Kakapo Recovery Programme

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ABSTRACT

The kakapo is a highly endangered parrot endemic to New Zealand. It ebbed to 50 known individual in 1995. Over the past 8 years The department of Conservation in partnership with corporate sponsorship, a leading conservation oriented NGO, and a pool of dedicated volunteers from the global public have reversed the decline of this species producing a 72% increase in kakapo numbers over this time. The progress has been so successful that managers are now looking for more space to put the expanding population and are contemplating reducing management effort by an order of magnitude. Environmental education has been an effective by product of kakapo recovery. Positive conservation messages are presented in all forms of the media, and an intensive volunteer programme facilitates public involvement in the programme.

1 INTRODUCTION

The Kakapo Recovery Programme is a partnership between a sponsor, Comalco New Zealand, a non-government organisation, The Royal Forest and Bird Protection Society, and the Department of Conservation. It is also a partnership with the international public, which donate money and volunteer their time to help save the kakapo.

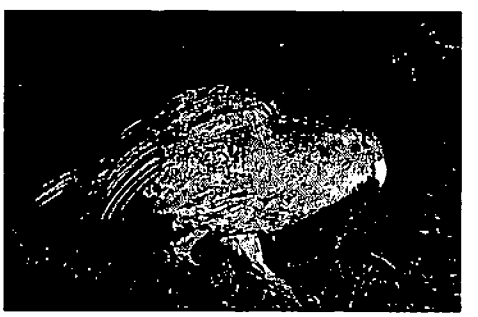

Fig. 1. Portrait of the critically endangered kakapo.

Kakapo are of international significance as they have many unique features that are of scientific interest (Fig 1). Kakapo have become a symbol of the struggle that endangered species face. Kakapo are of particular significance to Maori, the indigenous people of New Zealand, and the species is specifically mentioned in New Zealand legislation as a treasured (taonga) species.

2 BACKGROUND

Kakapo are endemic to New Zealand and from sub fossil remains it is evident that they were once common on the three main Islands of New Zealand. However, by the 1960's, kakapo were restricted to a small remote area of south west New Zealand. Kakapo survived in the upper elevations of the steep sided glaciated valleys of Fiordland's Milford catchment. In 20 years of searching in this area only 22 birds were located all of which were male. It is believed that the decline of kakapo was due to the introduction of stoats (ermine) for rabbit control, shortly after the turn of the 19th century. This flightless ground nesting bird was easy prey for this agile predator

In 1976 kakapo were discovered on Stewart Island. It was estimated, by the number of male lek breeding sites that the population was approximately 200 birds. Kakapo use a "lek" where male kakapo loosely aggregate and display to attract females during the breeding season. Each male has a series of interconnected tracks and excavated bowl like depressions. Kakapo use an audio display,

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a sequence of low resonant "booms" repeated thousands of times each night. These calls are interspersed with high frequency calls called "chings" which are believed to make it easier for the female to accurately locate the male. However, it was not until 1980 that the first female was confirmed as present. This first female was called Mandy, after the trained tracker dog that found her. This was the first confirmed female found since efforts to save kakapo had begun in 1957 and the first female seen in over 50 years. Mandy was weighed, measured, and leg banded with a stainless steel band, then released. Mandy has never been seen again.

In March 1981 the first nest was discovered. "Alice" successfully fledged her male chick "Snark" and at least one other female produced offspring that year. Unfortunately celebrations were short lived. With new transmitter technology fitted to the birds it was revealed that cats were a significant predator of kakapo.

Five male kakapo were found killed by cats on their display lek in one week and it was estimated that cats had killed half the Stewart Island kakapo population since its discovery 5 years earlier.

Fig. 2. Location of kakapo islands.

Cat control was established immediately and under the protection this afforded, kakapo were located and transferred to predator free islands. This process took 10 years due to the cryptic nature of kakapo, poor weather (with the island at 47° south in latitude), and a near complete cover of their habitat with exceptionally dense vegetation.

Birds were translocated to three offshore islands around New Zealand. Maud Island was the first recipient of birds with Little Barrier and Codfish Island to follow (Fig. 2).

The presence of the Polynesian rat Rattus exulans on two of the three islands (a species introduced to New Zealand by Polynesian settlers) was under estimated as the rat was not a predator of adult kakapo. However, their effect was devastating as they preyed on eggs and newly hatched chicks. Male kakapo play no role in incubation and rearing of chicks. Consequently rats met no opposition when the female was away from the nest foraging for food.

It was evident that even though adult mortality had been reduced to near zero, without successful breeding kakapo would be functionally extinct within 30 years.

3 RECENT RECOVERY EFFORTS

In 1995 the kakapo recovery team was restructured and a new recovery plan was written. The plan focused on the essential tasks to halt extinction and had one very clear performance measure to assess success, the number of female kakapo produced.

The recovery goals were (abbreviated):

1. Manage existing breeding potential for best effect.
2. Undertake and apply research to increase breeding frequency

The performance measure to assess progress was:

Eight female chicks produced and 24 nests with eggs by 2005.

While these goals were very simple and served to focus activity to achieve them, many new strategies had to be employed.
These included:

1. Training female kakapo to take food to ensure that they could support their chicks should fruiting fail.
2. Detailed planning was undertaken to determine responses to potential disasters such as predators entering the nest.
3. Rats were controlled locally around nest sites to reduce the risk of kakapo being predated.
4. Specially designed bait and trap stations were made to avoid harming kakapo.
5. Placing of infrared video cameras in the nest to observe the nest without disturbance.
6. Remote fired rat scaring system.
7. Heat pads to replicate incubation in the nest when the female is absent.
8. Nest modifications to protect chicks from environmental factors.
9. The nest minder programme was developed to provide personalised attention for each nest and to intervene promptly should this be required.

The heat pad, and operating the rat deterrent, was the primary focus of the nest minder. However, the minders also carried the 3 tonnes worth of equipment to and from each nest that was required over the 4 month incubation and fledging period.

The miniature "in nest" video cameras were connected to 24 hour video recorders so all happenings in the nest could be reviewed for detailed data gathering.
Fig 3 shows an example of type of data collected that helped develop incubation and hand raising standards.

In 1997, with the planning process just completed, we faced our first breeding season with 7 females attempting to breed. Our planning process was successful and 3 male chicks were produced.

In 1998 our second breeding season (one nest) was 100% successful. Two males and one female chicks were produced.

Through both seasons chick growth was monitored through regular weights being taken from nestlings. This enabled close monitoring of chick health and development, and also enabled us to acquire growth curves of naturally raised healthy chicks. All this data was then analysed to produce growth "normals" and thresholds that would determine what action was required and when.

As can be seen from the graph of Fig. 4, male and female weights diverge soon after hatching. A 20% below average weight figure was used to set a point for intervention. This generally took the form of removing the chick from the nest and hand raising.

Review of observations

time	leave	arrive	egg roll	time away in minutes	unusual behaviour or other animals	comments
02:45	✓					
03:20		✓		35		
03:41			✓		scratching	

Fig. 3. Example of data collected.

In 1998 there was an opportunity to rid Whenua Hou (our premier kakapo island) of Polynesian rats. We predicted that breeding would not occur that summer due to the lack of abundant fruiting of rimu. Our plan was to move all the kakapo from Whenua Hou temporarily to Pearl Island, a smaller island to the south-east.

However, after the birds were moved the eradication of rats was delayed a few months and the abundance of rimu fruit was higher than anticipated. With concern that a late return to Whenua Hou may disturb any potential for breeding, kakapo were left on Pearl Island for the season. In early January mating sign was found.

With weka, an endemic flightless rail, and a known predator of eggs, present on the island a new strategy was required. Weka could not be trapped or poisoned (as they are a threatened species too) and were unlikely to be deterred by our rat scaring devices. All eggs were collected for artificial incubation and hand rearing. The data collected from previous breeding season gave us the confidence to act.

The results produced were better than the previous two seasons. Six new chicks were produced, four of these were female, but to achieve this required difficult and nerve racking work.

We believed that, wild mothers given a predator free environment and some support such as supplementary feeding, could have easily duplicated this result. From the three breeding seasons from 1997 to 1999 we built a clear set of actions that could be used to meet the goals of the Kakapo Recovery Plan. Lessons and actions taken over the three successive breeding seasons that are now invaluable to kakapo management were:

1. Protection from predators at the nest increased productivity significantly.
2. From the transfer of kakapo to Pearl Island in winter we learnt that winter transfers do not interfere with breeding the following summer.
3. Understanding each individual bird and managing accordingly i.e. it's personality traits and tolerance to intervention.
4. Supplementary feeding of females to support them raising chicks.

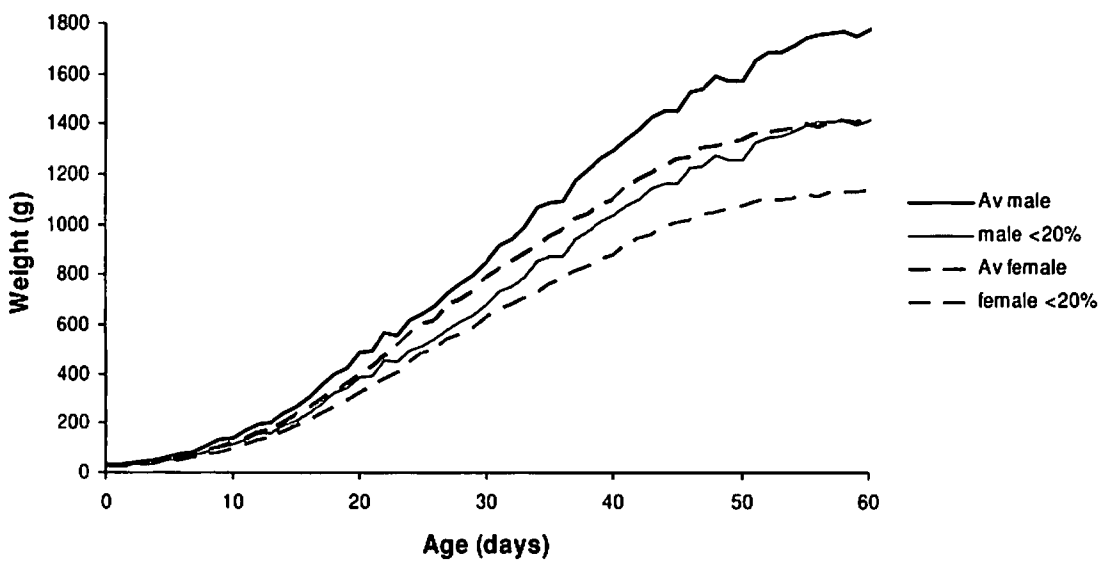

Fig. 4. Graph of male and female weights divergence after hatching.

5. Intensive monitoring of nests and nest management increases hatchability and chick survivorship.
6. Artificial incubation and hand raising is an integral part of close order programmes and information vital for this activity had been gathered and tested.

In 2002, after two years of no kakapo breeding activity, kakapo bred again.

The season started with the knowledge that rats were no longer present on Whenua Hou and that an exceptional crop of rimu fruit was developing and set to ripen (probably a 1 in 20 year event). Males were in excellent condition and females were exhibiting all the precursors to breeding (i.e. "walk about" to assess food availability, good body weight, etc).

All females were moved to Whenua Hou for the predicted breeding season. This was based on the experience of the Pearl Island transfer of two years before, to ensure the transfer timing would not interfere with breeding and to ensure the maximum number of females would attempt to breed in association with the heavy fruiting.

Over 130 nest minder volunteers were recruited and programmed to assist for two weeks at a time over the 6 month breeding season. With rats absent the volunteers job of managing nest was easier than in the past. However, with 24 nests for the season, there was still more than enough work to keep everyone fully occupied keeping eggs warm and ensuring that the nests and chicks were safe and secure.

Nest management was further refined with egg transfers between nests to reduce potential for mortality through sibling rivalry and to encourage re-nesting and the laying of second clutches. Eggs were moved to ensure no bird hatched more than two young and that the young were of as near equal age as possible to avoid the larger chick out competing the other for food. These egg transfers also provided an opportunity to collate single egg clutches and the disposal of infertile eggs allowing 7 females to re-nest. The result was several nests with a single chick or two chicks the same size. Of the seven females that were encouraged to re-nest by removal of their clutch, four produced a second clutch increasing productivity further.

Nest boxes replaced most natural nests to ensure chick security from natural environmental hazards such as steep banks and "pit fall" holes. These structures also allowed unimpeded access to chicks for management, reducing the risk of intervention caused injury.

As a result of these combined management actions 24 new kakapo were produced. Nine males, and 15 females. A 39% increase in the population in one year.

At this point the performance measure in the plan have been exceeded. We have produced 20 females, over double that required in the plan to ensure the population would not decline. Kakapo numbers seem set to double within the 10 year term of the plan.

4 THE FUTURE

Success has created a new set of issues that need to be planned for. The biggest single factor is the need for more predator free habitat for the expanding kakapo population. Fig 5 shows the predicted population growth under four scenarios. The bottom line is if we stop management. The second line from the bottom is supplementary feeding only in kakapo breeding years to support females raising their chicks. The top line is continuing with intensive nest minder type management (impractical in the long term as logistically this exercise becomes too large and would be detrimental to the habitat). The second from top line (our planned course) is intensive management till we reach a target of 50 female kakapo then use supplementary feeding only until we get 150 female kakapo.

If we apply the strategy as demonstrated by the planned line in the figure below we feel confident that we can stop management when 150 female kakapo are in the population. The birds will be numerically strong enough to increase on their own. This strategy will reduce expenditure on kakapo by an order of magnitude within five to 10 years. However, this assumes there is space to accommodate the extra kakapo. With Current understanding of kakapo/predator interactions this

can only be achieved on predator safe islands.

The criteria for kakapo islands are rather simple. They need to be 500 Hectare or larger, Be predator safe, and have a mast fruiting species to initiate breeding. However, there are few islands around New Zealand which meet these requirements. Removal of predators from islands in Fiordland, south west New Zealand, is the key to more space for kakapo in the medium term.

There are other issues that we will continue to attempt to resolve in the short term. The most important of these is male infertility.

Male infertility is a significant issue as one third of all eggs laid in 2002 were infertile and male infertility is seen as the most probable cause. Increasing fertility of eggs has the greatest potential to increase the rate of recovery. We have employed a "guilty by association" programme over the past four breeding season for males involved in matings that have produced infertile eggs. We have been ruthless in applying this as production of chicks from any pairing, when kakapo are in such critically low numbers, has been more important than genetic considerations. However, with the kakapo population now on the increase it is time to re evaluate the "guilty" males as they may have a contribution to make. To test male fertility an assessment of their sperm is required. Attempts at non-invasive sperm collection have been unsuccessful.

Methods attempted started with remote controlled mannequins. Males showed no interest in these and work subsequently moved step-wise though a series of increasingly invasive techniques settling on electro ejaculation. Electro ejaculation uses a small electric current passed through the bird in the area of the gonads while the bird is anaesthetised. Once the fertility of males has been evaluated final decisions on which birds can successfully mate with females will be made.

5 WIDER CONSERVATION BENEFITS

The kakapo is an international icon for endangered species management and as such has exceptional potential to raise awareness of conservation issues. The National Kakapo Recovery

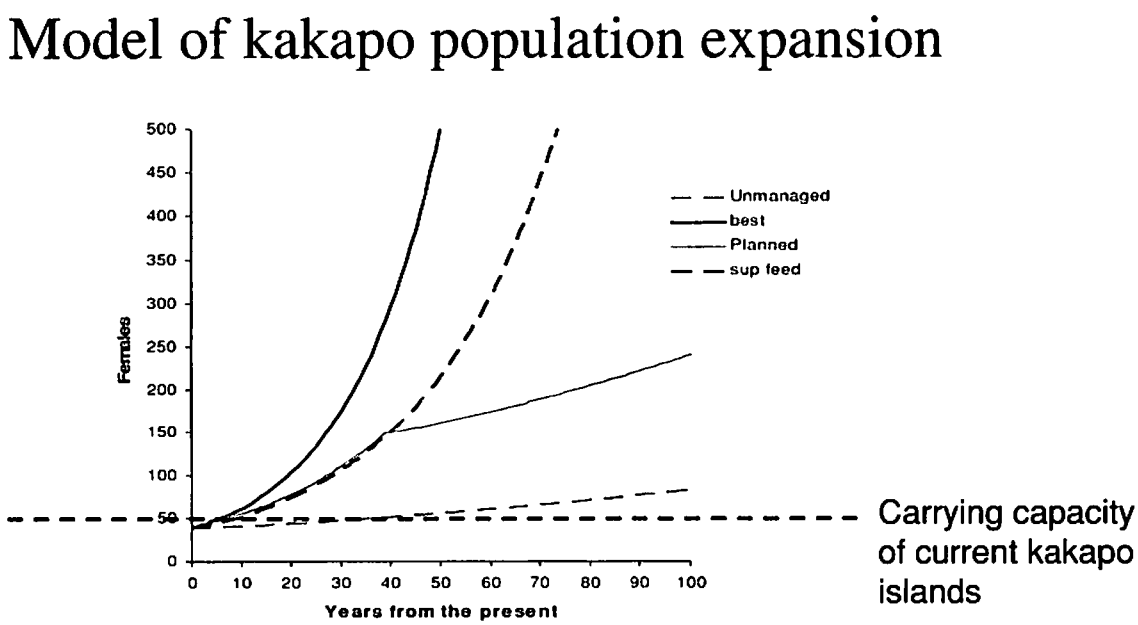

Fig. 5. shows the predicted population growth under four scenarios.

Programme and the Broader Department of Conservation produce many educational outputs directly associated with kakapo recovery. We need to continue to involve the public through advocacy and education to ensure future commitment to kakapo conservation and wider ecosystem management.

Educational tool used to date include:

Web sites, web based education (in the form of teacher hosted virtual field trips), volunteer opportunities (where members of the general public work with staff of the programme in the field managing kakapo), print media and television news stories, and scientific publication.

These have various levels of investment and while the overall cost benefit of the various activities has not been investigated there have been some indicators of the level success within each target group.

Schools

Indicators from targeted information to schools shows a high up take of information. Huge participation from schools during chick naming competitions and an insatiable appetite for information about kakapo would suggest this message is reaching the intended target.

Interested public

The kakapo recovery programme has an oversupply of volunteers for field work. Additionally numerous letters from public requesting information and donating money show that the kakapo message is reaching the intended audience.

General public

Surveys of general public have high recognition of conservation significance of kakapo.

Politicians

Many politicians from New Zealand and overseas have visited the recovery programme using the visit to promote a positive political message. Most also leave with a greater appreciation of the value of conservation on a personal level.

Non Government Organisation

There is continuing support from conservation NGO's for the programme. The largest Conservation NGO in New Zealand is a partner in the administration of sponsorship funding.

Sponsors

Comalco New Zealand, a subsidiary of Rio Tinto, has sponsored Kakapo since 1990. Since them the Then sponsorship contract has been reconfirmed on three occasions and seems set to continue into the future. While the educational impact of sponsoring the Kakapo Recovery Programme is hard to Quantify, during the term of the sponsorship , both Comalco NZ Ltd, and their parent company, have become environmentally more aware and proactive in environmental sustainability.

Conservation managers and scientists

Uptake of research from the kakapo programme is low. New conservation projects within New Zealand and overseas are still being designed with previously elucidated flaws present. As more kakapo research outcomes are documented it is likely that up take of this information by the scientific community will increase.

6 CONCLUSION

The recovery of kakapo has been effective to date avoiding extinction through a programme of intense intervention. It is highly likely that the costs of recovery will be able to be reduced within

the next 10 years as kakapo numbers grow to a more secure level and are unlikely to decline even if all management intervention ceased. The success of the kakapo recovery programme has been due to timely intervention with conservation management techniques, some of which had to be newly developed. However, it is unlikely that the funding for such and expensive and extended programme of work would have been allocated without support generated by the conservation education outputs from the programme.

There is now potential that kakapo will return to the mainland of New Zealand within our life spans. Despite the long time frame, the adaptive management approach coupled with a "can do" attitude, and a strong conservation education programme, has provided a sound platform from which this can happen.

Visit our website at: kakaporecovery.org.nz