

Background and Implementation Information for the
Helmeted Honeyeater *Lichenostomus melanops cassidix*
National Recovery Plan

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in conjunction with the Helmeted Honeyeater Recovery Team



Australian Government

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Published by the Victorian Government Department of Sustainability and Environment (DSE) Melbourne, 2008.

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ISBN 1 74152 357 5

This publication contains detailed background information and implementation detail for the 'National Recovery Plan for the Helmeted Honeyeater *Lichenostomus melanops cassidix*' (Menkhorst 2006a), and should be read in conjunction with that document (available at www.environment.gov.au).

This document has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Citation: Menkhorst, P. 2008. Background and Implementation Information for the Helmeted Honeyeater *Lichenostomus melanops cassidix* National Recovery Plan. Department of Sustainability and Environment, Melbourne.

Cover photograph: A captive-bred Helmeted Honeyeater *Lichenostomus melanops cassidix* released to the wild at Bunyip State Park. Photograph by Iain Stych, Healesville Sanctuary.

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History of Conservation Action

Concern for the survival of the Helmeted Honeyeater dates from the early 1900s (see reviews by Mack 1933, Cooper 1967a and 1967b, Woinarski and Wykes 1983, Backhouse 1987, Menkhorst and Middleton 1991). This concern was manifest in detailed surveys by amateur ornithologists (e.g. Lee and Bryant 1948, Hyett 1964) and donation of land for a reserve.

Efforts by the Victorian Government to halt the decline in the Helmeted Honeyeater population began in 1965 with the establishment of the Yellingbo State Wildlife Reserve, following recommendations from the Victorian Ornithological Research Group and the Bird Observers Club. The reserve included 167 ha of remnant streamside vegetation along Woori Yallock, Cockatoo and Sheep Station Creeks and contained most of the known Helmeted Honeyeater population. In March 1971 the Helmeted Honeyeater was declared one of Victoria's State Faunal Emblems (with Leadbeater's Possum) and its struggle to survive over the ensuing 35 years has remained a topical subject in the mass media.

In 1974, the Victorian and Federal Governments jointly committed two million dollars for acquisition and rehabilitation of key habitat remnants to add to the Yellingbo State Wildlife Reserve (but actual expenditure was apparently about \$600 000). Land purchase increased the area of the reserve to almost 400 ha. Intensive fencing and revegetation work took place through the remainder of the 1970s and early 1980s. However, with the initiation in 1989 of the current recovery effort, the emphasis switched from habitat protection and revegetation to active management of the birds themselves (Menkhorst and Middleton 1991, Menkhorst et al. 1999).

Taxonomy

The complex and controversial taxonomic history of the Helmeted Honeyeater was summarised in the first recovery plan (Menkhorst and Middleton 1991). Since then Schodde and Mason (1999) have undertaken further morphological studies on museum specimens. These studies reaffirmed the subspecific status of *L. m. cassidix* but suggested that there is intergradation across eastern Victoria and south-eastern NSW between the nominate race and race *cassidix*. This conclusion disallows *L. m. gippslandicus* as a taxon, and suggests that *cassidix* occurs far more widely through west Gippsland than is currently recognised – Schodde and Mason (1999) define the eastern boundary of *cassidix* as the Tyers-Aberfeldy Rivers system, without providing any justification for the adoption of that boundary. Genetic research conducted on behalf of the recovery team (Hayes 1999) does not support Schodde and Mason's subspecific arrangement. Rather, it confirms the distinctiveness of *cassidix* as a taxon and confirms its geographic limits to the Yellingbo area. Hayes found that genetic distances between the Yellingbo birds (*cassidix*) and populations only 20 km away at Reefton (*gippslandicus*) are of similar magnitude to those between *cassidix* and birds from East Gippsland, and between *cassidix* and the inland race *meltoni*. Therefore, there is no genetic evidence of significant intergradation to the east of Yellingbo and the subspecific arrangement proposed by Schodde and Mason (1999) is not supported.

Conservation Status

Using the IUCN categories (Species Survival Commission 2001) the Helmeted Honeyeater currently rates as critically endangered under criterion B (geographic range) because the area of occupancy is less than 10 km², the population is confined to one locality, and a continuing decline is expected in the area and quality of habitat due to continuing dieback of vegetation at one major colony (criterion B2abii,iii,v) [the translocated colony at Bunyip State Park cannot yet be considered to be established. When it becomes self-sustaining the conservation status ranking would have to be downgraded to Endangered under criterion D]

The Helmeted Honeyeater has been classified in the highest threatened category since such rankings began in Victoria (Ahern 1982, CNR 1995, DSE 2003) and nationally (ANZECC

1991, Garnett 1992, Garnett and Crowley 2000). It is listed as a threatened taxon in Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* and an Action Statement has been produced (Baker Gabb 1992) and revised (Menkhorst 2006). It is also listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Life History

Helmeted Honeyeaters are territorial, sedentary and aggressive towards other bird species. Territories are clumped into colonies in patches of suitable habitat and there is a degree of communal defence of the colony area. Many pairs rarely leave their territory of about 0.5 ha, but some birds wander during the non-breeding period in search of nectar or other rich food sources.

The diet consists of invertebrates, lerps, honeydew and manna, all gleaned from foliage, twigs and branches of eucalypts or tall shrubs. Helmeted Honeyeaters spend considerable time gleaning lerps from foliage, invertebrates from behind decorticating bark, or making repeated visits to points where manna is weeping from damage to a branch or twig of eucalypts or melaleucas.

The breeding season is highly regular and protracted; the first eggs are laid in mid August and the last eggs are laid in mid January to late February. Some pairs may make as many as nine nest attempts during this period but three is the norm. The average clutch size is two, and new clutches may be laid before the young of the previous clutch are independent. The mean number of young raised to independence per pair per year is 1.5, although one pair has raised eight. Females do most of the nest building, incubation and brooding, both parents feed the young and males undertake most nest defence (Franklin *et al.* 1995).

Like the breeding cycle, moult of flight feathers is highly seasonal and highly consistent between years, reflecting the highly predictable environment occupied by the Helmeted Honeyeater (Franklin *et al.* 1999). Moult also partially overlaps with breeding, a strategy which allows the protracted breeding season and reflects the rich food resources available in the *Eucalyptus camphora* Swamp in late summer.

Recovery Objectives

Overall Long-term Objective

Achieve a stable population of at least 1000 individuals in at least 10 separate but interconnected colonies dispersed along several creek systems in the mid-Yarra and Western Port catchments and thus have the taxon removed from the IUCN Red List of Threatened Animals.

Specific Objectives

Within the life span of this Recovery Plan, the objectives of recovery are to:

1. Effectively administer the recovery effort to ensure that recovery plan objectives are met.

Performance Criterion: Progress towards meeting all objectives is efficiently achieved with high levels of community and government support.

2. Increase the number and size of wild populations.

Performance Criterion: Attain a wild population of at least 200 mature individuals spread between at least two self-sustaining sub-populations, at least one of which is in a separate water catchment to the Cockatoo-Woori Yallock Creek system.

3. Maintain and enhance the value of Helmeted Honeyeater habitat in:

- i. Yellingbo Nature Conservation Reserve
- ii. Bunyip State Park
- iii. elsewhere throughout the former range.

Performance Criteria:

- i. expansion of population into currently unoccupied habitat.
- ii. establishment of a self-sustaining population along Diamond Creek, Bunyip State Park.
- iii. maintenance of habitat options for future population expansion and re-establishment.

4. Improve the management of stream flows, water quality and riparian environments throughout the Woori Yallock Creek catchment.

Performance Criteria:

- i. preparation and implementation of a Streamflow Management Plan for the Woori Yallock Creek.
- ii. re-engagement of the floodplain of Cockatoo Creek within Yellingbo NCR.

5. Manage the captive population of Helmeted Honeyeaters to provide insurance against the demise of the wild population and to meet the needs of the recovery program.

Performance Criteria:

- i. maintenance of a viable captive population to the standards of a Category 1 species under the Australian Species Management Program.
- ii. production of at least 15 young per year that are available for release.
- iii. maintain 95% of the wild heterozygosity in the captive population.

6. Maintain the genetic diversity and evolutionary potential of the Helmeted Honeyeater.

Performance Criterion: No decrease in current levels of heterozygosity, nor evidence of problems attributable to inbreeding, in either the wild or captive populations.

7. Improve public awareness of the Helmeted Honeyeater recovery program and public support for implementation of this recovery plan.

Performance Criterion: continuation of present levels of public goodwill towards the recovery program, and maintenance of membership levels of the Friends of the Helmeted Honeyeater.

Recovery Actions

OBJECTIVE ONE: Increase the number and size of wild populations.

Population Monitoring

1.1) Continue to use the territory mapping technique and searches for begging fledglings to estimate number of breeding pairs and production of fledglings.

Explanation: With the growth of the Helmeted Honeyeater population it has become unrealistic to continue the program of colour-banding all individuals to facilitate close population monitoring. That technique was an essential component of the first recovery plan and allowed detailed studies of population demographics, dispersion and breeding success. Now that the focus of the recovery effort has shifted more towards establishment of new colonies and the management of habitat, a less intensive, and less costly, monitoring regime should be sufficient. This will allow the Field Ornithologist to devote increased attention to management work such as establishment of new colonies by release or translocation, monitoring of colonisation events, and control of Bell Miners.

Costings are based on five days searching per month of the breeding season (August-February) by the Field Ornithologist with assistance from ranger staff (funded by PV) and volunteers, plus costs of data analysis and travel.

Responsibility: Operations Group.

Costs of action 1.1 are included in action 7.3.

1.2) Closely monitor all new naturally-established colonies, using colour-banding if necessary, to ensure that the maximum information on colony establishment is gathered.

Explanation: Creation of new colonies of Helmeted Honeyeaters is the key to improving the conservation status of the taxon and a central theme of this recovery plan. Consequently, it is essential to grasp all opportunities to increase our knowledge of the processes by which dispersal and colony formation occur. This knowledge can then be utilised in designing future release protocols.

Costs are calculated on 10 person days per annum by the Field Ornithologist, plus travel.

Responsibility: Field Ornithologist.

Costs of action 1.2 are included in action 7.3.

1.3) Institute a program of bi-annual population simulations using the most appropriate modelling techniques available and the most recent demographic data, to predict the impact of a range of management scenarios.

Explanation: A population viability analysis package has been constructed specifically for the Helmeted Honeyeater (McCarthy 1995b, 1996). This model allows investigation of the impact of a range of management scenarios and threatening processes on the population (eg. McCarthy 1995a, McCarthy *et al.* 1994) and is a valuable tool for planning recovery actions. Other modelling techniques may have utility in assessing management options and should be examined to assess their applicability for this species (e.g. McCarthy *et al.* 2004, Meyer 2005). Without a specific program for applying these tools their value is unlikely to be fully realised.

Responsibility: Recovery Team.

Control of Bell Miners

14) Continue to exclude Bell Miners from adjacent to existing Helmeted Honeyeater colonies and from areas of suitable habitat that may be available for colonisation by Helmeted Honeyeaters. Monitor Helmeted Honeyeater usage of areas from which Bell Miners have been removed and maintain these areas free of Bell Miners.

Explanation: Breeding success rates of Helmeted Honeyeater pairs whose territories abut Bell Miner colonies were shown to be significantly lower than those of neighbouring pairs whose territories are not immediately adjacent to Bell Miners (Franklin and Smales 1990, Smales *et al.* 1995). Further, in the Yellingbo area, several former Helmeted Honeyeater colony sites and other patches of suitable habitat are currently occupied by colonies of Bell Miners. It has been clearly demonstrated that Helmeted Honeyeaters without breeding territories will readily occupy such habitat once Bell Miners are removed (e.g. figure 4, Pearce *et al.* 1995). Since 1990 removing Bell Miner colonies from suitable habitat has allowed the establishment of some 16 new breeding territories. This technique remains the major successful method for allowing expansion of the Helmeted Honeyeater population.

Costings are split between Parks Victoria for the contribution by Ranger staff, and through other funding of the Field Ornithologist.

Responsibility: Port Phillip Area, DSE and Parks Victoria, Melbourne East District.

1.5) Develop a strategy for landscape-scale vegetation management to reduce the spread of colonies of the Bell Miner. Investigate novel and ethical methods for reducing the impact of Bell Miners, including catchment-wide vegetation and stream management.

Explanation: Although culling of Bell Miners has proven to be an effective method of addressing competition from Bell Miners on a local scale, it is not a viable long-term solution – it treats the symptom not the cause(s) of deeper ecological changes that are taking place throughout the district. Further investigation is required into the relationships between catchment-wide habitat alteration, and changes to the hydrological system, and the establishment of Bell Miner colonies. It is envisaged that this project will be undertaken by a post-graduate student.

Responsibility: Recovery Team to liaise with Port Phillip and Western Port CMA to develop a study brief and joint project management arrangements.

Re-introduction

1.6) Develop a clear strategic plan for re-introduction works over the life of this plan.

Explanation: The re-introduction phase of this recovery effort has achieved some major milestones but a need for a clear path forward has been identified. A strategic plan needs to be developed to clearly define medium-term aims and targets to guide re-introduction work for the life of this plan.

Responsibility: Recovery Team

1.7) Continue to trial techniques for establishing new colonies, using an adaptive management approach, and utilising both captive-bred birds, and direct transfer of eggs or nestlings from either the wild population at Yellingbo or the captive population. Reinforce the incipient colony at Tonimbuk as necessary to ensure it becomes a viable group of at least 20 breeding pairs by the year 2008/09.

Explanation: Establishment of new colonies of Helmeted Honeyeaters away from the Yellingbo NCR is essential to spread the risk of deleterious events such as wildfire, drought or stream degradation. Designing the most cost-effective methods of establishing new colonies should be a primary aim of the recovery effort, to maximise the probability of success (McCarthy *et al.* 2004, Meyer 2005).

Progress towards this aim will depend to some degree on output of young birds from the captive colony and breeding success of the wild colonies. However, given that the success rate for eggs laid at Yellingbo is about 33% (Smales 2004), and many of the fledglings produced at Yellingbo are never recruited to the breeding population, an increased level of harvest of eggs or immatures for translocation is justified. At the maximum intensity, the trials will run for three breeding seasons and may require daily husbandry visits to aviaries for two intensive two-week periods per year, plus monitoring of released birds by the Field Ornithologist, Ranger staff and volunteers.

The survival of released captive-bred Helmeted Honeyeaters, and several wild-born offspring, at Tonimbuk since 2002 represents the beginning of the re-establishment of new colonies away from Yellingbo - a primary objective of this plan. Given the conservation significance of these incipient colonies, and the effort and resources expended on their development (Smales *et al.* 1999, 2000), it is essential to ensure that they grow to a viable size.

Responsibility: Recovery Team.

1.8) Review the protocol aimed at minimising risks of disease transfer between populations.

Explanation: The possibility of disease and parasite transmission is a factor that must be considered in any translocation or release program (Cunningham 1996). Under the previous plan, a risk minimisation protocol for translocations was developed. The outbreak of an unidentified disease during 2002/03 again highlighted the importance of this issue and suggested that the current protocol should be reviewed to ensure that all reasonable safety procedures are adopted. The review, which needs to include wide consultation with zoo veterinarians, should consider translocation of birds and eggs between captive colonies, from captive to wild and wild to captive situations.

Responsibility: Zoological Parks and Gardens Board.

1.9) Consider the establishment of a third colony at the most appropriate site outside the Woori Yallock - Cockatoo Creek system.

Explanation: If the initial artificially-created colony on Diamond Creek at Tonimbuk is successfully established during the life of this plan, work should immediately begin on preparations to establish another new colony at the most appropriate site, using methods recommended by the recovery team after reviewing previous trials.

Costs are based on a requirement for four husbandry trips per week for the duration of the six-month breeding season, plus weekly monitoring for the remainder of the year. Travel is likely to be about 100 km per trip. Costs of action 2.3.4 are contained within 2.3.3

Responsibility: Recovery Team and Operations Group.

OBJECTIVE TWO: Maintain and enhance the value of Helmeted Honeyeater habitat in Yellingbo NCR, Bunyip State Park, and elsewhere throughout the former range.

2.1) Liaise with the Port Phillip and Western Port Catchment Management Authority to ensure the future protection and rehabilitation of riparian vegetation and quality of stream water throughout the former range of the Helmeted Honeyeater.

The Helmeted Honeyeater should be promoted as a ‘flagship’ for CMA riparian vegetation rehabilitation. The health of current habitat of the Helmeted Honeyeater, and patches of potential habitat, is closely linked to processes that occur further upstream in the catchment (e.g. Kasel 2001). The Port Phillip and Western Port Catchment Management Authority has prepared a Native Vegetation Plan (that provides a sound framework for improving the retention and rehabilitation of riparian vegetation, thereby improving stream health. The recovery team needs to work closely with the CMA to ensure that the needs of the Helmeted Honeyeater are catered for in all CMA planning documents and procedures, with particular attention paid to areas identified as potential habitat. The objectives of CMA planning should include significant reductions in stream sediment loadings, protection and rehabilitation of all riparian vegetation, and protection of critical attributes of Helmeted Honeyeater habitat.

Other relevant government programs and agencies that need to be appraised of the needs of the Helmeted Honeyeater include:

- CMA landcare facilitator network
- DSI Nutrient Management Extension officers
- Melbourne Water Waterways and Drainage Group
- DSE Land for Wildlife program
- Local government planning schemes and Environmental Significance Overlays

Responsibility: DSE, Parks Victoria.

2.2) Facilitate the implementation of Flora and Fauna Guarantee Action Statement number 130 – Sedge-rich *Eucalyptus camphora* swamp.

The Department of Sustainability and Environment published this Action Statement in mid 2003 following the listing of the vegetation community in 1994 (Turner 2003). The Action Statement includes intended management actions that will result in improved capacity to conserve the primary habitat of the Helmeted Honeyeater at Yellingbo.

Responsibility: PV, PPWP CMA, Melbourne Water

2.3) Further refine the habitat suitability index for the Helmeted Honeyeater and use it to identify and rank areas of potential habitat throughout the former range of the Helmeted Honeyeater.

Explanation: Reliable identification of potential habitat for regional planning purposes, and potential sites for colony establishment, requires a clear method for quantified, repeatable assessment of habitat suitability. This project aims to assimilate current knowledge of the habitat requirements of the Helmeted Honeyeater and develop criteria that can be used to score the suitability of various sites for colony establishment.

Costing is based on three weeks work by a consultant, including travel and reporting costs.

Responsibility: Recovery Team.

2.4) Review and update the revegetation strategy (McMahon and Carr 1993) for Yellingbo NCR then expedite its implementation. Experiment with untried revegetation techniques.

Explanation: Attempts to create new habitat for the Helmeted Honeyeater, or to rehabilitate degraded habitat, have been undertaken and refined since the early 1970s (Backhouse 1987). Revegetation methods were further refined and focussed under the first plan (McMahon and Carr 1993) and subsequently by the Friends of the Helmeted Honeyeater, Parks Victoria and Melbourne Water (e.g. Bennets, Cook and Osler 2006). These efforts have materially benefited the Helmeted Honeyeater through the provision of extra food resources and breeding habitat – the first nesting in shrubs planted by the friends group took place in November 2002 in a *Leptospermum* thicket planted in 1996 (Quin 2003). However, about 20 ha of the Cockatoo Creek floodplain within the Yellingbo NCR was cleared in the 1950s and is now dominated by the introduced weed *Phalaris arundinacea*. Trials of techniques for large-scale removal of this weed and revegetation of this area are needed. Further, there is a need to further focus and prioritise revegetation efforts to reflect current capacity and program aims.

Responsibility: Parks Victoria Melbourne East District, Recovery Team and Friends of the Helmeted Honeyeater.

2.5) Provide support and encouragement for the revegetation efforts of the Friends of the Helmeted Honeyeater, both within and outside the Yellingbo NCR.

Explanation: Since 1989 the community group Friends of the Helmeted Honeyeater has worked closely with the Recovery Team and Operations Group to undertake vital revegetation works, both on private land surrounding the reserve and in strategic areas within the reserve. This cooperation needs to be fostered and enhanced to maximise the contribution of both parties to the recovery of the taxon.

Responsibility: Recovery Team and Operations Group.

2.6) Continue to investigate the causes of eucalypt dieback throughout Yellingbo NCR. Develop a protocol for monitoring vegetation succession in the dieback-affected areas.

Explanation: Continuing tree death in several parts of the Yellingbo NCR is reducing habitat available to the Helmeted Honeyeater and, at one site, has resulted in the loss of several breeding territories. Studies of the role of elevated nutrient levels in stream and soil water suggest that this may be implicated, at least at some sites (Granger *et al.* 1994, Kasel 1999), but are yet to provide a practicable solution. Fungal pathogens have been ruled out, at least in the worst affected site (Limongiello and Keane 1995). Further studies are required to unravel the relationships between changed hydrological regimes, nutrient levels, pathogens and insect outbreaks. Costs are based on a three-year PhD study and include a student stipend plus travel costs.

Responsibility: Recovery Team.

2.7) Foster research into the regeneration biology of *Eucalyptus camphora*.

Explanation: It is likely that the current stands of *E. camphora* will decline in quality as Helmeted Honeyeater habitat over coming decades as the stands age and thin (Pearce 1997). The stands that currently form the core habitat of the Helmeted Honeyeater are even-aged and there is little evidence of natural regeneration. In order to provide *E. camphora* swamp woodland habitat in the medium- long-term, a greater understanding of conditions that promote regeneration of *E. camphora* is needed. This will likely include an understanding of how to control *Phragmites australis* and *Phalaris arundinacea* which grows vigorously in the absence of *E. camphora* and inhibits seedling establishment.

Responsibility: Recovery Team

2.8) Review the regional fire plan to assess its adequacy for protecting key habitat within and outside Yellingbo NCR.

Explanation: Many factors combine to make the threat of wildfire a significant concern for the managers of Yellingbo NCR and the Helmeted Honeyeater. These include the local topography, climate, vegetation flammability and the linear shape of the reserve. As long as the Helmeted Honeyeater is confined to the Yellingbo NCR the risk of wildfire wiping out a significant portion of the habitat is high. The Recovery Team needs to determine the adequacy of current fire control plans and have them modified where appropriate.

Responsibility: DSE Fire Management Branch, DSE Port Phillip Area, and Recovery Team.

2.9) Develop a fire response plan specifically for the Helmeted Honeyeater.

Explanation: Should wildfire threaten the areas occupied by Helmeted Honeyeaters there may be practical actions that could be taken to minimise the impact on the Helmeted Honeyeater population. Development of a contingency plan which outlines options for a range of fire scenarios would be a beneficial planning exercise and should result in a lower risk for the taxon. The experience of the fire that threatened habitat in Bunyip State Park in April 2004 should be used to test the suitability of current fire plans.

Responsibility: Recovery Team, DSE Fire Management Branch and DSE Port Phillip Area.

OBJECTIVE THREE: Improve the management of stream flows, water quality and riparian environments throughout the Woori Yallock Creek catchment.

3.1) Collaborate with Melbourne Water to produce a Streamflow Management Plan for the Woori Yallock Creek system.

Explanation: Recommendations for environmental flows in the Woori Yallock/Cockatoo Creek system were prepared by an advisory committee using the standards defined under the Victorian River Health Strategy. The committee considered the water regime required by the Sedge-rich *Eucalyptus camphora* Swamp Community, as well as problems further upstream that affect the health of Helmeted Honeyeater habitat within the Yellingbo Nature Conservation Reserve. As a result of the committee's work, Melbourne Water has applied to have the catchment declared a Water Supply Protection Area. Such a declaration will enable the preparation of a Stream Flow Management Plan to ensure the maintenance of a specified flow regime in the Cockatoo and Woori Yallock Creeks.

Responsibility: DSE, Melbourne Water, Friends of the Helmeted Honeyeater

3.2) Reduce sediment and nutrient loads in the Cockatoo and Woori Yallock Creeks.

Explanation: A serious threat to about half of the Helmeted Honeyeater breeding territories at Yellingbo Nature Conservation Reserve is dieback of *Eucalyptus camphora* and *Melaleuca/Leptospermum* thickets. While the causes of this dieback have not been established, investigations have identified siltation, water-logging and elevated nutrient loads as likely causes (Kasel 2001).

Responsibility: Melbourne Water

3.3) Re-establish a natural flood regime across the floodplain of the Cockatoo Creek within the Yellingbo NCR.

A plan to re-invigorate the floodplain of the Cockatoo Creek, and control erosion points within the Yellingbo Nature Conservation Reserve (Craigie et al. 1998) has been partially implemented. This needs to be completed.

Responsibility: Parks Victoria, Melbourne Water

OBJECTIVE FOUR: Manage the captive population of Helmeted Honeyeaters to provide insurance against the demise of the wild population and to meet the needs of the recovery program.

4.1) Maintain the captive population at a minimum of 15 breeding pairs with a suitable age and sex structure to allow adequate recruitment into the breeding population.

Explanation: Given the precarious situation of the wild population — total size approximately 85 individuals in three groups along two streams — a captive colony is considered essential insurance against its demise. A captive population has been established at Healesville Sanctuary (Smales *et al.* 1992, 1995) and Taronga Zoo has recently become a second location for captive birds. Captive husbandry techniques have been refined and a captive husbandry manual prepared (Miller 1995) but this needs updating.

A captive colony of this size is considered adequate to provide the insurance function as well as to generate a reliable supply of birds for release into unoccupied habitat, as required to achieve Objective 2 and Action 2.3. The preferred means of adding founder birds to the captive colony remains to cross-foster eggs under captive Yellow-tufted Honeyeaters *Lichenostomus melanops gippslandicus* (Franklin 1991).

Costings reflect the annual cost of captive management to Zoos Victoria.

Responsibility: Zoos Victoria.

4.2) Investigate causes of low breeding success in captivity.

Growth of the captive population is being severely constrained by the low reproductive participation rate combined with the high proportion of eggs that fail to hatch – over the 16 year life of the captive population only 47% of the paired females have laid (81 of 172 paired female breeding seasons), and the hatching rate is 49% (201 of 409 eggs laid). Histological and genetic examinations of eggs that fail to hatch are necessary to understand the causes of this failure. There are several possible causes of this low breeding success and investigations are required to understand the reasons and to develop strategies to overcome them. Feodoroff-Walker (1996) and Dare (2003) found higher levels of disturbance at the captive-breeding facility than in the wild, but other possible causes of the low hatching rate require investigation.

Responsibility: Zoos Victoria and recovery team.

4.3) Review the contingency plan for emergency evacuation of birds from Healesville Sanctuary.

Explanation: Any institution holding captive colonies of endangered wildlife should prepare contingency plans for the event of a natural disaster, such as wildfire. Such plans minimise the uncertainties and maximise the efficiency of responses to the threat. This is particularly true for Healesville Sanctuary given its location on the edge of steep, densely forested mountain ranges which support highly-flammable eucalypt forest.

Responsibility: Zoos Victoria.

4.4) Review and update the captive husbandry manual.

Explanation: Knowledge about the captive husbandry of the Helmeted Honeyeater is accumulating steadily, as experience with this taxon in captivity grows. It therefore seems wise to ensure that regular updates of the captive husbandry manual are produced, to ensure that all new information and advice is documented and readily available for all practitioners. This will be particularly important for new institutions that are brought into the captive management component of the recovery effort.

Responsibility: Zoos Victoria.

OBJECTIVE FIVE: Maintain the genetic diversity and evolutionary potential of the Helmeted Honeyeater.

5.1) Produce an overview of the results of genetic work between 1989 and 2006, and develop recommendations for future priorities.

Explanation: A great deal of useful information and experience has been gained since 1989 about the genetics of the Helmeted Honeyeater. However, this information is not collated or readily accessible in a convenient form, even to the Recovery Team. A review document that describes the achievements and their significance, and documents priorities for future works, is urgently required.

Responsibility: La Trobe University School of Genetics and Evolution.

5.2) Use microsatellite assays to track genealogies under the regime of incomplete sampling of the population which is a consequence of no longer maintaining a fully-banded population.

Explanation: An understanding of the genealogies of breeding pairs is essential to ensure that the genetic variation in the wild population is fully represented in the captive population and that stock for re-introduction are not too closely related. In the past the maintenance of a fully banded population has made this a reasonably straightforward task. However, now that most of the population is unbanded, other methods for ensuring that a small range of genotypes are not dominating captive or re-introduced populations will need to be developed. Mitchell (2001) investigated the efficacy of obtaining DNA from Helmeted Honeyeater feather samples. She concluded that feathers are an unreliable source of DNA, at least with currently available markers.

Responsibility: La Trobe University School of Genetics and Evolution, and Recovery Team.

5.3) Maximise genetic diversity in the captive colony and in the re-introduced populations. Monitor heterozygosity in the wild population using DNA extracted from blood samples from fostered young.

Explanation: For long-term captive breeding, a target of 90% of wild heterozygosity after 200 years is generally used (Ralls & Ballou 1986). A higher target is necessary for the short period of this program, during which the gene pool of the released birds should be as unchanged as possible from the wild birds (Frankham *et al.* 1986).

Costings include maintenance of the ISIS studbook by Zoos Victoria, as well as laboratory costs.

Responsibility: La Trobe University School of Genetics and Evolution, and Zoos Victoria.

5.4) Continue to estimate effective population size using a range of techniques.

Explanation: Total population counts may provide an overly optimistic assessment of conservation status, for example, if a small proportion of the population contributes disproportionately to each new generation. This is particularly likely to occur in small populations like the Helmeted Honeyeater. A more reliable measure of population status is the 'effective population size' (N_e) which takes into account the proportion of individuals that contribute to each generation and the generation time. Stephens (2001) estimated N_e of the wild population during the period when it was fully colour-banded – 1990-1997. This provides a comparison for future estimates of N_e . However, because the population is no longer fully colour-banded, alternative, less direct, means of estimating N_e will be required.

Responsibility: La Trobe University School of Genetics and Evolution, and Recovery Team.

5.5) Continue the search for variation in mitochondrial DNA and in microsatellite loci from Helmeted Honeyeaters and the other subspecies of *Lichenostomus melanops*. Apply these techniques to amplified DNA from selected museum skins to determine the loss of variation since the late 1800s. Clarify the taxonomic relationships between *L. melanops* subspecies.

Explanation: The genetic distinctness of the Helmeted Honeyeater has been a factor affecting its conservation priority. An assessment of the level of changes in allele frequency between specimens collected last Century and the current population would give valuable insights into the degree to which the present population is representative of the Helmeted Honeyeater as represented by the type specimen and other early museum skins. This study will be of great interest to conservation genetics because it will provide a measure of the genetic impact of severe population decline and fragmentation over a century.

Responsibility: La Trobe University School of Genetics and Evolution and Recovery Team.

OBJECTIVE SIX: Improve public awareness of the Helmeted Honeyeater recovery program and public support for implementation of this recovery plan.

6.1) Maintain community awareness of the Recovery Effort and its achievements through all forms of mass media and local regional media.

Opportunities for positive publicity in local newspapers, radio or television should always be grasped. Articles in wildlife or environmental magazines and journals are also a valuable means of increasing support and awareness amongst the committed public.

6.2) Where possible support the public education activities of the Friends of the Helmeted Honeyeater, particularly their program of talks to school groups.

6.3) Ensure that information presented on the DSE, PV, ZV and FoHH websites is up-to-date and accurate.

Explanation: Providing accurate information on the world-wide web is the most efficient means of meeting the demand for information for school projects etc. The recovery team is the most appropriate body to provide accurate and current information for inclusion.

Responsibility: recovery team

6.4) On a local level, numerous government and community groups will need to be kept informed of significant habitat patches and the appropriate management of them. Such groups include shire planners, fire fighting organisations, utility providers and landholders.

Responsibility: This level of extension must be carried out by regional staff of the Department of Sustainability and Environment and Parks Victoria, reinforced where appropriate by the Friends of the Helmeted Honeyeater.

6.5) Establish a Helmeted Honeyeater exhibit at Healesville Sanctuary showing a colony of Helmeted Honeyeaters in a simulated natural habitat and incorporating details of the natural history of the Helmeted Honeyeater and information on aspects of the recovery effort.

The Flooded Forest exhibit established at Healesville Sanctuary in 1998 has not been successful at displaying the Helmeted Honeyeater due to shortcomings in aviary design. This display is unique, and the desire of members of the public to be able to view Helmeted Honeyeaters has not diminished, and is probably growing. Therefore, Healesville Sanctuary needs to find means of upgrading the aviary facility so that Helmeted Honeyeaters can be permanently on display.

Responsibility: Zoos Victoria.

OBJECTIVE SEVEN: Effectively administer the recovery effort to ensure that recovery plan objectives are met.

7.1) Continue to use the Recovery Team as the primary focus for coordination and review of priorities and progress.

Explanation: Given the complex, multi-disciplinary nature of the recovery effort, and the number of individuals and organisations involved, a coordinating body is essential to oversee and assist implementation of this plan, to review progress and to advise on refinements to the plan. The Recovery Team should include, but is not restricted to, the following people:

A representative of Threatened Species and Communities Section, DSE

Flora and Fauna Manager or delegate, Port Phillip Area, DSE

Chief Ranger, Environment or delegate, Parks Victoria Central Region

The Field Ornithologist, Port Phillip Area, DSE

A representative of each contributing captive-breeding institution

A representative of the Conservation and Research Branch of Zoos Victoria

A representative of Birds Australia

A representative of the Bird Observers Club of Australia

A representative of the Friends of the Helmeted Honeyeater

A honeyeater ecologist

A botanical ecologist

A conservation geneticist

Responsibility: DSE, Biodiversity and Ecosystem Services Division

7.2) Continue to use the Operations Group to facilitate close collaboration between the Flora and Fauna Program of DSE, Parks Victoria and Zoos Victoria in operational aspects of implementing the recovery plan.

Explanation: Implementation of operational aspects of this plan requires close collaboration and coordination between field staff of DSE, Parks Victoria and Zoos Victoria, and key members of the Friends of the Helmeted Honeyeater. The necessary levels of cooperation, flexibility and quick response have been successfully achieved by regular meetings of key field staff who comprise the Operations Group.

The operations group comprises, but is not limited to:

Manager, Helmeted Honeyeater Recovery Effort

The Field Ornithologist

Ranger, Yellingbo NCR, Parks Victoria

Ranger, Bunyip State Park, Parks Victoria

Relevant keeping staff, Zoos Victoria

Coordinator, Friends of the Helmeted Honeyeater

Responsibility: DSE, Biodiversity and Ecosystem Services Division

7.3) Employ a full-time field ornithologist to monitor the wild population and its habitat, assist with re-introduction, and maintain databases.

Explanation: close monitoring of population size, dispersion and breeding success is a specialised and labour-intensive task, particularly in the dense swampy habitat of the Helmeted Honeyeater. The presence of a full-time field ornithologist for much of this recovery effort has led to the precise understanding of population number, trend and demographics, information that has been critical to the successes achieved. With the recovery team embarking on the critical stage of establishing a second population in a different catchment, it is even more critical to have adequate staff resources to closely monitor progress so that the re-introduction program can proceed efficiently.

Responsibility: DSE Port Phillip Region

7.4) Collaborate closely with the Friends of the Helmeted Honeyeater to ensure that the efforts of both the Friends and the Recovery Team remain focussed on the priority actions detailed in this plan.

Explanation: The community group Friends of the Helmeted Honeyeater plays an extremely important role in revegetation works, community education and publicity, particularly in the Yellingbo district. Since 1989 it has been a major ally to Government agencies involved in the recovery effort and should be supported whenever possible.

Responsibility: Recovery Team.

7.5) Recruit, train and encourage specialist volunteers to assist the recovery program.

Explanation: During the course of this recovery effort volunteers have undertaken numerous valuable tasks. These include both field and office-based tasks such as monitoring of population numbers and dispersion, monitoring breeding success and re-introduction success, providing supplementary food for re-introduced birds, and data entry and database management. Each of these tasks is time-consuming and cannot be fully achieved by the Field

Ornithologist or keeping staff, but can be usefully addressed by suitably-trained volunteers. It is hoped that this contribution will continue.

Responsibility: Operations Group, Friends of the Helmeted Honeyeater and Threatened Bird Network.

References

- Ahern, L.D., 1982. Threatened wildlife in Victoria and issues related to its conservation. *Fisheries and Wildlife Paper, Victoria*, No. 27.
- ANZECC 1991. ANZECC List of Threatened Vertebrate Fauna, April 1991. Australian National Parks and Wildlife Service, Canberra.
- Backhouse, G.N., 1987. Management of remnant habitat for conservation of the Helmeted Honeyeater *Lichenostomus melanops cassidix*. Pp 287-294 in '*Nature Conservation: the role of remnants of native vegetation.*' Ed by D.A. Saunders, G.W. Arnold, A.A. Burbidge & A.J.M. Hopkins. Surrey Beatty & Sons, Sydney.
- Baker-Gabb, D. 1992. Action Statement No. 8. Helmeted Honeyeater *Lichenostomus melanops cassidix*. Department of Conservation and Environment, Melbourne.
- Baker-Gabb, D. 2002. Major project review of Helmeted Honeyeater *Lichenostomus melanops cassidix* recovery program 1999-2003. Unpublished report to Environment Australia and Department of Sustainability and Environment. Elanus P/L, St Andrews.
- Barrett, G. Freudenberger, D. and Nicholls, A. O. 2005. A template for threatened species management: learning from the Helmeted Honeyeater (*Lichenostomus melanops cassidix*). Unpublished report to Port Phillip and Western Port Catchment management Authority by CSIRO Sustainable Ecosystems, Canberra.
- Bartlett, L. J. 2003. Helmeted Honeyeater (*Lichenostomus melanops cassidix*) nest success: the effect of nest site and the identity of nest predators. BSc Hons thesis, Department of Zoology, The University of Melbourne.
- Bennetts, K., Cook, D. and Osler, D. 2006. Vegetation restoration plan, and baseline vegetation monitoring, for the degraded section of Cockatoo Swamp, Yellingbo Nature Conservation Reserve. Unpublished report to Melbourne Water. Australian Ecosystems Pty Ltd, Patterson lakes, Victoria.
- Blackney, J.R. & Menkhorst, P.W. 1993. Distribution of subspecies of the Yellow-tufted Honeyeater in the Yarra Valley region, Victoria. *Emu* 93: 209-213.
- Chambers, L. E., Quin, B. R., Menkhorst, P., Franklin, D. C. and Smales, I. 2008. The effects of climate on breeding in the Helmeted Honeyeater. *Emu* 108:15-22.
- CNR. 1995. Threatened fauna in Victoria - 1995. Department of Conservation and Natural Resources, Victoria.
- Cooper, R. P. 1967a. Is the Helmeted Honeyeater doomed? *Australian Bird Watcher* 3:1-13.
- Cooper, R. P. 1967b. A centenary review of the Helmeted Honeyeater. *Victorian Naturalist* 84: 215-220.
- Craige, N. M., Brizga, S. O. and Condina, P. 1998. Assessment of proposed works to ameliorate the effect of hydrological processes on vegetation dieback at Cockatoo

- Creek Swamp, Yellingbo Reserve. Unpublished Report to parks Victoria by Neil M. Craige Pty Ltd, Croydon.
- Cunningham, A. A. 1996. Disease risks of wildlife translocations. *Conservation Biology* 10: 349-353.
- Damiano, J. D. 1996. Microsatellite analysis of genetic variation within the Helmeted Honeyeater *Lichenostomus melanops cassidix* and between the related subspecies *L. m. gippslandicus* and *L. m. meltoni*. unpublished BSc Hons thesis, Department of Genetics and Human Variation, La Trobe University, Melbourne.
- Dare, A. 2003. Contrasting nesting behaviour in captive and wild populations of Helmeted Honeyeaters, *Lichenostomus melanops cassidix*. BSc Hons thesis, Department of Zoology, La Trobe University, Melbourne.
- DSE 2003. Advisory List of Threatened Vertebrate Fauna in Victoria, 2003. Department of Sustainability and Environment, Melbourne.
- Feodoroff-Walker, S. 1996. Nest attentiveness of the endangered Helmeted Honeyeater, *Lichenostomus melanops cassidix*. BSc Hons thesis, School of Botany, The University of Melbourne.
- Frankham, R., Hemmer, H., Ryder, O.A., Cothran, E.G., Soule, M.E., Murray, N.D. and Snyder, M. 1986. Selection in captive populations. *Zoo Biology*. 5: 127-138.
- Franklin, D. 1991. Helmeted Honeyeaters in the wild - the 1990/1991 breeding season. Unpublished report to the Helmeted Honeyeater Recovery Team.
- Franklin, D. & McCarthy, M., 1992. A cost/benefit analysis of protection of Helmeted Honeyeater nests. Unpublished report to the Helmeted Honeyeater Recovery Team.
- Franklin, D. & Smales, I.J. 1990. Helmeted Honeyeater - the 1989/90 Breeding Season. Unpublished report to Helmeted Honeyeater Recovery Team.
- Franklin, D., Smales, I., Miller, M. & Menkhorst, P. 1995. Reproductive biology of the Helmeted Honeyeater *Lichenostomus melanops cassidix*. *Wildlife Research* 22: 173-191.
- Franklin, D., Smales, I., Quin, B. and Menkhorst, P. 1999. Annual cycle of the Helmeted Honeyeater: a sedentary inhabitant of a predictable environment. *Ibis*. 141: 256-268.
- Gadsden, G. 2003. Nursery News. Friends of the Helmeted Honeyeater Newsletter 15(2): 7-8.
- Gadsden, G. & Ashby, M. 1995. Revegetation of habitat for the Helmeted Honeyeater *Lichenostomus melanops cassidix*, in the Yarra Valley. *The Victorian Naturalist* 112: 116-121.
- Garnett, S. 1992. Threatened and Extinct Birds of Australia. RAOU Report Number 82. Royal Australasian Ornithologists Union and Australian National Parks and Wildlife Service, Canberra.
- Garnett, S. T. and Crowley, G. M. 2000. The Action Plan for Australian Birds 2000. Environment Australia, Canberra.
- Granger, L., Kasel, S. & Adams, M. A. 1994. Tree decline in south eastern Australia: Nitrogen-reductase activity and indications of unbalanced nutrition in *Eucalyptus ovata* (Labill.) and *E. camphora* (R.T. Baker) communities at Yellingbo, Victoria. *Oecologia* 98: 221-228.
- Hayes, V. 1999. Genetic insights into the taxonomy and conservation of the Helmeted Honeyeater (*Lichenostomus melanops cassidix*) using microsatellites. BSc (hons) thesis, La Trobe University, Melbourne.

- Hyett, J. 1964. The present status of the Helmeted Honeyeater (*Meliphaga cassidix*). Victorian Ornithological Research Group Report Number 6. [reprinted in *VORG Notes* 12(1): 14-32.]
- Kasel, S. 1999. The decline of *Eucalyptus camphora* and *E. ovata* within Yellingbo State nature Reserve, Victoria. PhD thesis, School of Botany, The University of Melbourne.
- Kasel, S. 2001. Human and natural impacts in the Upper Yarra Region with reference to the Yellingbo Nature Conservation Reserve: a review. *The Victorian Naturalist* 118: 127-139.
- Lee, R. D. and Bryant, C. E. 1948. A count of Helmeted Honeyeaters. *Emu* 47: 230-231.
- Limongiello, N. and Keane, P. 1995. Progress report on an investigation into the cause of dieback of *Eucalyptus camphora* in Yellingbo Nature Reserve, November 1995. Unpublished report to Helmeted Honeyeater Recovery Team. School of Botany, La Trobe University, Melbourne.
- Mack, G. 1933. The Helmeted Honeyeater. *The Victorian Naturalist* 50: 151-156.
- McCarthy, M.A. 1995a. Population viability analysis of the Helmeted Honeyeater: risk assessment of captive management and reintroduction. Pp. 21-26 in 'Reintroduction Biology of Australian and New Zealand Fauna' Ed. by M. Serena. Surrey Beatty & Sons, Chipping Norton, New South Wales.
- McCarthy, M.A. 1995b. Stochastic population models for wildlife management. unpublished PhD thesis, School of Forestry, University of Melbourne.
- McCarthy, M.A. 1996. Extinction dynamics of the Helmeted Honeyeater: effects of demography, stochasticity, inbreeding and spacial structure. *Ecological Modelling* 85: 151-163.
- McCarthy, M.A., Franklin, D.C. & Burgman, M.A. 1994. The importance of demographic uncertainty: an example from the helmeted honeyeater. *Biological Conservation* 67: 135-142.
- McCarthy, M. A., Menkhorst, P. W., Quin, B. R., Smales, I. J. & Burgman, M. A. 2004. Helmeted Honeyeater (*Lichenostomus melanops cassidix*) in southern Australia: Assessing options for establishing a new wild population. In 'Species Conservation and Management' ed by Akcakaya, H. R., Burgman, M., Kindvall, O., Wood, C. C., Sjogren-Gulve, P., Hatfield, J. S. and McCarthy, M. A. Oxford University Press, New York.
- McMahon, A.R.G. & Carr, G.W. 1993. Strategy for restoration of habitat for the Helmeted Honeyeater, Yellingbo State Nature Reserve. Report to Department of Natural Resources and Environment. Ecological Horticulture Pty Ltd, Clifton Hill, Victoria.
- McMahon, A.R.G. and Franklin, D.C. 1993. The significance of Mountain Swamp Gum for Helmeted Honeyeater populations in the Yarra Valley. *The Victorian Naturalist* 110: 230-237.
- McMahon, A.R.G., Carr, G.W., Race, G.J., Bedgood, S.E. & Todd, J.A. 1991. The vegetation and management of the Yellingbo State Nature Reserve with particular reference to the Helmeted Honeyeater (*Lichenostomus melanops cassidix*). Report to Department of Conservation and Environment. Ecological Horticulture Pty Ltd, Clifton Hill, Victoria.
- Menkhorst, P. 2006. Action Statement Number 8 (revised), Helmeted Honeyeater *Lichenostomus melanops cassidix*. Department of Sustainability and Environment, Melbourne.
- Menkhorst, P. & Middleton, D. 1991. Helmeted Honeyeater Recovery Plan. Department of Conservation and Environment, Victoria.

- Menkhorst, P. Smales, I. and Quin, B. 1999. Helmeted Honeyeater Recovery Plan, 1999-2003. Department of Natural Resources and Environment, Melbourne.
- Meyer, R. 2005. Determining the optimal captive management of the Helmeted Honeyeater (*Lichenostomus melanops cassidix*) using stochastic dynamic programming. MSc thesis, School of Botany, The University of Melbourne.
- Miller, M. 1995. Husbandry manual for the Yellow-tufted Honeyeater *Lichenostomus melanops*. Zoological Parks and Gardens Board, Victoria, Australia.
- Mitchell, S. 2001. The Helmeted Honeyeater (*Lichenostomus melanops cassidix*): Managing the Gene Pool using Microsatellites. BSc Hons. thesis, Department of Genetics, La Trobe University, Melbourne.
- Mitchell, S. 2006. Woori Yallock Creek Sub-catchment Biodiversity Local Area Plan: Conserving the natural habitat. Department of Sustainability and Environment, Box Hill.
- Moysey, E. 1997. A study of resource partitioning within the Helmeted Honeyeater *Lichenostomus melanops cassidix* during the non-breeding season. *Emu* 97: 207-219.
- Parks Victoria, 1998. Bunyip State Park Management Plan. Parks Victoria, Melbourne.
- Parks Victoria, 2004. Yellingbo Nature Conservation Reserve Management Plan. Parks Victoria, Melbourne.
- Pearce, J. 1997. The delineation and prediction of habitat, with particular reference to the endangered Helmeted Honeyeater. PhD thesis, University of Melbourne.
- Pearce, J. 2000. Mountain Swamp Gum *Eucalyptus camphora* at Yellingbo State Nature Reserve: Habitat use by the endangered Helmeted Honeyeater *Lichenostomus melanops cassidix* and implications for management. *The Victorian Naturalist* 117: 84-92.
- Pearce, J., Burgman, M.A. & Franklin, D. 1994. Habitat selection by Helmeted Honeyeaters. *Wildlife Research* 21:53-63.
- Pearce, J., Menkhorst, P. & Burgman, M.A. 1995. Niche overlap and competition for habitat between the Helmeted Honeyeater and the Bell Miner. *Wildlife Research* 22: 633-646.
- Pearce, J.L. and Minchin, P.R. 2001. Vegetation of the Yellingbo Nature Conservation Reserve and its relationship to the distribution of the helmeted honeyeater, bell miner and white-eared honeyeater. *Wildlife Research* 28(1): 41 – 52.
- PPWPCMA. 2004. Port Phillip and Western Port Regional Catchment Strategy, 2004-2009. Port Phillip and Western Port Catchment Management Authority, Frankston.
- Quin, B. 2003. Out in the Field: Population monitoring report. *Friends of the Helmeted Honeyeater Newsletter* 15(1): 6.
- Ralls, K. & Ballou, J. 1986. Captive breeding programs for populations with a small number of founders. *TREE* 1: 19-22.
- Runciman, D., Franklin, D. & Menkhorst, P.W. 1995. Movements of the Helmeted Honeyeater during the non-breeding season. *Emu* 95: 111-118.
- Schodde, R. and Mason, I. J. 1999. The Directory of Australian Birds: Passerines. CSIRO Publishing, Melbourne.
- Smales, I. J. 2004. Population ecology of the Helmeted Honeyeater *Lichenostomus melanops cassidix*: Long-term investigations of a threatened bird. MSc thesis, School of Botany, The University of Melbourne.

- Smales, I., Menkhorst, P. & Horrocks, G. 1995. The Helmeted Honeyeater recovery program: a view of its organisation and operation. Pp 35-44 in 'People and Nature Conservation: Perspectives on Conservation on Private Land and Endangered Species Recovery'. *Transactions of the Royal Zoological Society of New South Wales*.
- Smales, I.J., Craig, S.A., Williams, G.A. & Dunn, R.W. 1990. The Helmeted Honeyeater: decline, conservation and recent initiatives for recovery. Pp. 225-238 in *Management and Conservation of Small Populations*. Eds T.W. Clark & J.H. Seebeck. Chicago Zoological Society, Chicago.
- Smales, I., Miller, M., Middleton, D. & Franklin, D. 1992. Establishment of a captive-breeding programme for Helmeted Honeyeaters *Lichenostomus melanops cassidix*. *International Zoo Yearbook* 31:57-63.
- Smales, I., Quin, B., Krake, D., Dobrozczyk, D. and Menkhorst, P. 1999. Completing the cycle: Re-introduction to the wild of captive-bred Helmeted Honeyeaters *Lichenostomus melanops cassidix*. Proceedings of 1999 conference of the Australasian Regional Association of Zoological Parks and Aquaria, Alice Springs.
- Smales, I., Quin, B., Krake, D., Dobrozczyk and Menkhorst, P. 2000. Reintroduction of Helmeted Honeyeaters *Lichenostomus melanops cassidix*, Australia. *Reintroduction News* 19:34-36.
- Species Survival Commission, 2001. IUCN Red List Categories and Criteria, Version 3.1. IUCN – The World Conservation Union, Gland, Switzerland.
- Stephens, L. 2001. Estimating the Effective Population Size of the Helmeted Honeyeater *Lichenostomus melanops cassidix*. BSc Hons. thesis, Department of Genetics, La Trobe University, Melbourne.
- Turner, V. 2003. Flora and Fauna Guarantee Action Statement Number 130: Sedge-rich *Eucalyptus camphora* Swamp. Department of Sustainability and Environment, Melbourne.
- Woinarski, J. C. Z. and Wykes, B. J. 1983. Decline and extinction of the Helmeted Honeyeater at Cardinia Creek. *Biological Conservation* 27: 7-21.
- Wykes, B. J. 1985. The Helmeted Honeyeater and related honeyeaters of Victorian woodlands. Pp 205-217 in *Birds of Eucalypt Forests and Woodlands: Ecology, Conservation and Management*. Ed by A. Keast, H.F. Recher, H. Ford and D. Saunders. Surrey Beatty & Sons, Sydney.

Duration and Cost Of Recovery Plan

Priority, Feasibility and Estimated Costs (\$x1000) of Recovery Actions

Note that Actions 1.1 and 1.2 are undertaken by the Field Ornithologist and costs are covered within Action 7.3.

Action 3.2 is a catchment-wide, un-costed program which, while highly desirable, is outside the scope of this recovery plan – it is included here to emphasise the importance of a catchment-wide perspective.

Action 4.2 is a component of captive management and its costs are covered in the costings for Action 4.1.

Action	Description	Priority	Feasibility	Cost estimate					Total
				Year 1	Year 2	Year 3	Year 4	Year 5	
1	Wild population management								
1.3	Biannual PVA	1	90%	0	10	0	10	0	20
1.4	Control Bell Miners	1	75%	5	5	5	5	5	25
1.5	Study Bell Miner control at landscape scale	2	75%	0	27	27	27	0	81
1.6	Re-introduction strategy	1	90%	7	0	0	0	0	7
1.7	Reinforce Bunyip population	1	90%	48	48	50	50	50	246
1.8	Quarantine protocol	1	100%	2	0	0	0	0	2
2	Landscape and vegetation management								
2.1	Inter-agency liaison	1	85%	2.5	2.5	2.5	2.5	2.5	12.5
2.2	Implement Action Statement Number 130	2	70%	10	10	10			30
2.3	Habitat Suitability Index	2	75%	0	4	0	0	0	4
2.4	Review revegetation strategy	2	100%	5	0	0	0	0	5
	Support FoHH revegetation work	1	100%	3	3	3	3	3	15
2.6	Research eucalypt dieback	1	75%	0	25	25	25	0	75
2.7	Research E. camphora regeneration	2	75%	0	25	25	25	0	75
2.8	Review regional fire plan	1	100%	1	0	0	0	0	1
2.9	Develop fire response plan	1	90%	2	0	0	0	0	2

3	Stream management								
3.1	Streamflow management plan	1	100%	0	5	0	0	0	5
3.3	Re-establish flood regime	1	75%	0	50	0	0	0	50

<i>Action</i>	<i>Description</i>	<i>Priority</i>	<i>Feasibility</i>	<i>Cost estimate</i>					<i>Total</i>
				Year 1	Year 2	Year 3	Year 4	Year 5	
4	Captive management								
4.1	Maintain captive population	1	100%	165	165	165	170	170	835
4.3	Review emergency contingency plan	2	100%	2	0	0	0	0	2
4.4	Update captive husbandry manual	2	100%	5	0	0	0	0	5
5	Genetic management								
5.1	Review genetic studies and understandings	1	100%	8					8
5.2	Track genealogies	1	75%	7.5	7.5	7.5	8	8	38.5
5.3	Maintain heterozygosity	1	75%	7.5	7.5	7.5	8	8	38.5
5.4	Estimate Ne	1	75%	4	4	4	5	5	22
6	Public Awareness								
6.1	Increase media exposure	1	100%	2	2	2	2	2	10
6.2	Support FoHH public education program	2	75%	2	2	2	2	2	10
6.3	Review and update websites	2	100%	1		1		1	3
6.4	Government and community liaison	1	100%	10	10	10	12	12	54
6.5	Helmeted Honeyeater exhibit	2	80%	20	8	8	8	8	52
7	Effective Administration								
7.1	Recovery Team administration	1	100%	36	36	36	36	36	180
7.2	Operations Group admin.	1	100%	20	20	20	20	20	100
7.3	Employ field ornithologist	1	100%	95	95	95	98	98	481
7.4	Support Friends Group	1	100%	3	3	3	3	3	15
Totals				473.5	574.5	508.5	519.5	433.5	2509.5

