

Report on the IUCN Island Invasives conference Auckland February 19 to 23 2001

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Islands support some of the world's most remarkable ecosystems. They are home to numerous distinctive species, interlocking in unique plant and animal communities. They are demonstrations of evolution in action. They are also extremely vulnerable to disturbance from human activities and from introduced plants, animals and disease. Once disturbed, island ecosystems are easily destroyed and may be very difficult to rehabilitate. For these reasons the IUCN has long accorded to islands a high priority for conservation action.

The February 2001 Island Invasives conference in Auckland was organised by the Invasive Species Specialist group of IUCN. 180 persons attended from countries around the world. 48 speakers gave short presentations on their particular projects from many areas of the world from the tropics to the arctic zones. The various invasive species involved in the projects ranged from ants to rats, cats, snakes, goats and plants. The speakers were all persons involved in the field on eradication projects with the emphasis on practical work of eradication, on results of projects and on lessons learnt from projects.

The atmosphere of the conference was very optimistic and positive – in the past fifteen years many eradication projects have been successfully carried out around the world. New Zealand, through their Department of Conservation and private companies with ex-personnel from DOC, lead the world in eradication of island invasive species. The successes, and lessons learnt from numerous projects undertaken in the past fifteen years give great encouragement that the future for eradication of island invasives is bright.

Out of the conference the clear message is that the biggest threat to the conservation of island ecosystems is invasive species – indeed the biggest threat to all ecosystems worldwide.

Islands are ideal places to start eradication for several reasons

- They are (relatively) small areas
- They often have limited invasive species
- Their native species have developed without competition and are more vulnerable to extinction by invasive species.
- They have defined areas with boundaries that act as barrier to prevent re-introduction
- Islands usually contain unique and interesting ecosystems and species with great biodiversity for a small area - worthy of conservation.
- Techniques and lessons learnt can be applied to larger continental areas.
- Successes on islands can be an inspiration to apply techniques on larger land areas.

It has become clear with experience from the early eradication projects that eradication is not the intended outcome – ecological restoration is the desired outcome – but eradication is a part of this. Careful planning needs to include follow up work on habitat restoration if the eradication is to have the desired effect.

If there are multiple introduced species then the eradication process can be more complex. The eradication of just one invasive species may mean an explosion in other invasive species also present. So in planning for eradication and restoration, the effect of removal of one invasive species needs to be carefully considered. If it appears that eradication of one species is going to lead to an outbreak of another, then simultaneous eradications may be necessary.

Also the impact of eradication methods on non-target species needs to be considered- those species that may be affected by the poisons or methods used for the target species. Rigorous research and planning for any effects on non target species needs to be part of the funding and lead up to the development of an eradication plan.

For the eradication phase of restoration to be effective the commitment of funds, personnel and resources must be to eradication, not merely control. Necessary steps for successful eradication include:

- Public consultation and education
- Planning including trials on target and non target species
- Funding commitment to eradication
- Availability of resources to ensure the task completed
- Appointment of dedicated and motivated staff
- Development of a monitoring program
- Good public relations
- Debrief

For invasive plants, priorities need to be established – those weed species that are thought to be transformers should be given the highest priority. Transformers are those weeds that can, by vigorously competing for water, nutrients or sunlight, transform a habitat and so crowd out native plants or prevent germination of natives. This leads to loss of biodiversity as the transformer species displace native plants and has a flow on effect in reducing habitat and food for native birds and invertebrates, with the resultant loss of species and further decrease in biodiversity.

Experience has shown that to deal effectively with weeds, it is necessary to develop a weed risk assessment system, control trial areas, accurate mapping, a strategic eradication program, research into biology of the weeds, monitoring and ensuring results of continued research, trials and monitoring feed back into the strategic program.

Quarantine

A vital part of an eradication program is quarantine, to ensure that further re-introductions of invasives do not occur. This may entail controls and procedures at departure and arrival points of any shipping to an island. Good education and awareness

programs are needed for people involved in transport to the island, and for residents to understand the importance of quarantine and what it means. Costly experience of the past tells us that even before any eradication is thought of, quarantine is a matter of urgency to ensure further invasive species do not arrive.

Early detection policy

Hand in hand with a quarantine policy is a system of early detection, reporting and quick response plan for invasive species. The earlier an invasive species is detected the better the chance of and the less cost of eradication. It is vital that the community be involved in this early detection, to be aware and vigilant for new species arriving. The community is where new species invasion must be stopped.

INTRODUCED SPECIES ON LORD HOWE ISLAND

Unlike most islands in the world inhabited by humans, the ecosystems of Lord Howe Island are relatively intact. Only about fifteen percent of the land area has been cleared.

However, the Island has a long history of plant and animal introductions, some of which can be termed invasive species.

On Lord Howe Island, as on many other isolated oceanic islands, the animal life evolved in the absence of predators so behaviour for protection was diminished; when humans and animals arrived on the Island, the island endemic animals were very vulnerable. Similarly the plants evolved in harmony with the other plants species so that competition from each other, and from insects present kept them in check. New plants that were brought to the island did not have the insect pests that kept them in check in their native country and so some thrived and became weeds.

Even before settlement of Lord Howe Island, humans had impacted on the environment. Two species of landbirds were hunted for food and shot into extinction. Pigs and goats had been put ashore to provide food for sailors that called in for provisioning. These animals had been browsing the vegetation for nearly 200 years. Their preference for certain species of plants meant that the vegetation today has a different composition than prior to discovery. Two plant species are known to be extinct on Lord Howe Island – *Sicyos australis* and *Solanum bauerianum*, both almost certainly eaten into extinction by introduced animals.

Cats were brought to the Island probably in the 1840's or 50's. These had an impact on the birds, reptiles and possibly some invertebrates. Mice reached the island probably as early as 1860, they would have had an impact on some plant and invertebrate life as food.

Rats came ashore in 1918 from a steamship beached at Ned's Beach. The rats and mice eat a variety of plant fruits and seeds. (*Baloghia inophylla*, *Elaeodendron curtispiculum*, *Pandanus forsteri*, *Lepidorhachis mooreana*, *Howea forsteriana*, *Howea belmooreana*, *Chionanthus quadristamineus*); they chew the stems of the four palm species, and of at

least 2 fern species *Asplenium milnei* and *Adiantum hispidulum*. (see attachment for images of plants eaten). In time this can alter the forest species composition.

The rats caused the extinction of five landbirds within just a few years of arrival. Almost certainly the rats reduce the breeding success of extant breeding birds – both landbirds and seabirds (see attachment for images of Masked booby attacked by rats).

Masked Owls were introduced from Tasmania and Victoria in the 1920's to reduce rat numbers which were devastating the *Kentia* palm industry. These introduced owls also prey upon native Lord Howe Island birds including Woodhen, White terns, Black-winged petrels and Providence petrels.

The mice and rats also prey upon a variety of invertebrates and there has been big impacts on invertebrates - the most notable examples being the large land snail *Placostylis bivaricosis*, greatly reduced in numbers; the large endemic bush cockroach *Panathesia lata* which is now confined to offshore islets; and the Lord Howe Island phasmid. The latter was exterminated from the main island in the 1920's, photographed on Ball's Pyramid as a dead individual in 1965 and "re-discovered" there in February 2001. There may be many extinctions of smaller invertebrates that we don't know of.

European songthrushes and blackbirds self introduced around 1950. These birds are still present on the Island and eat a variety of native and endemic insects and snails (including the endangered *Placostylis bivaricosus*).

An introduced, large, predatory slug is in the lowland forests and is a carnivorous species preying upon smaller endemic snail and slugs. Lord Howe Island has a rich assemblage of land snail fauna numbering 95 species and is of great scientific interest.

Even with much recent conservation attention and World Heritage Listing in 1982, new animals are still arriving on the Island. About 1995 a small species of bleating frog *Littoria dentata* and a small rainbow skink appeared on the Island – probably stowaways on cargo boats coming from Yamba. There are unofficial reports of snakes arriving but being detected early.

So is eradication a prospect on Lord Howe Island?

Already some important eradications have taken place on Lord Howe Island. In 1979, as part of the Woodhen rescue program, feral pigs and cats were removed from the Island. In 1982 a local law banned domestic cats (with a "grandfather" clause to allow current owners to keep pet cats if they were desexed).

This has had a great impact on the birdlife of the Island – the Woodhen numbers have increased from critically low 20 to around 250. Seabirds have increased in the settlement area – Sooty terns have started breeding on the northern end of Ned's Beach, the southeast slope of Malabar Hill, the cliffs from Ned's beach to Middle Beach. Black-winged Petrels have dramatically increased from Ned's Beach to Clear Place and some

pairs are even breeding adjacent to Middle Beach Road above Leanda Lei Lodge and along the lagoon foreshore. Little Shearwaters have been found breeding on the main Island from 1991 at Blinky Headland and the southern cliffs of Ned's Beach. Providence Petrel numbers breeding at low altitudes around the southern mountains have increased. Wedge-tailed Shearwaters are breeding along the lagoon foreshore from the seawall near the airstrip almost to the Aquatic Club

A campaign to eradicate goats was undertaken in 1999 and although there have been several sightings of goats since, the Island rangers are maintaining hunting pressure with the determination to eradicate them. Since 1999 the regrowth of ferns and low foliage in the southern mountains has been quite noticeable. Monitoring of vegetation is taking place at several locations in the southern mountains to quantify this.

Rat eradication?

Technically it is possible today for eradication of rats and mice to be carried out on Lord Howe Island. Methods developed in New Zealand over the past 15 years have had great refinement and success. Islands larger than Lord Howe Island are being targeted for rat eradication. For example the Department of Conservation are preparing to eradicate rats from Campbell Island (11300 hectares), south of New Zealand in winter 2001, and Raoul Island in winter 2002

The process used (after very detailed research and planning) is to use a helicopter to drop poison in a tight grid 50 or 25 metres intervals, using sophisticated differential GPS systems, over several days. This could be modified to allow ground bait stations in settlement areas. The poison used is specially prepared pellets of brodifacoum (an anticoagulant agent) tailored to a particular situation to allow for such factors as climate, target and non-target species. Death occurs in about 10 days and then sufficient time is allowed for extensive monitoring to ensure no target species have survived.

However it is not a simple or inexpensive process.

Because of the multiple introduced species on Lord Howe Island, any eradication attempts need to carefully consider the impact of removal of that species. For example, eradication of rats may mean an increase in mice; eradication of rats and mice may then mean that the introduced Masked Owl may look at hunting more birds for food. It may be that rats, mice and the owls all will need to be eradicated at the same time.

Research and trials of the effects of poisons on non-target species would be needed prior to any eradication attempt. Probable non-target species on Lord Howe Island include the Woodhen, the LHI Currawong and possibly Emerald Ground-dove. It may well be that the cost of this research and appropriate measures needed during eradication will exceed the actual eradication costs.

The benefits of eradication of rats and mice from Lord Howe Island would include:

- restoration of invertebrate populations to a more natural level

- increase in breeding success of landbirds.
- increase in breeding success of seabirds – particularly smaller burrowing species such as Little Shearwaters and Black-winged Petrels.
- Restoration of plant species to more natural balance
- Reduced costs to the LHI Board in rat control program
- Decrease in the risk of rat-borne infection affecting the human population
- Increase in palm seed yield
- The possibility of reintroducing some endangered invertebrates back to the main island – the endemic cockroach and the Lord Howe phasmid.

Possible action for investigation

Leaders in the field of rat eradication from islands include the New Zealand Department of Conservation (DOC), several private companies headed by people who were employed by and developed methods used by DOC. Expressions of interest could be sought from these to investigate the feasibility of eradication of rats from Lord Howe Island. Also there is an American consortium (The Endangered Species Recovery Council) that specialises in matching a particular operator(s) to a particular island ecological problem, and they may be best to do an initial investigation and advise on who should be employed for the project.

As any invasive species can have an impact on the existing plant and animal life, a priority should be given to investigating the eradication of the bleating tree frog that has appeared on the Island since about 1995. Frog species feed on invertebrate animals (insects and snails) and this introduced frog to Lord Howe Island must be having an impact on some invertebrates in certain areas. Other countries have eradication programs for introduced frogs and their experience could be used here. The earlier this is started the better chance and less cost of the eradication.

Eradication of weeds.

From the first settlement, plants were introduced to Lord Howe Island – initially as food crops then pasture grasses and accidental introductions of small weedy pasture species possibly brought over in hay as stock food. In the Flora of Lord Howe and Norfolk Islands (1994) Peter Green lists 241 species of vascular plants as native to the Island, and 218 species as introduced and now naturalised.

Some of the introduced plants have become pests. The Lord Howe Island Board in 1997 identified 18 species as noxious weeds. Those species that appear to be the main problem are the two asparagus fern species, cherry guava, bitou bush, Madeira vine, and *Pittosporum undulatum* – all introduced as ornamental or fruit plants.

A clear message at the conference that Cherry Guava is the number one biggest plant pest of subtropical island ecosystems. It is the major woody weed on the Galapagos Islands, Mauritius, Seychelles, Hawaii. More urgent attention to eradication of this plant on Lord Howe Island is needed.

The LHI Board has a Noxious Weed control procedures document (1997) in which 18 species are nominated as noxious, and a further 30 species as “of concern”. It may be time to consider a whole new weed review. This review should be far reaching and include every plant not native to Lord Howe Island. Research is needed for each introduced plant species – wherever possible it should be ascertained when it first arrived; its history on the Island; its weediness from other locations, its potential to become a weed; any biological information e.g seed viability; latest treatment methods. This inventory should be kept up to date with surveys on the Island and in the scientific literature.

This may entail development of a new classification system for all introduced plant species. This could be along the lines of one adopted by New Zealand for Raoul Island in the Kermadec group – of similar size, topography and soil as Lord Howe Island. This classifies introduced plants as: a) major weeds to be eradicated, b) those species maybe not major weeds but in low numbers for which eradication is easy and should be completed; c) weeds of the settlement not likely to spread and so control on the edge of the settlement is the best option, d) non weedy introduced species.

Surveys and mapping of all introduced plants need doing – including those that are reaching remote areas of the Island (land slips, mountain summits, Little Slope etc) so it can be determined if any should be targeted for eradication, and also to compare rate of spread in future surveys.

For those species determined to be weedy or potentially weedy, eradication should be the aim. More attention should be given to mapping the occurrence of each species, perhaps with a grid system across the island. Accurate monitoring of weeds within each grid plot should be kept. Records of eradication effort in each plot are needed for planning and funding purposes. Continual experiments in trial plots may be necessary to establish the most cost-effective methods for eradication. As the target of eradication is approached a method of survey to detect the last individuals is required.

Restoration of habitat is the aim, so follow up work may be needed with eradication. If areas are sprayed to eradicate a plant species is this laying the soil bare to allow invasion of other weed species? Consideration may need to be given in some areas to mulching to prevent germination and establishment of weeds. Similarly consideration should be given to whether native plants propagated on the Island should be planted out as ground cover to crowd out weeds, or restore native trees.

A continuous public education campaign needs to be carried out for residents to become aware of the problem of weeds – not just in the Lord Howe Island context but in the world context. The general community even on mainland Australia is not aware of the serious problems weeds are for the country (a CSIRO estimate is that weeds cost Australia 3.3 billion dollars in 1999). The community needs to be responsible for eradication if it is to succeed. Every effort should be made to continually make residents aware- articles in the Signal, notice boards, householders, workshops, posters, booklets, school projects.

Every source of labour should be explored – grants for paid local workforce, volunteers, grants for volunteers or bush regenerators, even work parties from the armed services.

Consideration should be given to looking at the propagation of a bigger range of native plants that have potential to be used in gardens and landscaping so that residents can be encouraged to remove any introduced plant species with weed potential. Examples of weedy garden plants include Holly fern, Morning glory, Ivy, Peruvian periwinkle.

Those introduced plants that are only in small numbers or of local occurrence but have the potential to become weeds need to be identified and eradicated as soon as possible to limit the future weeds that will have to be dealt with.

There have been, in the past, a number of plant species introduced onto the Island as ornamentals, belonging to a genus of which Lord Howe has one or more endemic species. Because of the possibility of cross-pollination and dilution of genetic material in the endemic plants, the introduced species should be removed. Two of these are the New Zealand Christmas bush or “Pohutakawa” (related to the two species of *Metrosideros* known locally as Mountain rose) and the South African species of *Dietes* (related to the Lord Howe Island Wedding lily *Dietes robinsoniana*).

Investigation into mechanical devices to speed up weed eradication should be pursued e.g. a pair of secateurs that apply poison as they cut the stem – this could be an ideal tool to greatly speed up eradication of asparagus fern and I am arranging for a trial of these on Lord Howe Island. Also a lever and jaws device that is placed on the ground next to a small woody weed - as a handle is pushed down, jaws grasp the stem and pull out the plant at the same time. This could be trialed for use in eradication of cherry guava and small *Pittosporum undulatum* plants if it is not too bulky to carry in the bush.

Other urgent matters

Clearly there is urgent need for a quarantine policy to be developed to prevent further introduction of plants and animals to Lord Howe Island. Currently no quarantine measures are in place and detection of any invasive animals relies on the interest or not of workers on the wharves and ships servicing the Island.

Also urgently needed is the development of a monitoring policy and quick response plan to deal with any new introductions. If a new invasive plant or animal arrives, the sooner it is detected and acted upon the least cost involved in the long run.

Funding

Clearly the community of some 350 residents cannot be expected to fund any major eradication projects. The international significance of Lord Howe Island has been recognised with World Heritage Listing in 1982. The New South Wales and Commonwealth governments have a responsibility to maintain the World Heritage values of Lord Howe Island. If these invasive species are a threat to the World Heritage values then major funding for planning and execution of eradication and restoration projects is

urgently needed. For some years the New Zealand government have been spending several hundred thousand dollars annually on weed eradication on Raoul Island; a similar level of funding is required for weeds on Lord Howe Island.

This report is a brief summary of ideas from the conference and how I see they may be applied to Lord Howe Island. I would be willing to undertake more detailed investigation of any matters raised.

Attached publications from the conference .

- 1 Ecological Restoration of New Zealand Islands
- 2 Abstracts from 2001 conference
- 3 Assessment of the weed control programme on Raoul Island, Kermadec Group.
- 4 IUCN Guidelines for the prevention of biodiversity loss caused by alien invasive species