Australian Government

National Recovery Plan for Lister's Gecko *Lepidodactylus listeri* and the Christmas Island Blind Snake *Typhlops exocoeti*

prepared for

the Department of the Environment and Heritage

by

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Note: This recovery plan sets out the actions necessary to stop the decline of, and support the recovery of, the listed threatened species or ecological community. The Australian Government is committed to acting in accordance with the plan and to implementing the plan as it applies to Commonwealth areas.

The plan has been developed with the involvement and cooperation of a broad 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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This recovery plan is available from the Department's web site at: www.deh.gov.au/biodiversity/threatened/recovery, or from the Department's Community Information Unit:
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Supplementary information on the threatened reptiles which are the subject of this Recovery Plan is available as a separate document entitled Background Information on Lister's Gecko *(Lepidodactylus listeri)* and the Christmas Island Blind Snake *(Typhlops exocoeti), available online at www.deh.gov.au/biodiversity/threatened/recovery*

Cover photos: *Lepidodactylus listeri* (upper, left) and *Typhlops exocoeti* (lower, right) - © Dr Hal Cogger

Contents

Summary

Lister's Gecko, *Lepidodactylus listeri,* and the Christmas Island Blind Snake, *Typhlops exocoeti,* are reptile species endemic to Christmas Island. Both are currently listed as Vulnerable (*T. exocoeti* as *Ramphotyphlops exocoeti*) under the *Environmental Protection and Biodiversity Act 1999* (EPBC Act). They are also listed as Vulnerable by IUCN (IUCN 2004). However the current conservation status of both is effectively unknown; Lister's Gecko was last seen in 1987, and the last blind snake record was made in 1986.

James (2004) has recorded significant declines in other, previously common endemic Christmas Island reptiles since the last targeted reptile survey in 1998 (Cogger & Sadlier, 2000). These declines, in relation to the range and relative abundance recorded in the first targeted reptile survey conducted in 1979, can only be termed "catastrophic". Consequently this Recovery Plan has been constructed within a context of no recent sightings of either threatened species but a clear record of substantial recent declines of other endemic reptiles on Christmas Island. There is a possibility that one or both of these species is now extinct.

A number of actions are identified that are needed to secure any remaining populations, including investigation of the potential threats to the species and to the integrity of the habitats in which they have been found in the past. The primary action required is to determine, through survey and monitoring, the presence, location and status of any remaining populations.

Distribution and Ecology

Lister's Gecko is a small (average snout-vent length ca. 50 mm) arboreal species found active on tree trunks at night or sheltering in the day under bark of living or dead trees (Gibson-Hill, 1947).

The Christmas Island Blind Snake is a fossorial snake found in the sub-surface soil and surface litter of the forest floor and almost certainly, like most of its congeners, preying on the eggs, larvae and pupae of ants and termites that it devours in large numbers. It is usually active on the surface only at night.

The two species occur only on Christmas Island. All provenanced records are shown in Figures 1 and 2 below.

Habitat Critical to Survival

Lister's Gecko: The only records for which habitat information is available (rather than inferred) were made in 1938-1940 (Gibson-Hill, 1947) and 1979 (Cogger and Sadlier, 1981; Cogger et al., 1983). These observations indicated that at the time these papers were written the gecko was:

- most abundant in primary forest on the plateau, but that within this area it will readily adapt to disturbed habitats and secondary growth that includes at least some mature trees;
- least abundant on the terraces sampled on the north-eastern, eastern and southern sides of the island;
- apparently absent from all mined areas even when covered by dense shrubby vegetation; and
- an arboreal species found active on tree trunks at night (from near ground level to the canopy of even large rainforest trees) or sheltering during the day under the bark of living or dead trees (Gibson-Hill, 1947, records them only from under the bark of dead trees, both standing and fallen). All recorded eggs were located under bark on standing tree trunks, within human reach.

At the time of the 1979 study, there is little doubt that the primary forest on the plateau would have been regarded as the island habitat most critical to survival of Lister's Gecko. Until fuller

knowledge of the current population size and ecological requirements is available, this habitat should be regarded as potential habitat critical to survival. The general characteristics of this habitat, including a description of its floristics and structure are provided by Gillison (1976) and are illustrated in Cogger *et al.* (1983) and Clarke (1995).

Christmas Island Blind Snake: The few records with information on locality or habitat suggest that this species occurs primarily where the deeper soils and primary rainforests occur on the island's central plateau. Most of this area is now located within the boundaries of Christmas Island National Park, managed for conservation by Parks Australia North (PAN), and is therefore secure as far as land tenure. However, this original primary habitat is currently being subject to immense environmental stress due to recent droughts and the explosive increases in populations of the Yellow Crazy Ant (*Anoplolepis gracilipes*) and its mutualist scale insects - *Tachardina aurantiaca* and introduced *Coccus celatus* (*vide* O'Dowd *et al*. 2003). Until knowledge of the population size and ecological requirements of the blind snake is available and understood, all forested parts of the island should be regarded as potential habitat critical for this species.

Given the absence of any records of either species for nearly 20 years, despite periodic intensive searches, and given the profound habitat changes that have occurred directly or indirectly during this period, it is not possible at this time to map habitat critical to the survival of these species. Rather, habitats in which the species were last recorded should be treated as surrogates for habitat critical to survival. Given the absence of recent sightings of either species, ***any*** habitat in which one or other species is found in future should be regarded as ***habitat critical to the species' survival*** and the discovered population treated as an ***important population***.

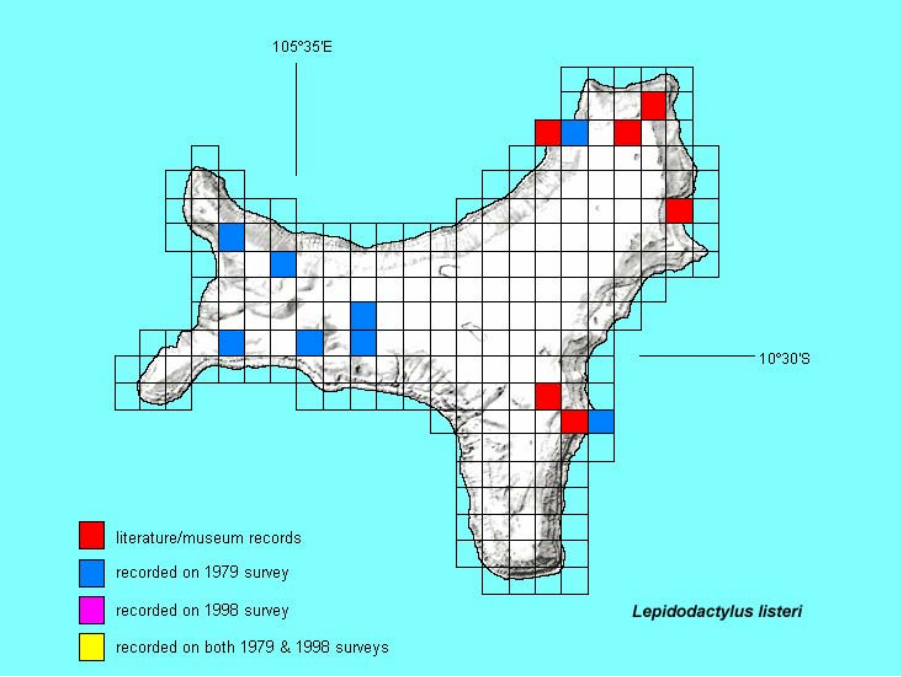

Figure 1: All records with specified provenance of Lister's Gecko from Christmas Island (from Cogger & Sadlier, 2000); grid at 30" intervals.

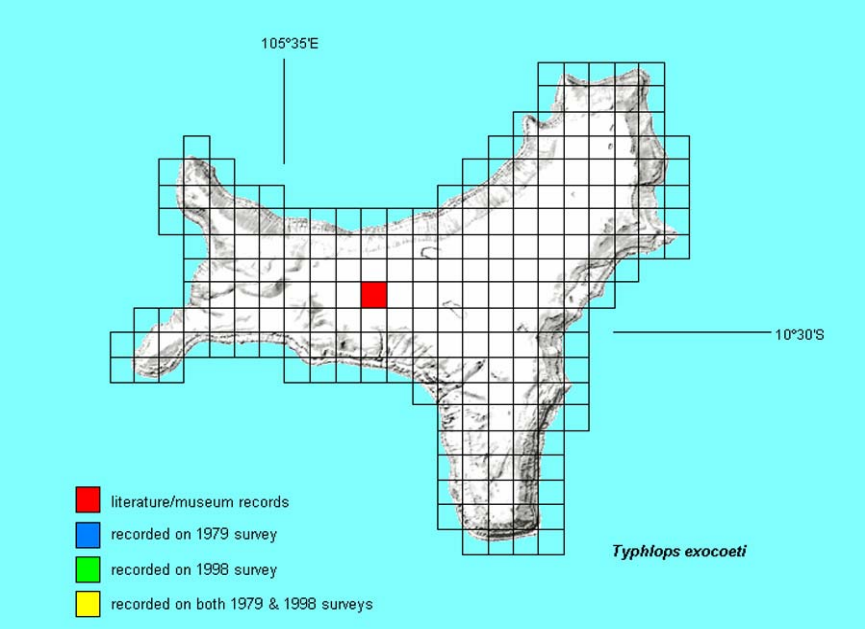

Figure 2: The only provenanced record of the Christmas Island Blind Snake is from near Stewart Hill, in primary rainforest near the centre of the Christmas Island central plateau.

Threats

Various threatening processes that are likely to impact on Lister's Gecko and the Christmas Island Blind Snake are listed below and may vary in their impacts according to the different ecologies of these two reptiles. However, because no ecological studies of the reptile species have been conducted, all are *potential threats* and the magnitude of impact, if any, is unquantifiable.

Predators

Other than native species which were sympatric with the Lister's Gecko before their declines, known or probable predators on Lister's Gecko and/or its eggs include the Black Rat (*Rattus rattus*), domestic and feral cats (*Felis cattus*), the Asian Wolf Snake (*Lycodon capucinus)*, the Yellow Crazy Ant, and the giant centipede. There is a high probability that the Wolf Snake is a major threat to all endemic reptiles of Christmas Island (Fritts, 1993). There are many examples of both cats and black rats having dramatic impacts on the native fauna, including lizards, of oceanic islands. While their impacts on the native reptiles of Christmas Island are unresearched and unknown, available data would caution against underestimating their potential impacts. There are also few data available on known or potential native predators and their current impacts on either of the two threatened reptiles.

Habitat loss, fragmentation and degradation

Before 1989 Christmas Island was subjected to more or less continuous loss and degradation of its native vegetation through clearing (for buildings, phosphate mining, airport construction, road infrastructure, etc.) and the impacts of exotic plants and animals. Christmas Island National Park was gazetted in 1980 (and extensions in 1986 and 1989), setting aside of more than 60% of the island, together with the resources and personnel to manage it. Outside the National Park the EPBC Act provisions provide for regulation of actions which may have significant impacts on threatened species.

However, past and ongoing fragmentation of native habitat, either through excision of forests for other purposes or the construction of roads and tracks, may also have had impacts on Lister's Gecko and the blind snake. The impacts of such intrusions into forests are usually greater than

the actual areas excised, due to degraded edges being used by introduced species that are competitors or predators, and by changing forest micro-climate significantly.

Probably the greatest impact on the ecology of the island, including the National Park, has been the development of supercolonies of the crazy ant, whose activities have seriously degraded about half of the forested habitats, and resulted in massive mortalities of terrestrial crabs and other organisms, that have led in turn to gross deleterious structural and floristic changes in the island's forests (Green *et al*., 2001). On-going control of the crazy ant and rehabilitation of the affected forests is probably critical to the survival of the endemic reptiles, including Lister's Gecko and the blind snake.

Information gaps

Knowledge of the biology, ecology, habitat preferences and spatial distribution of Lister's Gecko and the Christmas Island Blind Snake is insufficient to inform specific recovery actions. Consequently priority must be given to locating and determining relative abundance of any remaining populations through survey and monitoring, then targeted research on the species' ecologies. Interim actions are aimed at maintaining the ecological integrity of known or suspected habitats and determining the likelihood of impacts of potential threats.

New invasive species

A number of exotic species have been previously introduced to Christmas Island, including the crazy ant, black rats and cats, and more recently the scincid lizard, *Lygosoma bowringii* (sometime before 1979) and the Wolf Snake (*ca.* 1983). The probability of introduction of the invasive gecko *Lepidodactylus lugubris* (a congener of Lister's Gecko) is high and could possibly lead to eradication of any remaining populations of the latter should it become established on Christmas Island. The colonisation of Christmas Island by the latterly introduced species represents a failure, at the time of entry, of quarantine mechanisms then in place, and are indicative of the special vulnerability of isolated oceanic islands to the impacts of exotic species. The exclusion of further exotic species may be a critical factor in maintaining remaining populations of Christmas Island's native and endemic biota.

Disease

There is currently no evidence to suggest that exotic pathogens may be all or partly responsible for the recorded declines (Cogger et al., 1983; James, 2004) in the endemic reptiles of Christmas Island, including Lister's Gecko. However, this is a possibility that cannot be currently tested or dismissed. Without locating and regularly monitoring any remaining populations, as proposed in this Recovery Plan, pathogenic mortalities have little chance of being identified.

Competition

The introduced geckos *Hemidactylus frenatus* and *Gehyra mutilata* are both arboreal and feed on small arthropods, and so are potential competitors with Lister's Gecko. These species tend to occupy more disturbed habitats, but the occurrence of both at sites in 1998 that were occupied solely by Lister's Gecko in 1979 (Cogger & Sadlier, 2000) suggests either that they have succeeded in displacing it or have moved into such areas following the latter's decline from other causes.

Currently there is no information available on potential competition between the blind snake and the introduced Flowerpot Snake (*Ramphotyphlops braminus*). Both are primarily fossorial species feeding mostly or solely on the eggs, larvae and pupae of ants and termites, indicating that there could be significant competition for food and preferred space.

Both Lister's Gecko and the blind snake are likely to compete with the crazy ant. The latter preys on a wide range of invertebrate taxa, including all taxa likely to be eaten by both the gecko and the blind snake.

Crazy Ant control measures

The insecticide *fipronil* is currently used to control populations of the Yellow Crazy Ant on Christmas Island. Although fipronil is relatively toxic to a range of reptilian species (Peveling, 2000; Tingle and McWilliam, 1999), it has been used in what are considered to be safe dilutions for non-target species, and there is no evidence that fipronil at the concentrations used has an effect on the reptiles of Christmas Island. Trials of manual and aerial baiting with fipronil have included pre-and post-baiting surveys of the impact of baiting on non-target species, including reptiles (Stork *et al*., 2003), however no individuals of Lister's Gecko or the blind snake have been seen in any of these surveys and so the effects, if any, of baiting programs on these species are unknown. While it may well be that the overall impacts of the crazy ant on the Christmas Island biota are so severe that their control would be given priority over the conservation of any individual species, there is some potential for the control program to impact on both Lister's Gecko and the blind snake. Alternatives methods are currently being explored, including the use of insect growth regulators instead of insecticides.

Displacement from preferred habitat by the crazy ant

It is likely that both Lister's Gecko and the Christmas Island Blind Snake, like other endemic reptiles, are displaced from their habitats within areas grossly affected by ant supercolonies through physical distress when traversing areas with swarming ants, through olfactory responses to ant secretions in gecko-ant and snake-ant interactions, or through changes in forest microclimates following crazy ant infestations.

Recovery Plan Objectives

Overall Objective*:* To reduce the risk of extinction of Lister's Gecko and the Christmas Island Blind Snake and improve their conservation status in the long term.

Specific Objectives: To determine the current status of Lister's Gecko and the Christmas Island Blind Snake and to identify and moderate the causes of their apparent declines within 5 years, specifically to:

1. find both species in the wild;
2. determine the likelihood that one or more potential threats are threatening the survival of the species;
3. continue present abatement strategies, or develop and implement new strategies, for potential threats such as crazy ants, predators, habitat fragmentation and unintended invasive species introductions (quarantine effectiveness); and
4. obtaining, following rediscovery of either or both species, sufficient knowledge of the biology and ecology of, and threats to, these species to guide an effective management program for increasing their numbers and spatial distribution.

Recovery Actions

Action 1. Survey and monitor the endemic reptilian and other selected taxa of Christmas Island

Incorporate survey/monitoring for the Lister's Gecko and Christmas Island Blind Snake into existing or new monitoring program covering other native reptiles, to determine their current status on Christmas Island. Integration will not only be a cost-effective way of monitoring qualitative changes in the distribution and relative abundance of the two targeted species, but will also identify changes in the status of other native species that can inform the recovery of the threatened species.

Where practicable Lister's Gecko and the blind snake should be searched for in biodiversity field programs, but in addition a specific program should create fixed transects within the last-known areas from which they were recorded. The most appropriate technique given the habitat and geology, is for transects to include permanent drift fencing and closable pit traps. Surveys should be conducted at least 4 times each year for a minimum of 4 days/survey, during which pit traps should be left open and checked twice daily concurrent with a visual survey of all reptiles active in a zone 5m on either side of the drift fence. Sticky (or other) traps should also be used on selected trees during the survey period and monitored hourly during hours of darkness. If possible, a mark/recapture program should also be carried out in association to obtain baseline demographic information on the reptile species encountered. Materials and designs for the traps and fencing will need to be trialed to minimise the destructive predatory activities of Robber Crabs.

Action 2. Until Lister's Gecko and the Christmas Island Blind Snake are rediscovered, have annual searches for both species

Until either or both species are found in the course of Action 1, at least annually for the first two years of the program conduct or commission specific surveys for Lister's Gecko and the Christmas Island Blind Snake. Specialists in rainforest survey whose sole task is to conduct high intensity searches for these two species are required.

Action 3. Upon rediscovery of either or both species in the wild, conduct autecological studies to inform recovery actions

Obtain, through targeted field studies of each species, sufficient knowledge of their biology and ecology to guide an effective management program for increasing their numbers and spatial distribution.

Action 4. Identify the role of the introduced Wolf Snake as a potential threat to endemic reptiles

Continue current studies (by PAN) into the distribution, abundance and diet of the Wolf Snake, a potential serious predator on both native reptiles and mammals of Christmas Island, including the two threatened reptile species. If the Wolf Snake is found to be a significant predator on these or related native species, the feasibility of developing a Wolf Snake control program should be investigated and, if feasible, developed and implemented.

Action 5. Review and maintain existing control program for crazy ants

Review existing crazy ant control program to ensure it covers those areas that, on the basis of historical records, are likely to be primary habitat for Lister's Gecko and the Christmas Island Blind Snake. The existing control program should be maintained, and investigations into alternative control measures continue.

However, if widespread aerial baiting using fipronil is to be resumed, associated with this program there should be toxicological testing on congeneric species of the two threatened species. (This has not been costed as part of the recovery plan)

Action 6. Identify the role of cats and rats as potential threats to endemic reptiles

Research the diets of feral cats and black rats, potentially serious predators on native reptiles, including the two threatened reptile species. If cats and/or rats are found to be a significant predator on these or related native species, the need for control programs should be investigated.

Action 7. Reassess conservation status in the absence of further records.

If Lister's Gecko and/or the blind snake are not found within 2 years of implementing Actions 1 and 2, compile comprehensive information on the species to support reassessment of their conservation status under the EPBC Act. If either species is found, the information for reassessment of status should be compiled at the end of 5 years.

Action 8. Review quarantine protocols for all personnel and matériel entering Christmas Island

Through review and consultation involving AQIS, PAN, DOTARS and the Christmas Island community, where necessary quickly develop and implement stricter policies, guidelines and procedures to further minimise the potential introduction of new weeds, exotic animal species and pathogens to Christmas Island. Because oceanic islands with high levels of biotic endemicity are especially susceptible to rapid degradation by invasive species, quarantine policies and procedures should be *at least as rigorous* as those applying to people, livestock and goods entering continental Australia.

Costs

The estimated total cost of the recovery program is $265,000 over five years. Costs are to supplement existing survey, monitoring and threat abatement programs by including species-specific components ($125,000), to conduct annual specialist targeted surveys in first 2 years ($40,000), to cover reviews of quarantine proposals, pest control programs and population information ($10,000) and to initiate (commencing in year 3 if the species are located) an autecological study of either or both species ($90,000). If neither species is located in the first 2 years, this component will be deferred or dispensed with. Note that by supplementing existing programs, cross-benefits will assist in the conservation and recovery of all endemic reptiles and other endemic, near-threatened and threatened taxa on Christmas Island.

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Total required	$45,000	$55,000	$55,000	$55,000	$55,000	$265,000

Biodiversity Benefits

The actions set out in this Recovery Plan are intended to (a) acquire, through survey and research, the information needed to identify the current status, principal threats and species-specific recovery actions for these two species, and (b) assess potential threats to the integrity of those Christmas Island habitats and ecosystems in which both species have been known to occur. Both groups of actions, but especially the latter, have the potential to benefit all of the threatened and 'at risk' elements of Christmas Island's native biota, especially if integrated into existing and future enhanced biodiversity monitoring and conservation programs being conducted by PAN.

Management Actions

Without detailed knowledge of the species, specific management actions cannot be prescribed, however, generic actions which may aid the recovery of Lister's Gecko and the Christmas Island Blind Snake include:

1. Increasing community awareness of native threatened species by emphasising their endemic significance and potential roles as indicators of ecosystem health in island-wide recovery processes.
2. Integrating, to the maximum extent possible, the actions specified in this Recovery Plan in the Plan of Management for Christmas Island National Park (Environment Australia, 2002). This plan is in force until 2009.
3. Establish an island-wide Biodiversity Recovery Team to advise PAN and the Australian Government on actions needed to modify and/or enhance and/or integrate existing biodiversity survey/monitoring programs across Christmas Island.

By incorporating recovery actions for all threatened species into an island-wide biodiversity enhancement and management plan overseen by a CI Biodiversity Recovery Team or its equivalent, costs will be minimised and benefits to Christmas Island biodiversity optimized. Such a team should be assigned the task of monitoring the status of all native biota, but with

special emphasis on endemic and threatened taxa. The necessary links between such a Team and PANCI should be established to ensure that the Team's findings feed directly into PANCI's on-going management programs within Christmas Island National Park.

An action that would remove, modify or degrade habitat of these species and that could result in a significant impact on the species may require referral to the Commonwealth Environment Minister under the EPBC Act for a decision on whether assessment and approval of the action is required.

Monitoring, reporting and review

Progress should be monitored and evaluated by PAN, or members of any recovery team assigned responsibility for implementing this Recovery Plan. A review preparatory to implementing the autecological components of this Recovery Plan should be conducted whenever one or both species are rediscovered. There should be a review of the recovery program at the end of year two (i.e. early in year 3), including consideration of which (if any) actions should continue, based on whether the species have been found in the wild. If the recovery program continues until year 5 an external review should be conducted.

Performance Criteria

1. Populations of both species are located within 2 years *or* surveys to locate both species continue (until species located) for the life of the Recovery Plan (5 years).
2. The possible role of the Wolf Snake, cats and black rats as threats, and potential for control programs, investigated.
3. Existing control program for the crazy ant maintained and/or improved within 2 years.
4. Quarantine regulations and protocols reviewed, and modified as necessary within 2 years.
5. Autecological studies are commissioned within 6 months of the rediscovery of either or both species.
6. Should populations of either species be rediscovered, then at the end of 5 years the current distribution, biology, demography (including estimates of population size) and ecology is sufficiently well documented as to enable development of a full recovery program, including identification and prioritisation of all threats, together with plans for their abatement.
7. Comprehensive information is compiled on both species to support reassessment of their conservation status under the EPBC Act after 2 years if the species are not located, or, if rediscovered, at the end of 5 years.

Interests that may be affected by the Recovery Plan's implementation

- The Department of the Environment and Heritage (DEH)
- Parks Australia North (PAN) including PAN Christmas Island
- The Department of Transport and Regional Services (DOTARS)
- Phosphate Resources Limited
- Shire of Christmas Island
- Crazy Ant Steering Committee
- Telstra
- Christmas Island Tourism Association
- Christmas Island Economic Development Committee
- Indian Ocean Territories
- Australian Quarantine Inspection Service (AQIS)
- Asia Pacific Space Centre
- Department of Finance and Administration
- Union of Christmas Island Workers
- Island Care Inc

Social and economic impacts

Conservation of these species is warranted as important components contributing to the ecological services of Christmas Island's primary forests, and is also subject to actions required under Commonwealth legislation (EPBC Act) and international agreements (CITES). Consequently there is some potential for the presence of these species to constrain economic activity or development through a range of protective provisions and offences where a population of either species is to be affected; in the absence of recent records of these species the magnitude of this potential is currently unknown. The actions proposed in this Plan will assist in determining what could be significant impacts on both species.

These species are also of intrinsic scientific value in drawing attention to the unique evolutionary history and character of Christmas Island, and could contribute to the attraction of the island to visitors concerned with uniqueness of experience and wildlife conservation. These attributes should be emphasised by PAN in integrating these species into all programs aimed at involving the Christmas Island community in biodiversity conservation.

The greatest economic and social impacts possible due to implementing this Recovery Plan could be *increased quarantine measures, enhanced biodiversity survey and monitoring programs, and the autecological research components*. These actions, if implemented, involve modest supplementation of the existing management costs of Christmas Island's ecosystems by Commonwealth agencies. However more stringent quarantine measures could inconvenience visitors and returning residents by delays in clearing customs due to more rigorous inspection protocols, and could also have significant economic impacts on importers if requiring more rigorous inspections, quarantining or special treatment of some imported goods.

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