

## **Population estimations of wild Kea (*Nestor notabilis*)**

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### **Abstract**

Establishing accurate numbers of individuals within wild animal populations can be extremely difficult. Kea (*Nestor notabilis*), a species that covers an extensive and largely inaccessible range of the South Island, and which at specific life stages are behaviorally cryptic, are particularly problematic.

As an endangered/threatened species however it is vitally important to identify population status and numbers to ensure that they are assigned the appropriate level of conservation priority.

Kea numbers have been estimated at between 1000-5000 (Anderson, 1986) and 15,000 (Bond & Diamond, 1992; and Jackson, 1960). Additionally it is agreed that very little is known about the ongoing status and stability of kea populations (Grant et al, 1993; Elliott and Kemp, 2004).

The Kea Conservation Trust seeks to provide a more accurate estimate of kea numbers using a combined winter and summer survey across the species range and across years.

### **1.0 Introduction**

#### **1.1 Historical Issues**

Kea (*Nestor notabilis*), in common with many other New Zealand endemic species, have had their numbers and range reduced through introduction of exotic pest species and habitat degradation. Kea have also been subjected to an extended period of persecution with a government bounty finally removed in 1971. The legal culling of this species was initiated by the Acclimatisation Societies to protect introduced exotic species (Waitangi Tribunal), and was continued by the Crown due to concerns that kea were preying on sheep in high country areas. This resulted in the killing of 150,000 kea between 1860 - 1970 (Pullar, 1996). Kea only gained full protection status in 1986 under the Wildlife Act, 1953. The Kea is now listed as a 'nationally endangered' species by the Department of Conservation (DoC), (Hitchmough, 2007) and listed as 'endangered' by the IUCN.

#### **1.2 Past Population Estimates**

Separate population estimates calculate kea numbers to be as low as 1000-5000 (Anderson, 1986), and as high as 15,000 (Bond & Diamond, 1992; Jackson, 1960; Clarke, 1970; Kemp, pers. comm., 2007). The former figures are generally considered to be little more than a guess (Brejaart, 1994; Bond and Diamond, 1992), whilst the latter figures extrapolated from results of localized studies around Arthur's Pass and Nelson Lakes, are acknowledged by Bond & Diamond to be potentially unreliable. This unreliability may be due to the fact that kea tend to congregate around areas of human activity (also supported by Wilson & Brejaart, 1992 as stated in Brejaart, 1994). Until systematic banding and surveying of populations in more remote areas can be carried out, previous estimates of population numbers cannot be accepted as an accurate reflection of total kea numbers (Bond & Diamond, 1992). This uncertainty in estimates of population size and status is due

to the extended and often inaccessible range of the species as well as its ability to blend into the landscape.

Additionally past research on the viability of wild kea populations (Grant et al, 1993; Elliott & Kemp, 1999; 2004) highlights a deficit of knowledge concerning the status of this species and, as yet, few of the recommendations tabled by the 1993 Kea- Kaka Viability Analysis (Grant et al, 1993) have been addressed. These recommendations state a need to develop techniques to assess kea population densities, trends and features including productivity, age specific mortality (especially in females), proportion of males and females breeding in any one year, in both human and non-human influenced habitats.

Further research on adult sex ratios (ASR), conducted by the Royal Society for the Protection of Birds (RSPB) (Donald, P. 2007) has estimated that the ASR of kea is skewed to 66% male. Donald found that the higher threat an animal faced, the more severely skewed its adult sex ratio. In other chordate classes the ASR is often used as an indicator of population trajectory or measure of conservation status (ibid). Whether, and/or how these figures impact on kea population trajectory is unknown.

### **1.3 Human Induced Pressures**

Changes in land use, food availability and access to hazards are external factors considered of particular importance to kea population viability (Grant et al, 1993).

Whilst over 3 million hectares of the South Island are now protected within Department of Conservation managed National Parks (DoC, May, 2008), severe degradation of this environment from past agricultural practices and introduced browsing and predator species (Peat, 1995) continues to have an unknown impact on kea food availability and secure nesting sites. Starvation and direct human interference have in the past been cited as the greatest causes of death in the species (Jackson, 1969), whilst results of research by Elliott and Kemp (2004) into the hunting and predation of kea, suggest a marked increase in the risk of extinction over 100 years from 0.8% in the 1850's to 32% in 2004. However, no contiguous monitoring of the population or management of those factors identified by Grant et al (1993) has yet been initiated.

Numbers of people settling in the South Island and/or utilizing conservation areas for recreational activities continues to increase. Over 115,000 people settled in the South Island from 1991-2006 bringing the South Island population to just under 1 million (Statistics NZ, 2008) whilst the Canterbury region entertained over 10 million visitors in 2006 (Ministry of Tourism, 2008). In the same year, protected wilderness areas such as Fiordland received over 950,000 visitors and tourism in this area alone is forecast to increase by up to 3.2% per annum to over 1.19 million visitors by 2013 (ibid). Given the large influx of people and the historical problems surrounding kea and human cohabitation, there is a potential for increased human – kea conflict.

### **1.4 Hazards to Kea**

Increasing human presence within the landscape has increased the availability of human hazards to wildlife. Ingestion of foreign materials at high country dump sites such as Arthur's Pass has been the cause of past deaths in wild kea (Peat, 1995). Although many of these sites have now been identified and removed access to toxins such as lead, a metal used extensively in construction products throughout the South Island, has now been identified as a more widespread issue. Lead, in the form of roofing nails and flashings is a sweet, malleable metal and as such is highly attractive to kea.

Lead toxicity is known to affect neurological development and survivorship in animals (McLelland, unpub). Recent research on lead toxicity in Mt Cook kea (McLelland, unpub)

has found that of 38 live kea tested all were found to have detectable blood lead levels, 26 considered dangerously high. Additional analysis of 15 dead kea (sent to Massey University for diagnostic pathology between 1991 and 1997) found 9 to have lead blood levels consistent with causing death. Unpublished data collected by DoC suggests that lead toxicity in kea is widespread in areas where kea and humans overlap (McInnes, pers comm., 2007).

The use of 1080 to control pest species is another potential hazard to wild kea populations. Although 1080 has been used in New Zealand since the 1950's (Hackwell, 2007) and identified as a hazard to kea since 1964 (Spurr et al, 1997), monitoring of kea exposed to 1080 operations was only initiated in 2008. Two groups totalling 24 birds were radio tagged on the West Coast of the South Island this year. One group of 10 radio-tagged birds survived the poison drop, however in the neighbouring population over 30% of radio tagged birds died (Kemp, pers comm., 2008). Autopsies confirmed that 5 out of 14 study birds died through ingestion of 1080. The deaths of 2 adult males may indicate additional nest failure for this season (ibid).

Continuing persecution by humans is also a threat to kea population stability. The most recent incident occurred at Arthur's Pass where 2 juvenile males were shot and stapled to a sign (DoC, 2008). In 1995, 27 kea were also shot and dumped at the Fox Glacier dump (Peat 1995), and those few birds identified as sheep killers continue to be culled by DoC staff. In addition an unknown number are killed illegally each year (Elliott and Kemp, 2004).

## **2.0 Kea Conservation Trust Research**

The Kea Conservation Trust (KCT), was set up in 2006 to assist in conservation of wild Kea in their natural habitat and to increase the husbandry standards and advocacy potential of those Kea held in captive facilities within New Zealand. As its constitution states, these objectives will be achieved through; establishing positive working relationships with associated conservation groups/individuals; raising of funds to conduct research on kea issues and advocacy strategies, and provision of an easily accessible information resource on kea for all stakeholders.

The KCT has now gained significant funding to undertake two wild population based projects; an extensive annual survey across the species range beginning July 2008 (sponsored by T-GEAR Trust); and an intensive survey of three breeding populations in January 2009 (sponsored by NZ Lottery Grants).

Both of these projects are derived from recommendations by Grant et al (1993), Elliott and Kemp (1999) and Bond and Diamond (1992) and will be achieved through collaboration with a variety of organisations, experienced personnel, local community groups and members of the public.

The raw data from these studies will be utilized to provide improved estimations of kea populations in the wild, investigate sink/source dynamics, and provide information on distribution and movement of birds between survey areas. Further funding will be required to investigate population trends in localized areas. Additionally the winter study in particular will provide a valuable opportunity for increasing advocacy of the species.

## **2.1 Winter Survey**

The winter count aim to ascertain minimum numbers across the species range, provide information on fidelity to and immigration/ emigration across sites and act as an advocacy tool to raise awareness of kea issues.

The survey will be conducted simultaneously over 4 consecutive weekend afternoons in July at a large number of localities across the species range where kea are likely to concentrate (particularly ski fields and other tourist sites). These will, by necessity, be in areas which are easily accessible to observers. This survey aims to utilize an extensive volunteer base using a standardized protocol that will be replicated at a large number of sites across the species range and has been designed in a way that ensures it remains logistically feasible to sustain on a long term basis.

Recognizing that such a count may be subject to large biases, banding of individuals at selected sites (to correspond with summer survey sites) is to be conducted (depending on availability of funding) to ascertain the extent of annual variation in fidelity to such sites and whether such sites may act as population sinks.

### **2.1.1 Methodology**

A large volunteer pool is currently being developed to carry out the observations during the survey period. Key contact groups include Department of Conservation, OSNZ, Forest and Bird, South Island Ski fields and mountain guiding/safety groups, tourism operators, hunters, tramping groups, education providers, conservation groups, and high country land holders. All volunteers will be provided with an observer number, standardized information on recording protocol as well as recording sheets to complete and return. Recording sheets will provide information on the observer, the location and any kea observed.

Location details will include the site name and description, weather conditions, and numbers of people present, whilst kea details will identify the maximum numbers present at any one time during the survey period, the time when maximum numbers are sighted, age, banding details and behaviours the birds are engaged in. Identification of individual birds will be, where possible, by band identification (presence/absence, colour and/or number on metal monal bands) and age (presence or absence of yellow around beak and face). The survey will be conducted between the hours of 12noon – 4pm in the afternoon to additionally lower the incidence of duplicate counting of birds flying between sites.

## **2.2 Summer Survey**

The summer survey aims to estimate population densities at three sites across the South Island. These results will then be extrapolated (over habitats which fulfill these specific criteria) across the species range. Breeding status, age, mortality, immigration and emigration rates, dispersal and seasonal movements will also be investigated.

Research Projects will include the following;

1. Estimates of population density at three sites across the species range.
2. Identification of emigration / immigration and survival rates of kea over 3 sites.
3. Dispersal and seasonal movements of keas (males, females, juveniles).

Blood analysis used to identify health status, lead toxicity levels, and corticosterone levels may also be conducted and funded by other research facilities on the back of the KCT's population research.

The KCT is also in the process of developing protocols for collection and storage of blood and feather material to allow future research into the genetics and health of wild kea.

### **2.2.1 Methodology**

The methodology is based on a protocol devised by Kemp (pers. comm., 2007).

7 paired field researchers/observers per site will survey a minimum of 4 ridges each (a total of 28 ridges per survey site) over an 8 day period in mid-January. This will be timed to coincide with fledglings leaving the nest but prior to dispersal. This will allow determination of accurate densities in localized areas and, when additional funding becomes available, population trends by repeat counts conducted at yearly intervals. Researchers will survey along each ridge at the treeline, at a spacing of approximately one pair per kilometre. This should enable detection of almost all of the breeding adult pairs existing in the area.

Observers will identify birds and breeding status, and then capture and band all kea where possible. Associated with satellite and radio tracking of individual birds, banding will be utilised to establish immigration and emigration rates and fidelity to sites across years. Additional information on seasonal and inter-annual patterns of movement may also be determined that might further elucidate potential biases in winter counts.

The collection and storage of blood samples at the time of capture will provide samples for other organisations to screen for specific blood products, toxins and/or diseases.

Each paired group of researchers must therefore have combined experience in trapping, banding, blood collection and storage, and attachment of tracking equipment.

### **3.0 Summary**

Kea are a remarkably resilient species which have survived despite little management and protection, and after an extended period of persecution.

Changes in land use, food availability, access to hazards and removal of birds are all external factors that impinge on or limit population stability (Grant et al, 1993). Although these factors have been widely identified throughout the literature there has been a consistent lack of appropriate actions to minimise their impact or at the very least to monitor their effect. As a result the status of kea remains unidentified and uncertain. The objectives of the Kea Conservation Trust's research is to contribute to the monitoring and information of kea populations in the wild and to follow up on recommendations detailed in previous literature.

To ensure the best use of funds and information, the KCT will collaborate with a number of stakeholders to increase the potential outcome of the population studies. Accessibility of research data to increase continuity in future research will also be a focus of the Trust.

In order to achieve the first of these estimates, the KCT is calling for volunteers to take part in the winter survey throughout July and to actively increase awareness of the KCT's request for such volunteers.

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