Kea *(Nestor notabilis)* Captive Management Plan and Husbandry Manual

Threatened Species Occasional Publication No. 9

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1. Introduction

1.1 TAXONOMY

The kea *(Nestor notabilis)* belongs to the sub-family Nestorinae, which is endemic to New Zealand and contains only one other species: kaka *(Nestor meridionalis).*

1.2 CONSERVATION STATUS

The kea is listed as a "Category B "threatened species according to the Department of Conservation's threatened species priority ranking system. *(Setting priorities for the conservation of New Zealand's threatened plants and animals. Molloy and Davis 1992. Revised 1994. Department of Conservation, Wellington).* This classification places kea among a group of 214 Category B species whose priority for conservation action is recognised as important but less urgent than the 98 species listed in Category A).

Perceived threats to kea include:

- degradation of their habitat through fire, over-grazing by domestic stock and browsing by feral mammals (e.g., tahr, rabbits);
- predation at nests by introduced mammals such as stoats;
- illegal shooting and poisoning of kea perceived as threatening human activities (principally sheep-farming);
- illegal capture and trading of kea.

1.3 GENERAL BIOLOGY

The kea is the world's only alpine parrot. While these birds are primarily associated with the bushline, they are frequently found much higher, and occasionally venture into lowland forests.

Kea are found only in the South Island of New Zealand, where they occur in all mountain areas. Kea are inquisitive and social birds, often congregating to investigate novel objects in their environment or scavenge on food sources associated with human activities (e.g., rubbish tips). As a consequence of this behaviour, they are well known by a large section of the public including farmers, skiers and holiday makers.

Although kea are still seen in reasonable numbers throughout the South Island, the wild population size, trends and dynamics are poorly known. The wild population has been estimated at between 1,000 and 5,000 birds but because of the wide distribution of kea, the difficult terrain they inhabit, and the nomadic behaviour of some individuals, it has not been possible to carry out a proper census.

There is currently no need for a Kea Recovery Plan. However, the degradation of high country habitat, ongoing conflict with humans and possible impacts of introduced mammals give cause for concern. It is important that monitoring continues so that any decline of kea is detected in time for the appropriate conservation actions to be taken.

1.4 LEGAL PROTECTION

Kea have been persecuted as sheep killers ever since Europeans began to farm the South Island high country. Historically, the New Zealand Government encouraged farmers to eradicate kea and offered a bounty for kea beaks until 1971. At least 150,000 kea were killed between 1860 and 1970.

Because of their reputation as sheep killers, kea did not receive full protection under the Wildlife Act until 1986. Although partial protection was granted in 1970, this was not sufficient to prevent farmers from shooting any birds they thought were causing problems on their properties. It is now known that only a few kea attack live sheep, but historical prejudices persist. The *Wild Kea Management Statement* (Canterbury Conservancy Miscellaneous Report Series Number 4. Department of Conservation, Christchurch. June 1993) attempts to address this problem through advocacy, public education and by setting out a process for conflict resolution. A national KeaAdvocacy Strategy (Peat, N. 1995. *Kea Advocacy Strategy*. Miscellaneous Report Series No. 28, Department of Conservation, Dunedin) presents a strategy for resolving the wider series of issues involving kea and people in the South Island high country.

1.5 HISTORY IN CAPTIVITY

Kea are known to have been bred in captivity since the early 1960s but it is likely that earlier successes went unrecorded. Prior to 1992, captive breeding of kea was sporadic and uncontrolled. Only eight pairs, of which only 4 were of known wild-caught status (founders), are known to have produced captive-bred progeny on a regular basis. Two of these founder pairs have now been retired from breeding because they are well represented in the captive population.

Kea are potentially long-lived - one of the wild-caught males currently in captivity is known to be 37 years old. The birds' potential longevity, their popularity as an aviary bird and the historical lack of regulation prior to the species becoming protected, has led to the establishment of a large captive population of at least 213 birds within New Zealand. The captive kea population is currently much larger than is required for conservation purposes.

1.6 EXPORT

Between January 1961 and February 1985, 242 kea were legally exported from New Zealand. While the origins of these birds were not recorded, it is likely that most were wild caught. Kea have been found in the illegal wildlife trade. Prior to the recent (1993) establishment of kea studbooks in both Europe and the USA, there was minimal documentation and no coordination of captive kea stocks held outside New Zealand.

Even now, the numbers of kea held overseas are not accurately known because some kea are kept by aviculturists outside the coordinated programmes.

Whereas in the past, many of these exported kea were held in situations where they had no breeding potential, overseas holders are now focusing increasingly on breeding kea in captivity. It is hoped that the increasing availability of captive-bred kea originating within Europe and the USA will lead to a decline in the monetary value of kea and consequently reduce the incentives to trade illegally in this species. Other than reducing the illegal export of kea, kea held overseas are of little consequence to the conservation of the species. Disease risk prevents kea or their progeny being returned to New Zealand.

Relatively few kea have been exported from New Zealand in recent years. Nowadays, only captive stock of no value to the New Zealand captive kea programme may be considered possible candidates for export. Prior to export, each bird must have a Trovan electronic transponder implanted for permanent identification, in addition to a metal leg band. Overseas applicants must comply with the prescribed housing requirements and participate in one of the overseas co-ordinated programmes.

1.7 CURRENT STATUS OF CAPTIVE POPULATION

As at December 1994, the known captive kea population in New Zealand numbered 212 birds held by 32 institutions and 30 private aviculturists.

74 of these birds - 61 males and 13 females - are wild caught and of known origin.

40 of the kea currently in captivity are the captive-bred (F1) progeny of known founder pairs.

The remaining 99 birds are either of unknown parentage or unknown origin (captive-bred vs. wild-caught).

1.8 ADMINISTRATION OF THE NEW ZEALAND CAPTIVE PROGRAMME

A co-ordinated captive management programme was established for kea in 1991 in order to rationalise and make better conservation use of the large captive kea population held throughout New Zealand. Tony Pullar, an aviculturist employed by Dunedin City Council, is the Kea Captive Management Co-ordinator appointed by the Department of Conservation. This is a voluntary appointment.

The co-ordinator carries out a number of tasks on behalf of the Department of Conservation. His responsibilities include the establishment and maintenance of a stud-book for all kea known to be held in captivity in New Zealand. To achieve this task he liaises regularly with all kea holders. All births, deaths, transfers and other significant events are recorded on the computer database programme "SPARKS" (Single Population Analysis Records Keeping System) designed by "ISIS" (International Species Information Systems) based in the United States. An electronic copy of the updated stud-book is forwarded to the department's Threatened Species Unit each year, along with an annual report summarising the status and trends of the captive population.

In addition to collecting and collating these statistics, the co-ordinator, in consultation with the department and holders, plays a major role in the development and ongoing re-assessment of the captive management strategy for the species (outlined in section 2).

At the day to day management level, the co-ordinator advises holders on husbandry and record-keeping requirements, disseminates any relevant new information to holder and facilitates any approved research projects involving the captive population - this includes advising on the correct processing of any dead specimens so as to maximise the opportunity of establishing cause of death and obtaining other information relevant to the captive programme or kea conservation in general.

The co-ordinator makes recommendations to the department on transfers and pairings of birds, recruitment of holders and export applications. These recommendations are generally approved by the department, provided they are consistent with the agreed captive management strategy. The co-ordinator should be the first point of contact for holders seeking to withdraw from the programme or reduce the number of kea they hold. He must also be consulted before any new permits are issued to hold kea.

2. Captive Management Plan

2.1 GOAL

To manage a self-sustaining population of kea in captivity, of a minimum size needed to maintain adequate genetic diversity, to support the conservation of the species in the wild.

This population would provide a resource for the following:

1. Conservation education and advocacy;
2. Research - both to benefit kea and other threatened species e.g., kakapo.

2.2 OBJECTIVES

1. Manage a captive population that is self-sustaining and maintaining adequate genetic diversity
2. Ensure that all kea in captivity are held in facilities which meet set minimum aviary requirements
3. Maximise the advocacy opportunities associated with kea on public display
4. Maximise the research opportunities associated with the captive population

2.3 IMPLEMENTATION OF CAPTIVE MANAGEMENT OBJECTIVES

1. Manage the captive population to be self-sustaining and maintain adequate genetic diversity

Target population size approximately 100 birds, retaining as many as possible of the known wild-caught birds and/or their F1 progeny.

Explanation

The maintenance of a self-sustaining captive population requires a focus on quality rather than quantity, with pairings carefully controlled and generation intervals stretched so as to maximise the retention of genetic diversity within the captive population. A managed population of up to 60 birds is the minimum required to retain more than 90% heterozygosity over a 200-year period, a goal recommended by a Population Viability Assessment workshop held in 1991 in association with the Captive Breeding Specialist Group of lUCN. The target of approximately 100 birds provides an additional safeguard against annual fluctuations in productivity or mortality. Maintaining more birds than this in captivity is of no clear conservation value and imposes significant additional costs and management difficulties.

Actions

The captive population size will be managed as follows:

1. Short-term - reduce population to desired size for management.

The population will be reduced by a combination of the following:

- Natural attrition: The mortality rate in captivity has been relatively low, averaging 15 birds per year, so this will be a relatively slow process. All current holders of kea will be allowed to retain them for the remainder of the birds' natural lives, should they so wish.
- Moratorium on breeding. The breeding ban will continue and will be reviewed annually. Holders must prevent their birds from breeding by separating pairs, establishing single sex groups, or (the least preferred option) pricking eggs. The removal of next boxes from the aviary is not an effective method of breeding control because some kea will continue to lay eggs and incubate them on the aviary floor.
- Moratorium on the recruitment of new holders.
- Limited and controlled export of captive stock no longer required for breeding purposes within New Zealand and no longer wanted by current holders may be permitted. It is envisaged that export will cease once the New Zealand captive population has been reduced to the target level.

Time frame

Estimate 5 to 10 years. Depends on mortality rates, the number of birds exported and whether certain birds are bred from during the down-sizing process (see below).

2. Medium to long-term - maintain population through selective breeding.

Known wild-caught birds which are not yet adequately represented in the captive gene pool, and the F 1 progeny of known founder pairs can be considered the potential breeding stock of the future. There is no justification or intention to supplement the captive gene pool by catching further birds from the wild. As the captive population declines towards the target size, *limited* breeding from birds within this group *may* be authorised by the Director, Protected Species Division. A priority would be placed on selected wild-caught females which have not yet produced captive progeny. The 99 kea currently in captivity which are of unknown background (parentage or origin) will not be allowed to breed at all. The co-ordinator will inform all holders of the status of the birds they hold.

The future management of the captive population will depend on selective breeding using the principles recommended by small population biologists (e.g., maximise founder representation) and assisted by the analytical techniques available through computer programs such as SPARKS.

Good record keeping and co-ordination is required to make the best use of the captive population - e.g., planning pairings and breeding intervals, collecting and collating post-mortem reports. Good record keeping is also an essential component in the maintenance and transfer of husbandry skills and knowledge. A stud-book will be maintained using SPARKS software.

Time frame

Until such time as the need or purposes for a captive population are reviewed.

Personnel

The co-ordinator will be responsible for planning, administration, record-keeping including maintenance of stud-book and making recommendations on birds suitable for export and those that should be bred from. These recommendations will be subject to the approval of the Director, Species Protection Division. The Department of Conservation remains responsible for permits and negotiation of permit conditions. International expertise available through the Captive Breeding Specialist Group of IUCN will be drawn on in determining the principles used to select birds for breeding.

2. Ensure that all kea in captivity are held in facilities which meet set minimum aviary requirements

The recently revised Kea Husbandry Manual is appended to this Plan and will be sent to all kea holders. It specifies the minimum conditions acceptable for housing kea in captivity. A number of kea, including some held on public display, are kept in substandard conditions. This situation should be urgently addressed by reassessing all aviaries where captive kea are held and a reasonable time frame negotiated for upgrading or transfer of birds. Holders will be encouraged to develop their facilities beyond this minimum, particularly when held on public display.

Personnel

The co-ordinator will make holders aware of their responsibilities to ensure that the kea in their care are housed in appropriate conditions. He or she will also keep abreast of international developments in aviary design to advise holders seeking to improve their facilities. Conservancies will be responsible for undertaking inspections of kea holding facilities in their area to ensure that they meet the specifications outlined in the Husbandry Manual. The Department of Conservation remains responsible for permits and negotiation of permit conditions.

Time frame

Estimate two years to bring all facilities up to standard, then ongoing.

3. Maximise the advocacy opportunities associated with kea on public display

It is important to make use of the conservation education and advocacy potential of kea already held on display to the public. Institutions must be required to display kea in surroundings and with signs that convey effective conservation messages to the public. As the captive population is reduced to its target size it is intended that a high proportion of the birds will be on display, though birds that are breeding or used in specific research (see below) may be held off-display.

Personnel

The co-ordinator will be responsible for prompting display institutions to ensure that their displays are accompanied by adequate and appropriate advocacy material. Conservancy staff can inspect advocacy material when they do aviary inspections and discuss any relevant changes with the holder.

Time frame

Estimate 3 to 5 years in conjunction with Objective 2.

4. Maximise the research opportunities associated with the captive population

Actions should be taken to facilitate access to the captive population by those wishing to do research of benefit to kea and related species in the wild. This will involve researchers being made aware of the opportunity and holders being required to make their birds available for research where possible. Several research priorities were identified during the Population Viability Assessment workshop including the development of techniques for ageing and sexing kea and sperm collection and storage, the latter using kea as analogue species to assist work on the critically endangered kakapo.

Personnel

The co-ordinator would assist in matching researchers with appropriate birds. The Department of Conservation would be responsible for issuing the necessary permits and an Ethics Conunittee (departmental or University-based) would have to vet any intrusive research.

2.4 PLAN REVIEW

Priorities for captive management will change in response to changes in the status, trends and knowledge of the wild population. This plan will therefore be kept under review.

Appendix 1:
Kea Husbandry Manual

1. ADMINISTRATION AND PERMITTING

The roles and responsibilities of the kea captive management co-ordinator (subsequently referred to as the co-ordinator) are qutlined in section 1.8 of the Kea Captive Management Plan. Further details on the administration of protected species in captivity can be found in the department's Draft Procedure: *Captive Management of Species Protected Under the Wildlife Act 1953*. Kea may not be held in captivity without authorisation from the Department of Conservation. Permits to hold or transfer kea must be obtained prior to obtaining or transferring the birds. Applications to hold or transfer kea should be directed initially to the co-ordinator who will assess whether the application is consistent with the objectives of the species captive management plan and make the appropriate recommendation to the department. Any applications made directly to the department will be referred back to the co-ordinator before being processed.

The co-ordinator is appointed by the department and acts on its behalf. Holders are requested to co-operate with the co-ordinator in implementing the objectives of the Kea Captive Management Plan. All permits to hold kea will be reviewed as time permits. Meanwhile, holders will be expected to comply with the requirements of the co-ordinated programme even if these go beyond the conditions on existing holding permits. For example, holders must prevent their kea from breeding until otherwise instructed - even though this restriction is not stipulated in the majority of existing holding permits.

2. AVIARY REQUIREMENTS

The minimum cage area for two kea shall be no less than 6 metres long by 3 metres high by 2.5 metres wide. Where more than two kea are to be housed together, the minimum dimensions are increased in proportion to the number of birds held; e.g., 4 birds would require the equivalent of 6 m x 6 m x 2.5 m.

Adequate shelter must be provided to enable the birds to seek protection from wind, rain and sun. The covered area usually accounts for approximately one third of the whole aviary area and often contains the birds' feeding station and nest site (where applicable). Parasites and other pathogens tend to persist longer in cool shady areas. The floor and walls of this area, particularly the feeding station and the area beneath it, should therefore be constructed of materials that can be properly cleaned; e.g., smooth impervious wall surfaces rather than rough sawn wood; gravel or concrete base rather than a dirt floor.

Kea are very strong and inquisitive parrots. It is therefore essential that the aviary be constructed of heavy duty materials capable of withstanding intensive and prolonged

biting, digging and pulling; e.g., pipe framing covered with chain link (18 mm mesh size x 2.5 mm gauge). Smaller gauges are not sufficiently robust to contain kea, whereas larger mesh sizes permit the entry of rodents and wild birds, substantially increasing the risk of predation and/or disease. The correct wire gauge and size is available from most New Zealand wire merchants.

Entrance to the aviary should be via a double safety door to prevent the birds from escaping when people enter or leave the aviary.

Because of their tendency to chew almost any object within reach, kea are highly susceptible to heavy metal poisoning from galvanised wire products, old lead-based paints and other objects within the aviary environment. Two recent and fatal cases of lead poisoning were attributed to the birds (kaka) having had access to Weldmesh netting imported from China. This material has a much higher lead content than galvanised wire products made in New Zealand. These deaths occurred despite the normal precautions (washing with vinegar and weathering) having been taken before the birds were introduced into the new aviary. Any newly galvanised wire must be pre-treated by vigourous scrubbing with vinegar solution and natural weathering before birds are introduced into the aviary. It is recommended that the wire be painted with a non-toxic turps based paint to lock in the remaining poison below the paint surface. Chinese galvanised wire products should be avoided.

The aviary must be predator-proof. To prevent the birds from digging out and rodents and other mammals from digging in, the aviary should have concrete foundations extending well below ground level (preferably to 600 mm). Although mice are not likely to threaten kea or their eggs through predation, they are potential disease carriers and should be excluded as far as practical.

For health management reasons, the aviary should be sited in a location receiving adequate sunlight. The floor should consist of a well drained substrate (e.g., gravel) which is easy to keep clean and discourages the build-up of pathogens in the aviary environment. To enhance the birds' captive environment and minimise the risk of foot problems developing, a variety of substrates should be provided; e.g., a combination of large rocks arranged in stable piles and a range of natural log perches which offer perches of varying diameters and textures. Rotted logs should also be supplied for the birds to tear up. These and the log perches will need to be replaced as they are destroyed.

The inclusion of "toys" in a kea aviary is essential for the birds' mental well-being. Plastic ball-cocks, lengths of chain, old leather boots and the like will keep kea amused for hours. Avoid objects containing substances that are potentially toxic (e.g., some paints, metals, glues etc.) or that could cause a gastro-intestinal obstruction if swallowed - e.g., remove laces from boots. Because of their ability to destroy things, chewable play objects will need to be replaced at frequent intervals.

Clean fresh drinking water must be available at all times. If given the opportunity, kea will bathe frequently and eat most of their food in water. In addition to a basic source of drinking water, the aviary should ideally contain a pond suitable for bathing that is easy to keep clean.

3. SOCIAL FACTORS

Kea are intelligent, playful and social animals requiring considerable mental stimulation in the form of play objects and companions. For this reason, kea must be held in groups of no less than two individuals with the following exceptions:

- birds in temporary isolation due to illness or when recovering from injury;
- mal-adjusted birds which, as a result of having spent decades in solo captivity, are no longer capable of interacting normally with others of their own species;
- unavoidable situations as when a member of a pair dies, or a single juvenile has to be separated from its parents prior to the following breeding season. These are temporary situations; these birds should be incorporated into a group or pair as soon as practicable.

4. INDIVIDUAL IDENTIFICATION

All kea held in captivity must be individually identified using metal leg bands issued by the Banding Office and supplied through the captive co-ordinator, who collates the banding records for captive kea. Permanent identification of individual kea is necessary for record-keeping purposes and to identify any kea recovered after theft or escape from captivity. Holders must notify the co-ordinator of any unbanded kea they hold. Holders with previous banding experience may band the birds in their care, provided they inform the co-ordinator whenever a bird is banded, including an explanation of where the bird came from and why it was not previously banded. The co-ordinator will pass this information onto the captive management co-ordinator at the Threatened Species Unit. It is also essential that the co-ordinator and the conservancy office are informed of the replacement of any damaged or lost bands. Any person banding or removing bands from captive kea without the knowledge of the co-ordinator and their local conservancy is liable to have their birds removed and their permits revoked. Inexperienced holders should contact their local DoC conservancy office for assistance.

The use of electronic transponders in addition to leg bands is encouraged but is not mandatory. This technology provides a more secure form of permanent identification but is not yet widely used.

5. DIET

Kea are opportunists that are generally willing to eat a wide variety of foods. Consequently, the nutrient requirements of captive kea can potentially be supplied through a range of different food combinations. It is therefore not surprising that experienced kea breeders hold varying opinions on the "optimum diet" for this species. Some holders base the birds' diet on specially formulated parrot feeds (pellets or crumbles) designed to supply all the animals' nutrient requirements; e.g., Roudybush or Lakes brand. Others claim better results from feeding a more traditional diet based on a wide range of natural ingredients. While this approach is regarded as less scientific, it is likely that most animals offered a variety of foods will use their

"nutritional wisdom" to select foods which provide the nutrients they need at the time.

The following foods are commonly fed to captive kea.

- Pellets or crumbles that are specially formulated to supply the total nutrient requirements of parrots - may be fed as a total diet but more commonly supplemented to a greater or lesser extent by a variety of "natural" foods.
- Sunflower seed, peanuts, walnuts - to be fed in limited amounts.
- Feeding excessive quantities of high protein feeds (e.g., seeds, nuts, meat) can lead to the development of obesity and gout.
- Oats, maize and blue peas and other seeds may be fed soaked or dry. All dry seeds and beans should be preferably soaked and sprouted. Good hygiene is essential when preparing and feeding sprouts; any uneaten sprouts should be removed within 24 hours.
- Cheese - no more than 25 g per bird three times per week; may be increased to 75 g per day to birds rearing chicks.
- Fruit biscuits.
- Fresh green food - favourites include sow thistle (puha), flowering dandelion and chickweed, although silverbeet or celery may be substituted when these are not available. All green food should be thoroughly washed to reduce any spray residues and other contaminants before being offered to the birds. It is absolutely essential that birds with chicks are offered fresh green food every day.
- Fruits, particularly apples and oranges, may be consumed and carrots tend to be eaten in quantity. "Natural" foods such as coprosma berries, wild grasses and flowers, hawthorn berries are always appreciated and should be offered as availability and collection time permits.

Birds rearing chicks may be offered a "nectar mix" made up according to the following recipe:

- 2 cups of rolled oats
- 1 heaped tablespoon of complan
- 2 cups of cold water

Simmer gradually until thickened, then add brown sugar or glucose to sweeten - just sufficient to taste; avoid over-sweetening. When cool, add to each litre of mix:

- one slice of wholemeal bread
- a suitable multivitamin supplement at recommended dose rate

Offer 400 g of this mixture per pair per day. Surplus mixture may be stored in the fridge for up to 48 hours. Ensure that nectar feeding dishes are thoroughly cleaned after each use.

There is no evidence that meat and bones are an essential component of kea diet. Feeding of red meat or cooked meat on the bone should be discontinued. Alternative sources of protein include a variety of seeds, nuts and beans, in addition to formulated feeds. Formulated feeds or traditional cuttle fish will provide the birds with sufficient calcium.

6. AGEING AND SEXING

Juvenile kea can be distinguished from adults by the yellow-orange colour around the beak and nostrils (cere), which they retain until approximately 2 years of age.

Kea are sexually dimorphic. Juvenile and adult females are generally smaller in body length and weight than males in the same age class. In addition to their relatively large body size, males are also distinguished by the shape and size of their upper mandible, which is larger, thicker, usually longer and has a more pronounced curve than in females. However, as there is some overlap between the sexes in these morphometric measurements, this method of sexing kea is not 100% reliable.

Surgical sexing through laparoscopy is the most reliable method currently in widespread use but carries the disadvantages of added expense and a slight risk to the bird. A number of sex differentiation tests involving the analysis of blood cells are in the development stage. One or more of these techniques may be applicable to kea in the future.

7. HEALTH MANAGEMENT

Sensible aviary design, hygienic management, a balanced diet, and preventative health care (e.g., de-worming at intervals of 4 months) should reduce disease risks to a minimum. Kea are not known to have any particular disease problems that are specific to the species. The coordinator can provide advice on de-worming products and other medications that have been used successfully on kea with no adverse effects.

8. DEAD SPECIMENS

It is important to attempt to establish the cause of death of any kea dying in captivity. The coordinator should be informed immediately a captive kea is discovered dead or missing. The coordinator is responsible for passing this information on to the Department of Conservation. All freshly dead kea should be post-mortemed by a veterinarian (preferably one with experience in avian pathology) unless the cause of death is obvious. Even in these cases, a post-mortem can be helpful in detecting other subclinical but potentially harmful infections or conditions such as nutritional deficiencies. The carcass should be refrigerated *but not frozen,* and delivered or couriered to the veterinarian or laboratory as soon as possible, along with the bird's recent history. Autolysis (rotting of the animal's tissues) commences soon after death, and within 24 to 48 hours can be sufficient to preclude diagnosis of some conditions. The holder is liable for the costs associated with post-mortem examinations.

A copy of each kea autopsy report must be sent to the coordinator. By detecting recurring patterns and causes of death, it may be possible to take steps to prevent similar cases from occurring in the future.

9. BREEDING

Note: Holders may not allow captive kea to breed unless specifically authorised by the Director, Species Protection Division, Department of Conservation following the recommendation of the species' captive management coordinator.

Kea do not usually breed until five or six years of age. However, in captivity, some 3 year old birds have bred and raised young successfully. The breeding cycle, both in the wild and in captivity, commences in mid-winter, when the female prepares the nest site with twigs, leaves, etc. Females typically begin laying in early July.

Up to six eggs may be laid but the typical clutch size is three to four. The eggs are incubated for 25 days by the female alone. The mall feeds his mate on the nest and later on in the rearing process he also feeds the chicks. The chicks spend up to 12 weeks or more in the nest. Once the chicks have left the nest, they are fed by both parents for a further three months.

Because of the long period associated with rearing chicks (approximately four months from start of incubation to chicks fledging) it is uncommon for kea to rear more than one brood in a season. However, if the eggs fail to hatch or are damaged, or if the chicks die or are removed, pairs will generally re-nest almost immediately. For example, when three 7-day-old chicks were removed as part of a hand-rearing experiment, the female laid a second clutch within 2 weeks.

Wild kea usually nest in rock cavities. In captivity, most pairs breed on the ground rather than using the traditional nest log or box. A semi-natural nest site can be constructed by placing a plywood box of approximately 1 metre square at ground level and then lining it with rocks inside and out. A door is cut in one wall of the plywood box to allow for nest cleaning and observations. The birds gain access to the nest area through a 200 mm diameter concrete pipe of approximately 1.5 metres long.

Progeny should be removed from the breeding aviary well before the next breeding season. Conflict and injuries are likely to occur when juveniles interfere with the nest site and attempt to interact with the breeding pair. The adult male can become particularly aggressive to his male progeny.

Young birds can be transferred to a colony situation where they learn to socialise with a larger group of birds. Birds introduced into male-female groups will eventually select their own mates. However, natural pair selection is not always appropriate in a controlled breeding situation because the birds do not necessarily choose mates that will result in maximum retention of genetic diversity within the captive flock.

10. FURTHER INFORMATION

Holders and others requiring further information on the captive management of kea, including husbandry information and applications to transfer or hold birds, should contact the Kea Captive Management Coordinator:

Tony Pullar
Dunedin City Council
P O Box 5045
DUNEDIN
Phone: (03) 477 8240
Fax: (03) 474 3368

Persons requiring a more detailed explanation of the rationale behind the direction of the captive management strategy should contact:

Species Protection Division
Department of Conservation
P O Box 10 420
WELLINGTON