INTERIM RECOVERY PLAN NO. 18

DIBBLER, *PARANTECHINUS APICALIS*, INTERIM RECOVERY PLAN

1998-2000

by

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for the Dibbler Recovery Team

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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in the Department of Conservation and Land Management (CALM) Policy Statements Nos 44 and 50.

Where urgency and/or lack of information mean that a full Recovery Plan can not be prepared, IRPs outline the recovery actions required urgently to address those threatening processes most affecting the ongoing survival and begin the recovery process of threatened taxa or ecological communities.

CALM is committed to ensuring that critically endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

The Director of Nature Conservation on 25 September 1998 approved this IRP. Approved IRPs are subject to modification as dictated by new findings, changes in status of the taxon or ecological community and the completion of recovery actions. The provision of funds identified in this IRP is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at June 1998.

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SUMMARY

The Dibbler, *Parantechinus apicalis* (Gray, 1842): Marsupialia: Dasyuridae.

CALM Regions	Midwest (Moora District), South Coast (Albany and Esperance Districts)	
Shires	Albany, Dandaragan, Esperance, Gnowangerup, Ravensthorpe	
Recovery Team	**Organisation**	**Position**
	CALM SID	Supervising Scientist, Dibbler Project
	CALM WATSCU	Director of WATSCU
	CALM South Coast Region	Leader, Nature Conservation Program
	CALM Midwest Region	Senior Ranger, Moora District
	South Coast Community	South coast resident
	Jurien Community	Jurien resident
	Environment Australia	representative
	Perth Zoo	Director of Research
	University of WA	Lecturer & Research supervisor
	Pat Woolley (La Trobe University)	Corresponding Member ~ dibbler expert
	Chris Dickman (University of Sydney)	Corresponding Member ~ dibbler expert
Current Status	**Endangered** (ANZECC 1991; Action Plan for Australasian Marsupials and Monotremes; Commonwealth Endangered Species Protection Act). "Fauna that is likely to become extinct or is rare" Western Australian *Wildlife Conservation Act 1950*.	
Habitat requirements	Little known but most mainland records are from long unburned heath or mallee heath. Island habitat may not be typical of recent mainland habitat. Apparently absent from high rainfall areas	
IRP objectives	2.1 Protect known populations and attempt to locate (and, if successful, protect) other populations 2.2 Breed captive animals and establish a new island population from their progeny 2.3 Acquire knowledge needed to write a full Recovery Plan.	
Success Criteria	3.1 Known populations persist: Dibblers are caught at three or more sites in FRNP each year and no less than six sites over three years. Populations on Boullanger and Whitlock Islands remain at no less that 40% of 1997 numbers, even in years when there is a male die-off after mating. 3.2 Where populations are known to occur, threatening processes are managed: Fire, feral predators and dieback disease are managed in FRNP in accordance with the prescriptions in the FRNP Management Plan and, in the case of feral predators, Western Shield. On Boullanger and Whitlock Islands, research and management actions prescribed in this IRP are undertaken. 3.3 Surveys aimed at locating dibblers will be undertaken in Cape Arid NP and in CALM's Moora District and additional populations, if found, will be protected. 3.4 At least 50% of adult females held in captivity during the breeding season produce young and at least 50% of the progeny are reared to maturity. 3.5 A new, island population is established by translocation of captive-bred dibblers 3.6 A full Recovery Plan is written by December 2000	
Recovery Actions	5.1 Monitor island and accessible mainland populations 5.2 Search for new mainland populations 5.3 Research and prevent or control potential threatening processes 5.4 Establish and maintain captive breeding colonies 5.5 Use the progeny of the captive colonies to establish a new island population 5.6 Research the genetic and taxonomic status of island *vs* mainland populations 5.7 Promote public involvement in dibbler conservation and the activities of the Recovery Team 5.8 Encourage care and discourage threatening activities through public education and advice to land managers 5.9 Support post-graduate and other external research relevant to dibbler recovery and, if necessary, appoint a scientist to implement research actions	

Budget

Budget	Year 1 1998	Year 2 1999	Year 3 2000
Actions	Total Cost	Total Cost	Total Cost
5.1			
5.2	10 000	10 000	10 000
5.3	115 500	115 500	115 500
5.4	55 000	55 000	55 000
5.5	61 000	56 000	56 000
5.6	2 000		
5.7			
5.8	3 000	3 000	3 000
5.9	38 000	38 000	38 000
TOTAL	284 500	277 500	277 500

1. BACKGROUND

1.1. History and taxonomic status

Gray described the dibbler, *Parantechinus apicalis* (Marsupialia, Dasyuridae), from a purchased specimen "doubtless from Australasia" (Gray 1842). Ride (1970) states that Gilbert first collected it in 1838 in the vicinity of Moore River near the present town of New Norcia but Gilbert did not visit the Moore River until August 1842 (Whittell 1942). Gilbert also collected dibblers near Wanneroo (just north of Perth) and at "King George's Sound". He recorded Aboriginal names including 'Dib-bler' used at King George Sound and wrote notes for Gould who used them extensively in his text for *The Mammals of Australia* (Gould 1863)

Several other early collectors obtained specimens but recorded little about the animals. Morcombe (1967) provides a summary. Tunney at Gracefield, near Kojonup, took the last (of which Morcombe was unaware) on 3 July 1904. It is in the Dublin Museum (Fisher 1998). Thereafter the dibbler was presumed to have become extinct. However, in 1967 photographer Michael Morcombe caught two in traps set for honey possums on *Banksia attenuata* blooms at Cheyne Beach (= Hassell Beach), east of Albany on the south coast of WA (Morcombe 1967).

Between 1967 and 1995 dibblers were recorded sporadically on the south coast from Torndirrup National Park near Albany (Smith 1990) to Jerdacuttup near Hopetoun (Woolley 1977, 1980). Most locations were within Fitzgerald River National Park (FRNP) (Chapman and Newby 1995). In 1985 dibblers were found on two small islands, Boullanger (25.9 ha) and Whitlock, (about 8 ha) off Jurien, a fishing and holiday town about 200 km north of Perth (Fuller and Burbidge 1987).

In 1995, with support from Environment Australia, implementation of a recovery Research Project was commenced. In the first year, actions concentrated on re-surveying previous locations and searching for new populations. Dibblers were only found in FRNP. In 1996, actions focused on the biology of a population in FRNP. The animals proved difficult to study, but it was concluded the species was relatively secure in the National Park. Western Shield (a program to control feral predators in south western Australia Anon; 1996a, Bailey 1996) and a Management Plan (Moore *et al*. 1991) address the perceived threatening processes. Therefore, in 1997, the last year of the research plan's life, the emphasis moved to the populations on Boullanger and Whitlock Islands where several potential threats were identified (Baczocha and Start 1997).

No subspecies of *Parantechinus apicalis* have been described. However, animals on the islands are substantially smaller than those on the south coast. It has been suggested (but is unlikely) they may warrant recognition as a distinct taxon. A survey of allozymes at 46 loci found no genetic differences between island and mainland forms and no allozyme variation within the Boullanger Island population (Cooper and Birrell 1996). However, low levels of allozyme variation between species have been reported for dasyurids by Baverstock *et al*. (1984). More recent attempts to examine the genetic relationship between island and mainland populations using mtDNA were hampered by technical problems (Cooper and Birrell 1996). Lynam (1987) commented on the genetic relationship of island populations but

his conclusions are questionable (Adams[1] personal communication in Baczocha and Start 1997).

It is significant that the island populations occur about 600 km north of the south-coast populations and the two groups are exposed to substantial differences in climate and habitat. The Recovery Team believes it is important to dibbler recovery that both south coast and west coast island populations are recovered, and that the genetic and taxonomic issues are resolved.

1.2. Distribution and habitat

At the time of European settlement the dibbler seems to have been endemic to parts of the (modern) wheatbelt of WA. Old South Australian and Queensland records are apparently erroneous (Flannery *et al*. 1990). Jones (1968), in his review of the mammals of South Australia in the 1920s, does not mention dibblers, however the species occurs in sub-fossil deposits on the Eyre Peninsula in South Australia (Baynes 1984). In Western Australia, it is known from sub-fossil deposits between Shark Bay and Israelite Bay and as far inland as Peak Charles (Baynes 1990, Baynes[2] personal communication in Baczocha and Start 1997) but it may have contracted from more arid areas before Europeans arrived. Significantly, it is not known from the extensive sub-fossil records in the largely forested south west corner of the State between Perth and Albany (Lundelius 1957, Archer and Baynes 1973, Baynes personal communication in Baczocha and Start 1997).

Since 1995 dibblers have only been caught on Boullanger and Whitlock Islands and in FRNP. They may persist at other south coast locations between Torndirrup National Park and Jerdacuttup, although none were caught during surveys in 1995 (Baczocha and Start 1997). There have been unconfirmed sightings on the mainland in the vicinity of Jurien and there are extensive areas of heath and other natural vegetation types in which they may persist north of Perth. There are also extensive areas of heath and mallee-heath in Cape Arid National Park and the Nuytsland Nature Reserve, which are, in part at least, within the sub-fossil range of the species.

BIOCLIM analysis by C. R. Dickman (unpublished data) suggests that, in WA, dibblers may have been widespread coastally and for some distance inland between Albany and Israelite Bay. Elsewhere there were small, scattered patches of potential habitat, particularly north east of Albany and on the west coast north of Perth. Not surprisingly, the prediction corresponded closely with the specimen-based knowledge of dibbler distribution but indicated that dibblers may occur in Cape Arid National Park where there are large areas of habitat with a similar profile to that in which dibblers occur in FRNP. The BIOCLIM analysis also indicated large areas, which may have provided suitable habitat in South Australia. Land clearing and other disturbances have affected most of the latter.

1.3. Biology and ecology

Prior to the recovery Research Project, there was scant information on the biology of dibblers. Gilbert's notes included information obtained from Aboriginal people about nests (Gould 1863). The label on the Gracefield specimen collected by Tunney states 'in hollow log' (Fisher personal communication). Some habitat data have been gleaned from post-1967 mainland sites.

[1] Dr. Mark Adams - Evolutionary Biology Unit, South Australian Museum.
[2] Dr. Alex Baynes, WA Museum.

Morcombe (1967) recorded his observations of dibblers from Cheyne Beach. He reported they were semi-arboreal with some dependence on large flowers for nectar and insects. They preferred dense stands of *Banksia*-dominated heath with a thick litter layer through which they moved. His specimens, and a later one found by George Duxbury (Muir 1985), all came from long-unburnt vegetation. This led to the assumption that dibblers are restricted to old vegetation and that frequent or extensive fire is a serious threat to their survival. Chapman and Newby (1995) supported the assumption. However Baczocha found a population in relatively young vegetation (approximately 10 years post fire). The significance of the vegetation age in dibbler habitat and the ability of dibblers to use fire edges remain unclear. Nevertheless, most specimens that can be associated with the habitat in which the animals were living have come from thick heath or mallee-heath that was at least 10 years old (or from close by). Most have been found on sandy substrates but animals caught in 1995 and 1996 on Thumb Peak, FRNP, by Sarah Barrett and Natasha Baczocha respectively, were trapped on more shallow, lateritic soils supporting open vegetation (Baczocha and Start 1997).

Dibbler habitat on Boullanger and Whitlock Islands is very different from that on the south coast, particularly in its floristic composition. However, it may have changed considerably since the islands were formed and may not be a useful guide to optimum modern dibbler habitat on the west coast mainland.

Lynam (1987) examined aspects of inbreeding and juvenile dispersal of the island populations. He suggested that reduced genetic variation and developmental instability (indicated by significant morphological asymmetry) were important factors limiting these populations. He ascribed the persistence of dibblers on the islands to an absence of environmental perturbations such as habitat destruction and fire. However, the environment is certainly harsh and has been disturbed by humans and, to a greater extent, by burrowing seabirds. The latter may be important and beneficial as dibblers will live and/or forage in the seabird burrows and the birds import nutrient. Furthermore, there are large populations of *Mus domesticus* and several weed species on the islands. These may have adverse effects. Although dibblers will occasionally eat the mice (Dickman 1986) they are not a common diet item (McCulloch 1998). Weeds have not extensively replaced native plants.

Dickman examined aspects such as population dynamics and the effects of *Mus* removal, reproduction, genetic structure and parasite loads during a three year study of the island populations. Most of his data are as yet unpublished (Dickman personal communication cited in Baczocha and Start 1997).

Woolley (1971, 1991) has examined aspects of their reproductive biology using captive animals. Dibblers breed in autumn (unlike related species which breed in late winter to spring) and produce up to eight young. There is some evidence of promiscuous matings (Dickman 1988). On the islands Dickman and Braithwaite (1992) observed a post-mating male die-off in three consecutive years but this is not always the case (Woolley 1991, Baczocha and Start 1997, McCulloch 1998). Males in a population in FRNP were also able to bred in at least two successive years (Baczocha and Start 1997) and wild-caught animals in Perth Zoo have survived to the onset of a second breeding season in captivity. The life history strategy of dibblers may be quite variable, both between populations and between years within any one population. The breeding biology is the subject of a current PhD research program.

1.4. Threatening processes

Threatening processes that the Recovery Team has recognised are:
Feral Predators. Cats are known to take dibblers (Woolley 1977) and foxes probably do so. Feral cats and foxes are present throughout the mainland distribution of dibblers. They are not present on the islands but the possibility of introduction can not be ignored. It would pose a serious threat.
Fire. The islands have not been burned in recent time and mainland habitats in which dibblers have been found have not been burned for at least ten years and usually much older. Frequent or extensive fire in dibbler habitat must be considered a threat.
Dieback disease. Dieback disease caused by *Phytophthora* spp. can extensively alter the structure and floristic composition of many heath and mallee-heath communities. Most of the habitats in which dibblers have been recorded on the south coast are probably very susceptible to the diseases. The effect of disease-induced changes on dibblers is unknown but dieback must be considered a potential threat. The highly calcareous soils of the islands are not conducive to *Phytophthora* and the dominant flora species are not known to be highly susceptible to the diseases. The potential threat is less critical on the islands.
House mice. Mice are abundant on Boullanger and Whitlock Islands. Dibblers are known to eat mice occasionally (Dickman 1986) but McCulloch (1998) did not detect mice in their diets. Dibblers and mice have co-existed for at least twelve years, since 1985 (Fuller and Burbidge 1987). However, interaction between mice and resources used by dibblers is unknown and the effect of this introduced rodent on the long-term viability of dibblers will be treated as a potential threat.
Human disturbance. Since European settlement, humans have probably had a catastrophic effect on dibblers through land clearing, introduction of feral animals weeds and pathogens, and modified burning practices. Humans still pose threats to mainland populations through use of fire and, perhaps, the spread of plant disease. On the islands the potential threats include introduction of feral predators and weeds, mis-use of fire, and activities that might cause breeding seabirds to abandon the islands.

1.5. Conservation status

The dibbler is classified **'Endangered'** by ANZECC (1991), the Commonwealth *Endangered Species Protection Act*, and the Action Plan for Australasian Marsupials and Monotremes (Maxwell *et al*. 1996). In Western Australia it is declared by the Minister to be **"Fauna that is likely to become extinct or is rare"** under the Western Australian *Wildlife Conservation Act 1950*. .

1.6. Recovery strategy

1.6.1. Recovery Plans and Recovery Teams

The recovery of dibblers will be a three-stage process. The first was the implementation of a Research Plan, which concluded at the end of 1997. The next stage will be guided by this Interim Recovery Plan (IRP) which will be effective until December 2000. An objective of this IRP is to write a full Recovery Plan by December 2000. Its implementation will be the third phase.

The IRP identifies:
- further knowledge needed for a full Recovery Plan and
- actions necessary to protect the species in the interim.

The Recovery Team that has overseen the implementation of the Research Plan from 1996

and the preparation of this IRP will implement the IRP. The plan and membership of the Team need to be sufficiently flexible to respond to changing circumstances. The Director of Nature Conservation has endorsed the present Recovery Team membership. At the end of 1998 team membership came from CALM, the South Coast Community, the Jurien Community, Perth Zoo, University of Western Australia, Environment Australia and two corresponding members from La Trobe University and the University of Sydney were appointed for their expertise in dibbler biology

1.6.2. Research

The research component offers good opportunities for post-graduate students. This will be encouraged and materially supported where the work is relevant to the implementation of the IRP. One post-graduate research project will be current when the IRP implementation commences in 1998. This is the second year of a PhD project addressing breeding systems of captive and wild dibblers.

A student for a Graduate Diploma of Natural Resource Management (McCulloch 1998) conducted a study of dibbler demography and habitat use on the islands.

Where necessary, a research scientist may also be appointed.

1.6.3. Management actions. Many management actions that will benefit recovery of dibblers are in place and others are addressed in Section 3.

1.7. AEEC approval

All work involving the handling of live dibblers will be subject to approval by an Animal Experimentation Ethics Committee (AEEC). The CALM, Perth Zoo and University of Western Australia AEECs are properly constituted in accordance with the NH&MRC guidelines.

2. OBJECTIVES

2.1 Protect known populations and attempt to locate (and, if successful, protect) other populations.
2.2 Breed captive animals and establish a new island population from their progeny.
2.3 Acquire knowledge needed to write a full Recovery Plan.

3. CRITERIA FOR SUCCESS

3.1 Known populations persist: Dibblers are caught at three or more sites in FRNP each year and no less than six sites over three years: Populations on Boullanger and Whitlock Islands remain at no less that 40% of 1997 numbers, even in years when there is a male die-off after mating.
3.2 Where populations are known to occur, threatening processes are managed: Fire, feral predators and dieback disease are managed in FRNP in accordance the prescriptions in the FRNP Management Plan and, in the case of feral predators, Western Shield. On Boullanger and Whitlock Islands, all research and management actions prescribed in this IRP are undertaken.
3.3 Surveys aimed at locating dibblers will be undertaken in Cape Arid NP and in CALM's

Moora District and additional populations, if found, will be protected.

3.4 At least 50% of adult females held in captivity during the breeding season produce young and at least 50% of the progeny are reared to maturity.

3.5 A new, island population is established by translocation of captive-bred dibblers.

3.6 A full Recovery Plan is written by December 2000.

4. CRITERIA FOR FAILURE

4.1 Island populations decline below 40% of 1997 numbers.

4.2 Dibbler populations on the mainland or the islands decline from manageable threats identified in this IRP or recognised through research prescribed in this IRP.

4.3 Failure to write a Recovery Plan by December 2000.

4.4 Failure to breed from >50% of adults brought in to captivity or to rear >50% of young born in captivity.

Natural, unavoidable catastrophes, including wildfire, do occur. Loss of wild populations from such causes, where all reasonable precautions had been taken, should not be seen as failure to implement the IRP.

5. RECOVERY ACTIONS

5.1. Monitor island and known, accessible mainland populations

Chris Dickman has intensively studied the populations on Whitlock and Boullanger Islands. Dickman's data have not been published but are available and provide one baseline against which the island populations can be monitored. Under the 1995-97 Research Plan the island populations were monitored in 1995 and 1996 and have been subject to an extensive trapping program through 1997 as part of post-graduate research projects investigating aspects of dibbler demography and habitat use (McCulloch 1998 and Mills[3] unpublished). McCulloch's study suggests population of about 80 dibblers on Whitlock Island and 100 dibblers on Boullanger Island. All animals caught in 1997 have been marked with Trovan passive implanted transponders (PITs).

While student research programs continue, dibblers on both islands will be closely monitored. When research no longer requires regular trips to the islands, they will be monitored at least twice per year by CALM and new animals will be marked with PITs.

Western Shield's monitoring program will involve trapping in several areas where dibblers have been recorded, including FRNP. Any dibbler captures will be reported to the Recovery Team. Additional trapping will be undertaken by CALM at a representative sample of sites where dibblers have been caught since 1990. Unless there are grounds for concern that dibblers may have declined, not all sites in FRNP will be trapped each year. The selection of sites will depend on accessibility, hygiene requirements, and events such as fire. New populations located outside FRNP will be monitored at least annually.

Responsibility: Recovery Team through CALM
Cost: Incorporated into Action 5.9
Participants: CALM, University of WA

[3] Harriet Mills. PhD student, University of Western Australia.

5.2. Search for new mainland populations

Western Shield's monitoring program will involve trapping in several areas where dibblers may occur, including parts of FRNP where dibblers have not yet been recorded, and Cape Arid National Park. Any dibbler captures will be reported to the Recovery Team.

In Cape Arid National Park there are large areas of habitat with a similar profile to that where dibblers occur in FRNP. Samples of these habitats will be surveyed for dibblers using traps or hair-tubes. Selection of sites will be determined on a reconnaissance trip unless fortuitous observations provide new leads.

There are unconfirmed reports of dibbler sightings on the mainland near Jurien and there are large areas of heath in coastal and adjacent landscapes, which may support dibblers. Samples of these habitats will be surveyed for dibblers using traps or hair-tubes. Selection of sites will be determined on a reconnaissance trip, taking into account of the reported sightings, unless fortuitous observations provide new leads.

Dibblers have very distinctive hairs (Valente and Woolley 1982). Use of hair-tubing methods, adapted to target dibblers, may be a cost effective alternative to trapping as a survey method. Advantages include the number of tubes *vs* traps that can be managed simultaneously and release from the need to check traps daily. This provides more versatility in areas where risks of spreading *Phytophthora* prevents access when the soil is wet and allows many sites to be worked simultaneously. It is not suitable for study of individuals or populations because animals can not be handled or individually recognised. However, dibbler sites located by hair-tubing could subsequently be studied by other methods.

Responsibility: Recovery Team through CALM
Cost: $10 000 per year
Participants: CALM (Supervising Scientist, South Coast and Midwest Regions)

5.3. Research and prevent or control potential threatening processes

5.3.1. Islands

Feral predators. At present there are no feral predators on the islands, which are Nature Reserves. Taking non-indigenous animals onto Nature Reserves is prohibited. There is a low risk of vandals intentionally introducing feral predators, including foxes, but a higher risk of unintentional introduction of rats, cats or dogs. Researchers and CALM officers visiting the islands will be alert for signs of feral mammals. Any indication that feral mammals are present will be treated as an emergency and eradication will take priority as an urgent action. Taking pets to the islands will be discouraged and the risks of feral mammals being introduced will be highlighted through public education (See Section 5.8.)

Fire. The fire history of the islands is unknown but they appeared long-unburned in 1985 (P. J. Fuller personal communication). No fires have been reported since then. Low litter accumulation, salt-laden winds, many succulent plant species, relatively high humidity and absence of human residents contribute to a relatively low fire risk. However, if fire occurred on either island, particularly during summer, it is possible that most of the vegetation could be burnt. Because dibblers can shelter in seabird burrows immediate mortality may not be

high. However loss of food and/or increased exposure to the elements and predation could cause many subsequent deaths.

There is a Fire Contingency Plan for Boullanger and Whitlock Islands. It was written to protect dibblers and Boullanger Island dunnarts (Anon. 1996b). There will be no prescribed fires on either island and wildfire will be extinguished if possible. The plan will remain current until it is revised or superseded by an area management plan, which includes the islands. In either case the Recovery Team will be consulted.

If a significant part of either island is burnt some of the dibblers may be taken into captivity. The number will be determined at the time and will depend on an assessment of the risk of mortality to animals surviving the fire. This will be treated as an emergency.

House mice. The interactions between dibblers and mice are not known. They have co-existed since at least 1985 (Fuller and Burbidge 1987). Decisive competition may occur under extreme stress from events such as drought or fire that have not yet been experienced. Alternatively, mice may induce gradual change over long periods, eg. by preventing recruitment of long-lived plants that are important to dibblers. Plants comprise a significant part of dibbler diets (McCulloch 1998). Interactions and competitive resource requirements will be researched. The recipient island for translocation will be mouse-free (see 5.5).

Seabirds. Dibblers frequently enter seabird burrows for periods ranging from minutes to hours, suggesting they forage and shelter in them (McCulloch 1998). However, their level of dependence on the burrows is not known. There have been suggestions that the number of burrowing seabirds using Boullanger Island has decreased. However a recent inspection found that white-faced storm petrels are abundant. Their small burrows collapse more readily than those of larger wedge-tailed shearwaters. As the latter is the common burrowing seabird on other islands, the suggested decline is probably not true. The use of seabird burrows by dibblers will be researched and the stability of the seabird population will be monitored. If dibblers depend on the burrows for shelter and the seabird population is declining, suitable artificial burrows may provide an alternative.

Weeds. Weeds are not threatening significant changes to the floristic composition or structure of the island vegetation at present. No plants will be knowingly introduced and new invasions will be eradicated if possible. The impact of weeds on island vegetation will be re-assessed if the *status quo* changes.

Human disturbance. See 5.8.

5.3.2. Mainland

Feral Predators. Foxes are controlled under CALM's predator control program, Western Shield, in Cape Arid, Torndirrup and Fitzgerald River National Parks and other areas where dibblers may occur on CALM-managed land. This will be ongoing. Development of methods for broad-area cat control is also supported by CALM. Cats will be controlled where they may threaten dibblers when the technology and necessary resources are available. If new dibbler populations are discovered in areas not covered by Western Shield, feral predator control measures will be initiated if practical.

Fire. The FRNP Management Plan (Moore *et al.* 1991) takes into account the requirement of

several threatened fauna species, including dibblers. It provides for protection of long-unburned vegetation. The Plan is in force until 2001, beyond the life of this IRP. However discussion in advance of its revision may occur during the life of this IRP, in which case the Recovery Team will seek input. In areas managed by CALM where there are no current management plans, management generally follows the principle of maintaining the *status quo*, including areas of long-unburned vegetation. Departure from this principal may be approved where managers demonstrate the need for 'Necessary Operations'. The Recovery Team will liaise with managers of other areas where dibblers are found to ensure that unburned areas are retained.

Dieback diseases. The FRNP Management Plan (Moore *et al.* 1991) prescribes measures to prevent the spread of *Phytophthora*. CALM is researching aerial application of phosphite for the control of dieback disease. Experimental areas include sites in the portion of FRNP that contains dibblers. Cost may limit the extent to which the new technology can be applied when it is operational. If dibblers are found on areas not managed by CALM but threatened by dieback, the managers will be encouraged to prevent infection or control the disease.

Human disturbance. See 5.8

5.3.3. Other Threats.

If other threats are identified, the Recovery Team will determine appropriate control actions and implement them if practical.

Responsibility:	Recovery Team through CALM
Costs:	$115 500 + costs in 5.9
Participants:	CALM and, perhaps, other parties as appropriate if new threats are identified

5.4. Establish and maintain captive breeding colonies

Two pairs of dibblers from Boullanger Island and two from Whitlock Island were brought into captivity at Perth Zoo in 1997. Three females gave birth and nineteen young have been raised. The fourth female died. All males survived the breeding season and are healthy. Husbandry techniques, which maintain healthy adults and allow captive-bred young to mature, have been developed.

Two litters were probably conceived in the wild but the third may have been conceived in captivity. However the hormonal build-up that precedes breeding would have occurred in the wild. Woolley (1971) raised young that had been conceived in the wild but they did not breed, possibly because their spermatogenesis and oestrus cycles were asynchronous

A 3 year PhD project (started 1997) is examining the reproductive biology and genetics of the dibbler using the colony at Perth Zoo and wild animals. This research will continue.

There may be value in adding mainland dibblers to the captive-breeding program for research purposes. The Recovery Team will determine this if it receives a proposal that demonstrates a significant benefit to dibbler recovery. It will be subject to CALM Policy on taking threatened species from the wild.

Support for the project is provided by the Departments of Animal Science (Faculty of Agriculture) and Zoology at The University of WA, Perth Zoo, the Marsupial CRC and CALM.

Responsibility: Recovery Team through CALM, Perth Zoo and University of WA
Cost: $55 000 per year
Participants: Perth Zoo, Marsupial CRC, University OF WA, CALM

5.5. Use the progeny of the captive colonies to establish one new island population

When captive-bred young from Boullanger and Whitlock Island stock are available for translocation they will be used to found a new island population. The timing will depend on the availability of animals. Selection of island(s) will be determined by the Recovery Team in consultation with relevant CALM officers and will be subject to approval of a Translocation Proposal in accordance with CALM Policy No. 29

Important factors in selection of suitable islands will include:

- secure tenure controlled by CALM or an agency able to assure long-term management compatible with the presence of dibblers.
- Accessibility.
- Absence of incompatible uses.
- Absence of conservation values that might be compromised by introducing dibblers.
- Availability of resources used by dibblers on Boullanger and/or Whitlock Islands.
- Similarity of habitat to that on Boullanger and/or Whitlock Islands.
- Absence of threats to dibbler survival (which may require pre-introduction management actions, eg. to remove feral predators).
- Absence of house mice.

Captive bred progeny of Boullanger and/or Whitlock Islands and mainland stock will not be released where they may compromise the genetic integrity of wild populations unless there are compelling reasons for doing so.

Responsibility: Recovery Team through CALM
Cost: $61 000 (Year 1) & $56 000 (years 2-3)
Participants: CALM, University of WA, Perth Zoo

5.6. Research the genetic and taxonomic status of island *vs* mainland populations

Dr. Peter Spencer, Perth Zoo Geneticist, is researching the genetic difference between the Boullanger Island, Whitlock Island and mainland populations. Study of the young born in the captive-breeding program (Action 5.4) will indicate the influence of environmental conditions on morphometric characters of the three populations. These studies will facilitate a review of their taxonomic status.

Responsibility: Recovery Team through Perth Zoo and the Marsupial CRC
Cost: $2000 (year 1 only)
Participants: Perth Zoo, Marsupial CRC, University of WA and CALM

5.7. Promote public involvement in dibbler conservation and the activities of the Recovery Team

There are many situations where individuals or community groups can contribute usefully to dibbler recovery. The Recovery Team will encourage and, where resources allow, materially support useful community involvement. These include promotion, education and survey work on the mainland. The fragile nature of the islands, particularly the risk of collapsing seabird burrows, limits the potential to use the public on the islands to selected, skilled volunteers working with Recovery Team personnel.

Responsibility: Recovery Team through CALM
Cost: Incorporated into Action 5.8
Participants: CALM, University of WA, Perth Zoo, Marsupial CRC

5.8. Encourage care and discourage threatening activities through public education and advice to land managers

Many threats to dibblers could emanate from inappropriate human activity, for example, introduction of animals or plants or disturbing seabird nests on the islands and lighting fires or spreading plant diseases on the mainland. Well-meaning people could perpetrate many of these activities in ignorance of their potential threat to dibblers (or other conservation values). The Recovery Team will promote awareness of dibblers, encourage appropriate activities and discourage potentially threatening activities amongst people living nearby. High priority will be directed to land managers, residents of Jurien and visitors to Jurien. Methods will include appropriate brochures, signs and promotion opportunities

Responsibility: Recovery Team through CALM
Cost: $3 000 per year (includes Action 5.7)
Participants: Recovery Team members

5.9. Support post-graduate and other external research relevant to dibbler recovery and, if necessary, appoint a scientist to implement research actions.

Many of the factors that require additional knowledge are suited to post-graduate research. The involvement of post-graduate students has many benefits to the recovery process and to academic institutions. For example, it provides training and resources for scientists who may carry the responsibility for the recovery of threatened species and communities in future and it involves the skills and resources of Universities in the recovery process. There are also other research organisations that have skills which are not otherwise available to the Recovery Team and which are interested in participating in the recovery process, for example the Marsupial CRC.

The Recovery Team will encourage and materially support, as far as it can, post-graduate research that is relevant to dibbler recovery. Where research that can not be undertaken by post-graduate students or scientists of participating organisations is required, it will be contracted to consultant scientists.

Responsibility: Recovery Team through CALM and the University of WA.
Cost: $38 000per year (includes components of Actions 5.1 and 5.3)

Participants: CALM, University of WA, Perth Zoo, Marsupial CRC

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Budget notes for Internal (CALM) use only.

In early 1997 a funding application was submitted for new funding in 1998. The IRP was not written as it was a contractual requirement for the end of 1987. Thus a comprehensive budget was not prepared. The budget that was supplies noted that there may be a requirement for modification. In fact the estimate for 1998 is OK but we need to add a student stipend to 1999 and 2000. The following trace the development of the IRP Budget.

Actions accompanying the original estimates.

1. Support the development of captive-husbandry techniques and the breeding colony at Perth Zoo (as insurance against disasters on Boullanger and/or Whitlock Islands) and support the University of WA research into the breeding biology of wild and captive dibblers.
2. Locate a suitable translocation site for captive-bred dibblers and

a) develop the protocols for successful translocation

b) establish a third island population on a non-house mouse infested island.

3. Support the continuation of University of WA research on ecological requirements of dibblers on Boullanger and Whitlock Islands and address (or refine) Recovery Actions emanating from that research and specified in the Recovery Plan to be written by December 1997. This action will also serve to monitor dibbler populations on the islands.
4. Continue to monitor dibblers in Fitzgerald River National Park and respond to location of dibblers elsewhere on the south coast of WA.
5. Search for mainland dibbler populations on the west coast mainland north of Perth.

1. Actual budget supplied with funding application.

	Year 1 1998		Year 2 1999		Year 3 2000	
Actions	ESP	CALM	ESP	CALM	ESP	CALM
1	8 000	2 000	8 000	2 000	9 000	2 000
2	10 000	6 000	5 000	6 000	5 000	6 000
3	5 000	2 000	3 000	3 000	3 000	3 000
4	3 000	2 000	3 000	3 000	3 000	3 000
5	20 000	4 000	0	0	0	0
Sub-total	46 000	[A]16 000	19 000	14 000	20 000	14 000
TOTAL	[A] 62 000		33 000		34 000	

[A] The original CALM total was added incorrectly as $10,000. This also affected the overall total.

Budget supplied with fund application, recast to fit IRP Actions.

	Year 1 1998			Year 2 1999			Year 3 2000		
Actions	ESP	CALM	PZ/UWA	ESP	CALM	PZ/UWA	ESP	CALM	PZ/UWA
5.1	(in 5.2)	(in 5.2)		(in 5.2)	(in 5.2)		(in 5.2)	(in 5.2)	
5.2	23 000	6 000		3 000	3 000		3 000	3 000	
5.3	5 000	2 000		3 000	3 000		3 000	3 000	
5.4	8 000	2 000		8 000	2 000		9 000	2 000	
5.5	10 000	6 000		5 000	6 000		5 000	6 000	
5.6	0			0			0		
5.7	0			0			0		
5.8	0			0			0		
5.9									
Sub-total	46 000	16 000		19 000	14 000		20 000	14 000	
TOTAL	62 000			33 000			34 000		

Budget Revised to correspond with IRP.

	Year 1 1998			Year 2 1999			Year 3 2000		
Actions	ESP	CALM	PZ/UWA	ESP	CALM	PZ/UWA	ESP	CALM	PZ/UWA
5.1	(in 5.9)	(in 5.9)	(in 5.9)	(in 5.9)	(in 5.9)	0	(in 5.9)	(in 5.9)	0
5.2	4 000	6 000	0	4 000	6 000	0	4 000	6 000	0
5.3	(in 5.9)	XXXX	0	(in 5.9)	XXXX	0	(in 5.9)	XXXX	0
5.4	5 000	0	50 000	5 000	0	50 000	5 000	0	50 000
5.5	10 000	6 000	0	5 000	6 000	0	5 000	6 000	0
5.6	0	0	2 000	0	0	0	0	0	0
5.7	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)	(in 5.8)
5.8	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000	1 000
5.9	26 000	7 000	XXXX	26 000	7 000	XXXX	26 000	7 000	XXXX
Sub-total	46 000			41 000			41 000		
TOTAL									

IRP Actions and notes on budget estimates.

5.1 Monitor island and accessible mainland populations
Besides CALM and student salary, includes ESP $3 000 *p.a*. for monitoring in FRNP.

5.2 Search for new mainland populations
Includes ESP $4 000 for searching for new popns and CALM salary + support costs.

5.3 Research and prevent or control potential threatening processes
Besides student stipend, ESP costs include $5 000 for field, vehicle, boat and consumable research costs; CALM costs are operational costs for managing fire, ferals and *Phytophthora* in FRNP.

5.4 Establish and maintain captive breeding colonies
ESP costs are $5 000 to PZ for consumables. PZ costs are salary + capital costs (figures supplied by Mark Bradley)

5.5 Use the progeny of the captive colonies to establish a new island population
ESP costs are operating costs to establish the translocation (year 1) and monitoring the translocation (years 2 & 3)
CALM costs are CALM salaries

5.6 Research the genetic and taxonomic status of island vs mainland populations
All costs met by PZ and Marsupial CRC

5.7 Promote public involvement in dibbler conservation and the activities of the Recovery Team
Costs combined with 5.8

5.8 Encourage care and discourage threatening activities through public education and advice to land managers
All costs associated with production of posters, pamphlets etc.

5.9 Support post-graduate and other external research relevant to dibbler recovery and, if necessary, appoint a scientist to implement research actions
ESP based on student stipend of $18 000 + $3 000 (FRNP; 5.1) + $5 000 (5.3 vehicle, boat, equipment etc for student research and island monitoring); CALM and UWA costs are for supervision, admin and office/lab support