutary to reflect that without this campaign this magnificent insect might by now have declined further, or even have been lost completely.