SCIENCE & RESEARCH SERIES N0.35

QUESTIONS ON THE HARVESTING OF TOROA IN THE CHATHAM ISLANDS

by

C J R Robertson

Published by
Head Office,
Department of Conservation,
P O Box 10-420,
Wellington,
New Zealand

ISSN 0113-3713 ISBN 0-478-01304-3

National Library of New Zealand
Cataloguing-in-Publication data

Robertson, C. J. R. (Christopher John Rutherford), 1941 –
Questions on the harvesting of toroa in the Islands / by
C.J.R. Robertson. Wellington [N.Z.] : Head Office, Dept. of
Conservation, 1 v. (Science research series, 0113-3713 ; no. 35)
Includes bibliographical references.
SBN 0-478-01304-3
1. Royal albatross--New Zealand--Chatham Islands.
2. Diomedea--New Zealand--Chatham islands. 3. Hunting--New
Zealand--Chatham Islands--Moral and religious aspects.
4. Maori (New people)--New Zealand--Chatham Islands--Hunting.
5. Morioris-- Hunting. I. New Zealand Dept. of Conservation. II. Title.
III. Series: Science & research series ; no. 35.
598.42099349

Keywords: Toroa, hopo, albatross, Royal albatross, Chatham Island mollymawk, Buller's mollymawk, Wandering albatross, ecology, populations, population dynamics, population estimation, survival rate, biennial breeding, productivity, catastrophic losses, modelling, monitoring, harvesting, Maori, Moriori, pre-historic, counting, aerial survey, the Sisters Islands, The Forty-Fours, Pyramid Rock, Pitt Island, Islands, radiocarbon dates, Wildlife Act, Animals Protection & Game Act, Maori Land Court, *Diomedea epomophora sanfordi, Diomedea Diomedea cauta eremita, Diomedea bulleri platei, Macronectes halli.*

CONTENTS

APPENDICES

TABLES

QUESTIONS ON THE HARVESTING OF TOROA IN THE CHATHAM ISLANDS

by

C J R Robertson

Science & Research Division, Department of Conservation
P.O. Box 10-420, Wellington, New Zealand

ABSTRACT

The right to harvest albatross species and especially the Royal albatross in the Islands, has been requested by local indigenous Moriori and island owning immigrant Maori on the basis of previous traditional uses and harvest before protection in 1921. The known and anecdotal history of harvesting and ownership is examined and recorded. Information on the known ecology of the albatrosses is presented while the past and present size of the populations are assessed and the assessment methods recorded. A predictive population model is used to assist the answering of questions as to the likely effects on the world Royal albatross population of changing variables including catastrophic nesting failures and harvesting. Aerial photographs are published of the breeding colonies.

EXECUTIVE SUMMARY

1 The Department of Conservation has received applications from both Moriori and Maori interests to harvest albatross species, and especially Northern Royal albatross in the Chatham Islands.

2 From the time of arrival of humans in the Chatham Islands there developed a tradition of taking three varieties of albatross (Northern Royal albatross, Chatham Island mollymawk and Northern Buller's mollymawk) by Moriori, and subsequently Maori, prior to the species' protection in 1921. Illegal harvests have continued since that time.

3 Albatrosses are presently found at four islands in the Chatham group (Big and Little Sister, The Forty-Fours and Pyramid). However, radiocarbon dated sub-fossil evidence indicates that albatrosses bred on Pitt Island at the time of arrival of humans

in the Chathams. They do not breed on Pitt Island today.

4 The Moriori developed a system of harvesting and preserving albatross from outlying islands of the group using simple wash-through canoes for access to the islands.

5 The arrival of Maori in 1835 and subjugation of the Moriori saw an increased level of harvest using sailing vessels and rowing boats for access to the bird islands. Extensive quantities of albatross were exported to Taranaki (1870-1900) to support the Te Whiti (Taranaki Pacifist) movement.

6 The Maori Land Court allocated ownership of the 'albatross' islands to various Maori in 1885, 1887, 1898. The minutes of the court are presented.

7 Albatrosses in the became protected species from 1931, but quite regular 'birding' continued until the 1940's and sporadically until the present.

8 Harvesting of albatross worldwide has been confined to specific localities and has reduced numbers significantly wherever it has occurred.

9 All three albatross species of the breed nowhere else outside of New Zealand. The Chatham Island mollymawk breeds only at the Chathams.

10 Albatrosses worldwide are long lived species, confined mainly to remote places for breeding, who traverse great areas of ocean for food gathering. Knowledge of their ecology, numbers and population dynamics, is generally minimal and obtained in the past 50 years, which is less than the lifespan of some of the larger species.

11 Comparative ecological data and population sizes (historic and present) are presented for each of three species present in the Chathams.

12 Methods for assessing the population size are outlined. Royal albatrosses are biennial breeders. Their two year breeding cycle, and methods for determining the size of the populations are outlined.

13 Assessments of the populations of Royal albatross in and 1989-91 indicate that there can be considerable periodic variation in breeding success. Chick production 1989-91 is considerably lower than in the 1970's though the breeding populations now may be similar in size or marginally larger.

14 A computer model of the Royal albatross population has been developed to assist the prediction of the effect of harvesting or other events.

15 A series of questions posed by Department of Conservation managers is addressed and answers given where there are data to allow an assessment to be made.

16 Various alternatives for ‘harvesting’ or 'taking' albatross are examined and the predicted effect on the populations shown graphically using computer modelling.

17 It is concluded that there is not currently enough knowledge of the Royal albatross populations in the Chathams to give any definitive answer on the viability of a sustained or periodic harvest.

18 There is evidence of wide fluctuations in productivity at the Royal albatross colonies, which may be an effect of previous harvesting, or present periodic climatic change, or 'Act of God'.

19 The albatrosses of the Islands are long-lived breeders with a very low reproductive rate (a minimum of 16 years to replace a breeding pair) and a seemingly irregular response to 'natural' environ-mental happenings, which may not be observable for many years after the event.

20 Albatrosses have evolved slowly in the absence of land-based predators and have been exposed to human influences, in the Islands, for a relatively short time. Worldwide, few relationships with humans have yet to be shown as beneficial for an albatross in the wild.

21 Harvesting of albatross in the Islands has had a totally unknown effect on the populations or species composition in the past, though there is fossil evidence that they used to breed at Pitt Island about the time of the arrival of humans. There are no data to suggest what a normal albatross population size should be now, or was, before humans arrived in the Chathams.

22 There are no reproductive or survival data for the albatrosses and few examples elsewhere to allow more than a theoretical prediction of the effects of a legal or illegal harvest of any size.

23 It is not possible to say whether modern style harvesting methods over the past 150 years are still having an effect on breeding, productivity and mortality variables within the albatross populations.

24 It is evident that the numbers of birds seen during sporadic or casual observation of a colony have little relationship to what may be happening to the populations or their health, on a long-term basis.

25 The resilience of such long-lived and slow breeding birds to exploitation, or human-induced loss, must be questioned in the light of both historic and recent examples and the present imprecise knowledge of any cycles of climatic change.

26 The monitoring requirements, should a be allowed for any reason, are outlined. Recent research results from similar species overseas demonstrate the need for continuous long-term monitoring to enable detection of the often quite small changes leading to adverse effects.

27 Various Appendices present information on: the applications made for the right to harvest; Minutes of the Maori Land Court assigning ownership of albatross islands; records of the numbers taken, rituals, methods of taking and export of albatross from the recorded; aerial photographs of the Northern Royal albatross colonies in the Islands; population data; and predictive graphical models of the effects of certain events, including harvesting, on the populations of the Northern Royal albatross in the Islands; the working of the population model.

* * * * * * * * * * *

"Proof is the authority, not authority the proof." L E Richdale.

"Let this be clearly understood by all Maoris, pakehas and other nations. The white feather is a sign that all nations through the world will be one, black, red and all others who are called human beings. This feather will be the sign of unity, prosperity, peace and goodwill."

Charles Waitara in funeral oration for Te Whiti, 1907.

1 INTRODUCTION

The NZ Department of Conservation (Canterbury Conservancy) has received applications from both Moriori (July, September 1989) and Maori (April 1991) to take (harvest) 'toroa' (Northern Royal albatross, *Diomedea epomophora sanfordi)* from the breeding grounds in the Chatham Islands (Appendix B).

In considering these applications the Canterbury Conservancy formally asked the Science & Research Division of the Department on 17 May 1991 to provide advice on a list of biological and ecological questions affecting any decision to harvest (Appendix A).

The issues raised by these applications are both culturally and ecologi-cally complex. I have endeavoured to gather within this report what is 'known or reported' about the taking of albatross in the Chathams. A lot of this material is first published here as a result of investigations covering 18 years and has never been collated before.

This collation illustrates a considerable paucity of records on which to base any ecological assessment of the past effect of any 'take', or even what might have been a 'tradition' of albatross harvest.

The explanation of the biology and population dynamics of any animal is never simple. Long-lived albatrosses, which breed in remote places and spend 87 percent of their life at sea, are among the most difficult of any animal to research. The basic biological information on which a clear black and white answer, agreeable to either or both the applicants and the Department, may never be obtainable, or may take many years at considerable expense.

This report will illustrate what is, or is not known, and endeavours to provide a clear explanation, or prediction based on known data, for the questions posed by the Departmental managers. It is important that both applicants and managers, plus others who have an interest, have common access to the same information when the wider cultural and ethical issues are discussed and decisions made.

1.1 Species of 'albatross'

The Northern Royal albatross breeds only in New Zealand, being presently found at the Sisters Islets (Moriori = Raki-tchu; Maori = Rangitutahi) and The Forty-Fours (Motchuhar; Motuhara) in the Chatham Islands to the east of mainland New Zealand and at the Taiaroa Head Nature Reserve, Otago Peninsula, The Northern Royal albatross was only classified early this century as a separate form from that found at the Campbell and Auckland islands (Murphy 1917).

Two other 'albatross' breed at the Chatham islands - the Northern Buller's mollymawk *(Diomedea platei)* at the Sisters and The Forty-Fours and the Chatham Island mollymawk *(Diomedea cauta eremita)* at Pyramid Rock (Tcharako; Tarakoekoea). With the exception of a recently discovered tiny colony of the Northern Buller's mollymawk at the Three Kings Islands (Wright 1984), both these sub-species confine their breeding to the Chathams.

The distinction of these two varieties from other mollymawks of the New Zealand region has only been recognised during the past 100 years (*platei* described in 1898, but only identified to the population in 1982; *eremita* described in 1930). These two albatrosses were not included by name in the applications made and are not discussed in detail here, though both have been harvested in the past and are some-times loosely referred to as 'toroa'.

All three species of albatross/mollymawk were called generally by the Moriori 'hopo' (Skinner & Baucke 1928). It seems probable that the Northern Giant petrel *(Macronectes halli)* which breeds on the Sisters and The Forty-Fours and is only slightly smaller than a mollymawk, was also classed as an 'albatross' by the Moriori.

The published records of the Wandering albatross *(Diomedea exulans)* as a breeding bird in the can be traced back to their original sources in the works of early ornithologists and especially Forbes (1893) who stated that

> "the outlying rocky islets off Pitt's and Wharekauri islands - Pyramid Rock, the Sisters and The Forty-Fours -are some of the chief breeding places of this species. The eggs and young are yearly collected in thousands by the Maoris for food purposes."

This was at a time when the two species of great albatross had not been adequately differentiated (Fleming 1939). Falla (1938), using photos taken by locals from visits to the Sisters and The Forty-Fours in the 1930's, and Fleming (1939) after his own visit to the Pyramid and with other information from islanders, were the first to clear up some of the existing confusion.

There is no evidence of the Wandering albatross, which has a distinctively dark plumage as a chick, having bred in the Chatham Islands in post-European times. The small island habitats currently used are not typical of any Wandering albatross breeding habitat presently known.

1.2 Pre-historic 'albatross' records from the Chathams

There is fossil evidence (*not* human midden material) that Albatross' bred on Pitt Island (Falla 1960, P Millener pers. comm.). Radiocarbon dates from an extensive collection of bone material excavated from consolidated sand at Taruwhenua Point

indicate a radiocarbon age of 4442 years BP (NMNZ NZA 1549) and a second date of 4298 years BP (NMNZ 27817, NZA 1906).

In February 1991, P Millener excavated further bone material exposed at the surface of consolidated soils at Motutapu Point the other northern promontory of Pitt Island. The material contained a range of bones of albatross including undeveloped chick and juvenile bones, which confirm a nesting site.

This material when dated produced a radiocarbon age of 1074 years BP (NMNZ 27818, NZA 1907). Calibrated to give actual years within a 68% confidence limit, these birds were nesting at Motutapu Point between 1245 AD and 1347 AD. The state of the site today indicates the strong probability that any more recent bone material has already been eroded from the surface.

The probability of this being an active albatross breeding colony at the time of arrival of humans *(Homo sapiens)* in the Chatham Islands must be considered high. Of further interest is the likelihood (Millener pers. comm.) that the species present was a form of Wandering Albatross. If this is so, then another species may need to be added to the already long list of extinctions from the group.

No albatrosses breed on Pitt Island today, and there is no record of them having bred within the Islands group in post-European times, other than at the present localities.

1.3 The Moriori and albatross.

From the arrival of humans ('Moriori') in the Chathams, at the latest by about the 1400's (450 to 500 years before present, B McFadgen pers. comm. from latest radiocarbon and stratigraphic evidence) until the discovery of the by Europeans in 1791, there developed a specialised mode of albatross harvest and preservation of meat (Appendix D, Baucke 1922; Skinner & Baucke 1928).

Details of the methods and accompanying rituals were not recorded by European writers until well after the arrival of the Maori and following the time in the late 1860's when few senior Moriori remained and the Maori population at one time had been as low as 20 individuals. As these written records date from the 1920's, they must be treated with some caution as the sole record and basis for a traditional method.

The Moriori system recorded was one severely curtailed by special rituals and customs, with close attention to the seasonal climatic and tidal conditions applying at the time of year. Access to the islands was by specially constructed 'wash-through' canoe with a capacity of some 40 albatross per eight-person craft.

There are no records of the numbers regularly taken, or the size of the populations which were being harvested. There was however, some implication that harvests may not have been made every year because of prevailing climatic and tidal conditions.

1.4 The Maori and albatross

The arrival of Maori in 1835 saw a major change in the method of access to the albatross islands (Appendices C & E) with sailing vessels and rowing boats used from the time of earliest access. The Maori acquired their initial knowledge of the location of albatross colonies and birding methods from the Moriori. Reports indicate that information on the richness of some of the birding resources in the Chathams were one of the principal reasons for the Maori migration there.

Following the first 'export' by W N Pomare of albatross meat and feathers from the back to the mainland about 1841 (reputedly for the celebration of the founding of New Zealand), records in the few ship's manifests and other records still available today (especially from 1864 to 1896) show considerable quantities to have been exported (Appendix E).

Those albatross exported last century were probably not all Royal albatross, but a mix of the available albatross species. The prime reason for export became the support of the Te Whiti (Taranaki Pacifist) movement (the wearing of distinctive white albatross feathers by fol-lowers signified their support for the movement). Albatrosses were only one of the products (including eels, mutton birds, ducks) sent back to Taranaki from the (Scott 1975).

Ownership of the albatross islands (Rangitutahi and Motuhara) was not specifically confirmed into Maori hands until the Maori Land Court of 1885 and 1887 (Appendix C). These show that after only 40 years since the arrival of Maori in the there was some confusion in the evidence, as well as a preference given to Maori over Moriori. This is especially evident relating to the Maori 'custom' of claiming uninhabited land according to 'first' arrival. There was no acceptance by the court that 'Moriori' had already been there 'first'. Chudleigh (1950) remarked in his diary of 24 May 1883, about Deighton the magistrate (later in charge of the Land Court hearings of 1885 1887)

> "He is quite ignorant of all law and as he is a paid officer there is a want of justice to the public in being ignorant."

Following the drowning of nine islanders returning from a birding expedition to the Sisters on 28 August 1900 (Chudleigh 1950, Richards 1952) (a visit seemingly not sanctioned by the tribal elders), there seems to have been a break in taking of albatross (probable tapu imposed) until about 1911-1912 when motor powered fishing vessels arrived in the Chathams to start a cod fishery (ODT 1/3/1913 p.4).

The last major export of albatross meat to Taranaki is reputed to have been in the mid 1920's (S Hough pers. comm.).

1.5 'Taking' after the protection of albatross.

Animal protection in New Zealand has been covered by a number of Acts since 1867. The first to specify species warranting specific protection was the Animal Protection and Game Act of 1921-22. This Act in its First Schedule made the Royal albatross (*Diomedea epomophora*) and the Snares Island mollymawk (*Thalassarche bulleri*) protected species. Regulations gazetted on 17 March 1931 added the Chatham Island mollymawk to the schedule of protected species. This was the first time that named species had been protected.

The Wildlife Act of 1953 made all wildlife absolutely protected throughout New **except** for any species listed in the various schedules. **No albatross are listed in any of the schedules.**

However specific allowance was made for the *hunting of wildlife in the Chatham Islands*. Schedule Three of the Wildlife Act (1953) does list bird species, which under certain conditions may be hunted specifically in the Islands (Black swan, Mallard, Pukeko and South Island weka). Further variations were made in the Islands (Wildlife) Notice 1977 pursuant to the Wildlife Act. The intent (using species predominantly used by humans) was clearly to provide a seasonal source of local food for the islanders with very limited provisions for the export of these products from the islands.

Though D Holmes (pers. comm.) remembers notices posted in the concerning the new protection laws during the 1920's, it is clear that even in the 1930's knowledge in the of the law change was not well known (A Wotherspoon pers. comm.; but see Section 1.6).

Records in Appendix E show that birding continued extensively during that period. In 1941 a major take of birds from The Forty-Fours for sending to the Maori Battalion is remembered by some islanders alive today. An attempted prosecution, (taken by an albatross island owner, under the Trespass Act and not the Animals and Game Protection Act [L C Bell in litt.]) at the time, failed because of the disruption caused by the War to the conduct of the case. Anecdote also suggests that much of that take did not get much further than Kaiapoi! However, there is little corroborated evidence of continued taking of albatross from then until 1962.

In 1962 a group of islanders was prosecuted under the Wildlife Act for hunting albatross and convicted. Various anecdotal accounts of birding by fishermen during the crayfishing 'boom' of the 1960's including the placing of a fixed access rope on

The Forty-Fours have not been confirmed, as generally 'mainlanders' rather than 'islanders' are reputed to have been involved.

1.6 Applications to 'take' albatross

In 1933 there were two applications. One from P Pomare to the T Te Tomo (Member of Parliament) on 14 April 1933

> "We have received word from the local constable that the shooting of albatross for food is to cease, such action being contrary to the law. In view of the fact that we and our forbears before us have always indulged in this practice the imposition comes hard on us. For this reason we are petitioning the House to remove this hardship. The petition should reach Wellington in due course and we would be very grateful if you would give it your support".

The petition to Parliament when it arrived was from Inia Tuhata and 76 others received 10 August 1933

> "We your petitioners pray to you to grant us the Maoris of Wharekauri permission to take Albatross which is a source of food supply to us and our children. At present the taking of Albatross is prohibited. There are three species of this bird. The Tara is taken in the March to April season; the Tataki in the September - October season; and the Ruru in the December -January season. These seasons were kept from the time of our elders even to our own time. We were taught by our elders not to foul the rookeries. there are three Islands we desire to take birds from. They are: Motuhara (Forty Fours), Rangitutahi (Sisters), Parakoekoea (Pyramids). These islands were awarded by the Native Land Court to Maui Pomare, to his younger brothers and other descendants of Pomare and Toenga te Poki. Those who despoiled the rookeries were prohibited from again visiting the islands by the descendants of Pomare and Toenga te Poki. Birds were taken for food only in the seasons hereinbefore mentioned. Wherefore your petitioners earnestly pray to grant us the Maori of Wharekauri only permission to take these birds in the seasons mentioned above".

The covering letter from Inia Tahuta to Taiti te Tomo MP, states

> "to allow the Maoris only of the Chatham Islands to take Albatross and Mutton birds for food. In previous years we were allowed to do this for food only, and not for sale".

Again in 1946 representations were made by Ata Rakete on behalf of the islanders to H R G Mason (Minister for Maori Affairs) during a visit to the islands (in litt. from Mason to Minister of Internal Affairs 3 July 1946).

> "...for permission to take the young of the Albatross in the month of September. The Maoris of the Islands have, from time immemorial, taken the young of the Albatross as a special delicacy, but of late years several Maoris have been brought before the court and fined. The Maoris maintain that what they take is for their own consumption, most

> of the catch being preserved for consumption over the year. They also maintain that the numbers they catch are not great in comparison to the numbers hatched and that the taking tend to make those that are left healthier and stronger".

In 1961 J R Hanan, then Minister of Maori Affairs (20 February 1961) made representations on behalf of the Annual National Conference of the Maori Womens Welfare League following a resolution passed at their conference as follows:

> 'That the Chatham Island Maoris he granted a permit to take albatross from the Forty-Fours and that an open season be granted each year, controlled by the Tribal Committee. The people of the state that many young birds are dying, and that having an open season, overcrowding will be prevented. Furthermore, the people of the will welcome the additional food supply'.

The Minister of Internal Affairs replied to the League on 3 March 1961

> "... I am not prepared to authorise an open season on this bird for the following reasons. Except for a handful of birds at Taiaroa Head, the Northern Royal Albatross breeds only on the outliers of the Chathams. These few thousand birds are, therefore, the entire world population of one of the most majestic and beautiful of oceanic birds. Basically, a small population such as this is not suitable for exploitation under modern conditions. Coupled with this is the fact that the birds take some 8-9 years to reach maturity, and then at most produce only one chick every two years. While the taking of the birds at one time may have constituted an important part of the diet of Islanders, I do not think that the need exists today. Indeed the Islanders are fortunate in the quantity of fish and game which is available to them and I do not consider that the taking of young albatrosses can he regarded as a vital addition to their food supply".

In 1972 a group of the albatross island owners on the approached the Wildlife Service, Department of Internal Affairs, with a request to take albatross. They maintained that this had been done without their permission by 'mainland' fishermen during the crayfishing 'boom' in the late 1960's. Unlike earlier petitioners they asserted the sole right to allow access to the islands and to give 'permission' for harvesting should it be allowed.

They gave Wildlife Service staff permission to visit and live on the islands to make the first full assessment of the numbers of albatrosses present and their breeding biology. They also undertook to ensure that no birds were 'taken' during the time of the study.

A number of meetings were held in the mid-1970's with the owners and their legal representative. That the claim was not subsequently pressed was, according to one of the owners in 1977, because a 'take' occurred during the time of the study. This happened in association with celebrations for the Centennial of the local Jockey Club (December 1974).

1.7 Other 'taking' of albatross

The regular collection of juvenile birds washed up on the northern and western beaches has occurred for many years (September-October). L C Bell and others have reported assertions that some birds have been taken from off the water near the breeding islands. This 'taking' is reputedly of juvenile birds who fail in their first flight and land on the water (see also Appendix E).

I know of no evidence to support assertions (anecdotes) of a reputed regular annual take of Royal albatross from the breeding islands over the past thirty years. I have received information in conversations with albatross island owners and kaumatua, which suggests that direct taking by 'islanders' of toroa from the breeding islands has occurred (with or without their prior knowledge) on no more than 4 instances in the past 20 years. This would be distinct from a few birds taken sporadically by a fisherman who would be unlikely to advertise his trespass to the landowner.

Because of the present illegality of taking albatross it is often difficult to distinguish fact from fiction, or 'try on' when discussions are held on this topic between islanders in general and visitors from the mainland. I have collected material on the topic with strict attention to duplicate confirmation to assess its validity over an 18 year period.

There is an important distinction however, between birds taken by humans from off the breeding islands, and those recovered (taken) as flotsam or jetsam from the sea or beaches when assessing the effects of 'taking' on the population. Assessment must take into account, the difference between natural mortality which happens anyway (naturally dead at sea or on the beach, or died naturally before fledging on the island) and a human 'take'. The take is a non-random direct action which may also have other side effects such as disturbance of the breeding area.

1.8 Albatross harvesting elsewhere

Worldwide, there may currently be only one locality, Tristan da Cunha Islands, where local law or regulation allows harvesting of albatross or eggs (Wild Life [Tristan da Cunha] Protection Ordinance, 1950, 1952). Though these ordinances were still current in 1975 I do not know of any further amendments. It would be necessary to check the current status with the Governor of the Colony of St. Helena at Jamestown.

Richardson (1984) and Williams (1984) record however, that the Wandering albatross became extinct on Tristan between 1880-1907 due to extensive culling, while the numbers of the Atlantic Yellow-nosed mollymawk (*Diomedea chlororhynchos*) on Tristan have been threatened by egg and chick collecting. At nearby Nightingale Island numbers have decreased substantially in the past quarter

century and the islanders imposed a ban on egg collecting in 1975.

Croxall *et al.* (1984) record the probable loss of a large Wandering albatross colony at South Georgia in the 1920's to 1930's due to depredations by sealers and whalers. Depredations on a local mollymawk there, were still prevalent as late as the 1950's. Rounsevell & Brothers (1984) record the reduction of Wandering albatrosses at Macquarie Island by sealers especially from 1870-1919.

Within the last 100 years, other records show that two varieties of albatross were severely affected by harvesting. The Short-tailed albatross *(Diomedea albatrus)* of Japan was reduced to a tiny relict population after harvesting for feathers.

From an estimated population of 100,000 in 1889, at the height of feather gathering, only some 250 individuals remain today (Hasegawa 1982). This species was protected by the Japanese Government in 1933 and 1947. The populations of the White-capped mollymawk *(Diomedea cauta)* in the Bass Strait region of Australia were similarly reduced by feather hunters almost to annihilation by the 1890's (Green 1974).

1.9 Early albatross population sizes in the Chathams

There are no complete records of the population sizes of albatrosses in the prior to the 1970's. It is a fact that harvesting occurred in Moriori times and from the Maori arrival in the 1830's and that this did not cause the extinction of the albatross species present there today. It also seems to be a fact that an albatross species used to breed at Pitt Island which does not exist there today. It is not possible to ascertain the population effects of harvesting in the in Moriori times, nor since the arrival of the Maori. **There are no factual grounds, based on the numbers present today, for asserting either the positive or the negative effects that this harvesting did have, has had, or may still be having, on the population. Any discussion can only be theoretical.**

The few records available suggest that during Maori harvests the Moriori 'rules' were not as strictly observed and considerable numbers were collected annually using the greater carrying capacity of modern vessels. All harvesting was done at a time when the knowledge of 'toroa' and albatross biology was minimal, for information on the biennial breeding of this and other albatross species has only been available since the 1940's.

1.10 Times for the 'taking' of albatross in the Chathams

Both literature, anecdote, and petitioners have shown great confusion with both the names and times of the taking of albatross in the Chathams. As time goes on with a minimal written record, there is an increasing danger that anecdotal or incorrect

information becomes entrenched and the wrong information unwittingly perpetuated.

A recent example of such confusion is the time of albatross 'taking' from the Islands recorded in two recent books on the Moriori and the Islands where each account differs (King 1989 p161; King & Morrison 1990 p130). The original sources are in the files of the Maori Affairs Department (Series 1.19/1/41). Following the petition of Tahuta in 1933 (see above section 1.6), the Under Secretary for Internal Affairs had replied

> "I have to advise you that it has not been possible to identify the native names used in the petition with any of the species of albatross or mollymawk."

The Under Secretary then lists (incorrectly) the following, Royal Albatross (*Diomedea epomophora*) Para taken March and April on Motuhara or Forty-Fours; Wandering Albatross (*Diomedea exulans*) Tataki taken September and October on Rangitutaki or Sisters Island; Chatham Island Mollymawk (*Thalassarche eremita*) Ruru taken in January on Tarakoekoea or Pyramid Rock. (NB change of Tara to Para).

The resulting mix of the sources in the petition (see section 1.6), which did not link bird names with islands, and the Under Secretary's letter, was then reproduced as follows

> "The young of the para (royal albatross) were taken from The Forty-Fours and the Pyramid in March and April; of the tataki (wandering albatross) from the Sisters between August and October; and of the ruru (Chatham Island mollymawk) in December and January." (King 1989)

and later

> "They took the young of the para (royal albatross) from The Forty-Fours and The Sisters in March and April, of the tataki (wandering albatross) from The Sisters between August and October, and of the ruru (mollymawk) from The Pyramid in December and January." (King & Morrison 1990)

Shand (1911) records that albatross expeditions were **made at the season when young birds were capable of flight.** I can find no earlier reference which clearly delineates the times of birding.

Fleming (1939) whose primary source was Paynter (pers. comm. to Fleming) states for Royal albatross that "September was the 'birding' month for this species when the young are at their fattest and at the right stage for eating." Buller's mollymawk "were taken for food as fat fledglings in March and April."

However, present day knowledge indicates April as close to fledging time for the Island mollymawk and late May-June for the Northern Buller's (Fleming 1939, records one chick left on 9th July).

The only large seabird species fledging in December or January is the Giant petrel (called Toroa-ruru in Richards, 1952). Tatua, according to W N Pomare (Appendix C), brought 'rurus' from Motuhara. This island is likely to have been the major breeding ground for this species then, as it is today.

1.11 Uniqueness of the albatrosses at the Chathams

All three albatross varieties of the Chatham Islands (see also sections 2 and 3), with the minimal exceptions of small New Zeakand colonies at Taiaroa Head in Dunedin, and the Poor Knights Islands, *breed nowhere else in the world.*

In number, they are by no means numerous. Some classifications of rarity have show that other species of bird with populations less than 50,000 individuals worldwide can be classed as vulnerable or rare, especially when they are confined for breeding to limited habitat. Both the Northern Royal albatross and the Chatham Island mollymawk are on available information less than that number, while for the Northern Buller's mollymawk we have not enough information to be certain.

As large and mobile seabirds, more than 80 percent of their life is spent away from the breeding islands. They are an important part of the ecology of the Pacific and southern oceans and do not 'belong' only to the country, or even the part of that country, where they breed.

1.12 General exploitation of seabirds

Feare (1984) in his contribution to a conference on the status and conservation of the world's seabirds, discusses human exploitation of seabirds. Most seabirds are dependent largely, if not entirely, on food obtained from the sea, and in order to breed as close as possible to their feeding areas, they tend to concentrate on coastal or island sites for breeding. Conspicuousness and lack of mobility on land render these seabirds highly vulnerable to terrestrial predators, and breeding sites selected must therefore be as predator-free as possible. Hence the gathering together in colonies, often as a predator defence. Other adaptations for dependence on marine food involve tendencies towards large body size, long life and low adult mortality rates, and a low reproductive rate. Incubation and the growth of chicks can be prolonged.

Human visits to seabird colonies, can be short, but during a visit they can harvest more than their own individual requirements dictate. They can furthermore, harvest over and above the immediate needs of the human community for various means of preservation are available. Thus the human use of seabirds falls outside the normal predator-prey relationships.

Feare also reminds us that wherever human exploitation of seabirds occurs it must be regarded as a potential threat, and that research is clearly needed on the population dynamics of all affected seabirds to establish a sustainable yield.

Our research on 'taking' albatross in the Chathams has revealed in written material and discussion often repeated assertions:

> (a) 'that there are thousands of them, so taking a few won't matter' or (b) 'they are overpopulated and the chicks are skinny so harvesting will reduce the numbers and provide better survival'; even scientifically trained observers have argued (c) 'that other birds are harvested, why should albatross be any different from ducks' or (d) 'if the mortality is increased by harvest then the breeding success will increase to compensate'.

Whether we have enough data to support, modify, or reject these generalised assertions, or answer the questions in Appendix A is demonstrated elsewhere in this report.

2 ECOLOGY OF TOROA

The studies started by L E Richdale on the fledgling colony at Taiaroa Head in 1937 and continued today, form the basis of our knowledge of Northern Royal albatross ecology and behaviour.

From 1973 to 1976 C J R Robertson conducted extensive field studies (living on the Little Sister and Pyramid, and with short visits to The Forty-Fours and Big Sister) on all three albatrosses in the Chatham Islands. The on-site studies of the Royal albatross were designed to compare breeding behaviour with that at Taiaroa Head and note any significant differences.

For the Chatham Island mollymawk and the Northern mollymawk this was the first time that their biology had been studied in any detail. From presently available information, it is likely that both these varieties of mollymawk will warrant full species status.

Albatrosses throughout the world are long-lived species, which are now mainly confined to remote islands for breeding, and traverse great areas of ocean for food gathering. Detailed knowledge of their ecology is generally minimal, patchy, and obtained within the past 50 years, which is less than the lifespan of some of the larger species. For few localities and even fewer species have detailed population counts or information on survival been given. ***Accordingly the prediction of Toroa population dynamics is based on minimal actual or comparative data with a large amount of statistical projection.***

Appendix O shows in graphic form the segments of the breeding cycle of the Northern Royal albatross while Table 1 attempts to summarise the known basic elements of the ecology of the Northern Royal Albatross ('toroa') and includes the two mollymawks for comparison.

Table 1. Basic Comparative Ecological Data for 'Albatrosses' Breeding at the Chatham Islands. (TH) = Taiaroa Head data only; [ ] = Chatham data only; no brackets = known for both localities or with mollymawks confined to Chathams only.

Factor	**Northern Royal Albatross**	**Northern Buller's Mollymawk**	**Chatham Island Mollymawk**
Laying period	27 Oct. to 27 Nov.	26 Oct. to 23 Nov.	Approx. 20 Aug. to 15 Sep.
Number of eggs	One	One	One
Ability to relay	No	No	No
Incubation period	77-81 days	68-72 days	68-72 ?
Hatching period	17 Jan. to 20 Feb.	4 Jan. to 28 Jan.	Approx 8 Oct. to 31 Oct.
Guard stage	Ave. 36 days	Approx. 21 days	?
Chick growth from hatching to flying	220-260 days (TH)[?]	?	?
Fledging period	Mid0August to mid-October (TH) [?]	Early to mid June ?	April ?
Age of first return	3-4 years (TH) [?]	?	?
Age of first breeding	8-11 years (TH) [?]	?	?
Annual breeding	No (TH) [Prob no]	?	?
Biennial breeding	Yes (TH) [Prob. yes]	?	?
Percentage of non-breeding birds of breeding age present at egg laying	Ave 35%. Range 25-75% (TH) [?]	?	?

Factor	Northern Royal Albatross	Northern Buller's Mollymawk	Chatham Island Mollymawk
Renest the following season if egg lost during incubation or chick lost before end of guard stage	Yes (TH) [Prob.]	Prob.	Prob.
Est. mean survival rate from fledging to first return to colony	67% (TH) [?]	?	?
Est. mean survival rate from fledging to first breeding at 9 years old	50% (TH) [?]	?	?
Est. mean annual adult mortality	2.1% (TH) [?]	?	?
Exchange of birds between colonies	Yes (TH) [?]	?	No
Holiday between successful breeding years	Yes (TH) [Prob]	No?	No?
Is age structure of the population known	Yes (TH) [no]	No	No
Re-nest in following year if chick lost between end of guard stage and fledging	No (TH) [Prob. No]	?	?

Studies of the Royal albatross at Taiaroa Head have shown that not all age classes of birds are present for the full season (Appendix P). This is an important consideration when endeavouring to assess numbers.

'Breeders' (including those who have lost mates -Bereaved Breeders) and 'Keeping Company' birds (birds paired up for at least one season before breeding) establish themselves in the colony before and during egg laying. Unsuccessful breeders (those losing their eggs early in incubation) and the keeping company birds start to vacate the colony by mid-December and have all dispersed before the end of the guard stage. Even birds still sitting on eggs (infertile) desert and depart by the end of the guard stage.

In contrast, adolescent numbers (3-7 years old) build up steadily during incubation to reach a peak just prior to hatching, while some stay on well past the end of the guard stage, before leaving the breeding ground. Most non-breeding birds are

intermittent visitors spending some of every couple of days at sea for feeding, and most activity when returning to the colony is in the middle to late afternoon.

3 SIZE OF ALBATROSS POPULATIONS

3.1 Pre 1973

Published records of the albatross populations in the Islands are scarce. Reports by L C Bell (1953 in litt., 1955) and Dawson (1955, 1973) provide the main source material. All are based on single visits to the islands at different parts of the breeding cycle.

3.1.1 Chatham Island mollymawk.
Murphy (1930) in his description of this new mollymawk (based on the collector R Beck's visit of 3/3/1926) gave the population as a few hundred birds. However, Beck's diary reveals that he did not land on the Pyramid. Fleming (1939) visited the Pyramid on 16/12/1937 and says "We examined only a fraction of the colony .... The most conservative estimate from our observations would allow a population of several thousand adult birds rather than the 'few hundred' which Murphy suggests." B D Bell and D V Merton (in litt. recorded in Dawson, 1973) give a probable population of between two and three thousand pairs on 24/11/1961. Dawson's (1973) estimated population from photographs taken from a boat on 17/10/1964 was 2500 pairs "admittedly very crudely reached."

3.1.2 Northern Buller's mollymawk.
Both L C Bell and Dawson noted the apparent discrepancy between the breeding times of the 'Buller's' in the and the Snares. *This and other studies in the 1970's by C J R Robertson (in litt.) both on the islands and in museums overseas led to the conclusion that the populations were at least a distinct subspecies (Robertson 1985, Turbott 1990), and probably warrant higher status.* These birds were on eggs during Bell's he did not record numbers. Dawson estimated 250 pairs on the Little Sister in 1954, but made an extrapolation in 1964, as birds were only just starting to nest. He estimated the population at The Forty-Fours in 1954 as 4000 pairs.

3.1.3 Northern Royal albatross.
L C Bell landed at the Little Sister on 26/12/1953 and estimated "the population at 1000 breeding pairs on this island and possibly about ten percent more on the larger island. I tried to count the numbers of albatross nests but found it hopeless for one person in the time available ... the albatrosses were sitting on eggs." He did not land at The Forty-Fours but estimated the same number there as the Sister's island he had landed on.

Dawson (1955) landed at the Little Sister on 29/1/1954. He records about 500 pairs ('between 400 and 450 and no greater than 500' in Dawson, 1973) among the low scrub on the flat top. Most of the birds had eggs, some of which were just hatching and others had chicks a few days old. He estimated about 750-800 pairs on the Big Sister, but did not land there. He landed at The Forty-Fours on 1/2/1954 and

estimated about 2000 breeding pairs. More than half the nests seemed to contain chicks.

Dawson (1973) reported visiting the Sisters again on 13/10/1964 when he counted 120 individuals beside nests, plus another 60 adults estimated. Ten fledglings were still present from the previous breeding cycle. Dawson also introduces counts made from aerial photos in 1972 which are discussed later in this report.

3.2 Methods of assessment

Any counting method where large numbers of animals are involved, depends on the amount of time, effort and cost involved to produce a level of predictable reliability. **Counts on their own may reveal very little other than a number, unless the count is combined with other biological data, such as the time within the breeding season, which enables a more specific interpretation of what the count represents.**

An important factor is to know what is being, or has been, counted -ie. nesting sites or territories, actual nests, nests with eggs, individual birds present, breeding adults, breeding pairs, chicks etc.

Each category produces an entirely different count interpretation. With colonial seabirds such as the albatrosses the usual and standard reference is the '**breeding pair**' because there is often little data on the size of the non-breeding and adolescent population to give knowledge of the total population of individuals.

Though it is rarely possible to actually count breeding over a long period, and with marked birds), the active nest sites counted at the correct time of the year are generally equated to a 'breeding pair' result. Unlike a count of individuals of unknown status, this extra knowledge enables other calculations to be made regarding population structure. This is important when looking at long-term trends.

At other times in the season the nest site count or number of chicks present can also be converted to 'breeding pairs'. If two or more counts are obtained during a breeding season it is possible to look at changes within the season and produce data which indicate 'productivity' or 'mortality' for the colony during the season.

3.2.1 Ground counts.
These are counts done on the ground at the nesting colony, preferably with more than one person doing the counting to check for discrepancies. Depending on the terrain, the time taken and the method of counting, this can be very accurate. It also allows other information, such as presence or absence of eggs or chicks, to be added to the count to assist later interpretation. Counts may be a simple, one by one tally, or in a more rapid method of 'estimation', in blocks of ten or more. On remote

islands the difficulties of access, length of time required and cost, often preclude reliable ground counts as a possible method.

3.2.2 Estimate by density and area.
A quicker method than the ground count, this requires the counting of representative areas of nests to produce a density, which can then be extrapolated according to the physical size of the colony. Works best on flatter areas, and can give a moderately reliable estimate, depending on the time put into obtaining the base density data. Depends on knowing the total area with some accuracy, which may involve surveying.

3.2.3 Aerial count. For species such as waterfowl resting on large water bodies it is possible to make reliable count/estimates of numbers from low flying aircraft with trained observers. Closely nesting areas of colonial birds can not be counted reliably in this way.

The best method for colonial nesting species which are visible from the air is by taking either vertical or oblique, black and white photographs or colour transparencies. Vertical photographs are rarely possible without special cameras, mountings and precision flying. The altitude is also important, because the birds must be easily visible on the resulting photographs.

The aerial photograph is a record of the number of birds or 'sites' present in the 'colony' at the instant of the photograph. The time of day may also be important if some species or age groups are more likely to be present at various times of the day. Therefore the photograph only represents images to be counted, but without interpretation, and without using other knowledge about the birds' biology; the basic photo count represents nothing more than the count of those images.

Appendices F to I, give examples of the type of black and white photograph which were obtained of the Royal albatross populations in the Chathams. Some of the counts presented in Appendix J were obtained from glossy black and white prints at twice the size of those illustrated in Appendices F to I. Each 'nest site' is pricked with a pin and the resultant number of sites is counted from the holes on the back of the print. The disadvantage is the cost of the print and its destruction by the pricking process.

Since 1964, C J R Robertson has used aerial photography with Australasian gannet (*Morus serrator*) colonies annually at Cape Kidnappers and elsewhere in New Zealand, for population counting (Wodzicki et *al.,* 1984). The most useful method has proven to be the taking of high angle oblique, 35mm colour transparency slides, with a zoom telephoto lens, automatic aperture control, and a shutter speed greater than 11500 to avoid movement blurring from the speed of the aircraft. Plenty of overlap should be allowed when shooting large areas.

Counting is a simple matter of projecting the slide onto a large sheet of paper, marking each 'site' with a pencil and then counting the result. The original image is not destroyed, and the count can be repeated with a new sheet of paper. Where parts of the colony are in separate photographs, then physical features are used to demarcate areas and prevent double counting.

With colour photographs, the interpretation is greatly enhanced in most cases, where value judgements have to be made of 'what is a bird' and 'what may be a rock' etc. Accordingly it is recommended that a series of photographs are counted together and by the ***same*** person. This allows the development of a knowledge of the locality and where to look. With the photographs counted for this report this procedure was followed.

3.2.4 Interpretation of counts.
The interpretation of what your count means depends on what it is to be used for, and what other information about the species has to be applied to provide that meaning.

Raw counts without interpretation are little better than the adding machine strip used to add them up.

Examples:

(a) A count of **chicks** does not tell you the size of the breeding population unless you know the failure rate for the eggs and the chicks up to that time in that breeding season. Further, it cannot be assumed to be the same failure rate in every season, so extrapolation from another season reduces the reliability of the interpretation.

(b) One aerial photograph count cannot tell you whether a nest 'site' contains a breeding pair or a non-breeding pair.

(c) Widely separated counts (years apart) may disguise both short term and long-term fluctuations in population size. A trend **cannot** be established with only 2 counts, and with long-lived species such as seabirds both annual and long-term patterns of fluctuation may occur. The examples shown in Appendix L demonstrate how different counts can be 'wrongly' interpreted when matched against the actual trend. When comparing counts from year to year it is also necessary to **compare equivalents** ie. same time of season in each comparable period.

3.2.5 Assessment of biennial breeders.
As a complex biennial breeder, a Royal or Wandering albatross population is much more complex to assess. Unlike annual breeders (mollymawks or gannets) where it is possible to have a reasonable basis for assessment of the breeding population size in one season, biennial breeders behave in different ways according to their breeding success at different times of the season.

In a biennial breeder, an annual count of breeders does not take into account birds which are not at the colony, but away on their 'holiday' year. At the simplest level of assessment, the population must be counted a minimum of three times in a breeding season, for a minimum of two and a part seasons to provide enough data for a ***single*** basic breeding population estimate.

This estimate will still be subject to a wide margin of error if the breeding population is not known, or there is no allowance made for annual mortality of adults. However, as a simple index of abundance the 'actual' total of nest sites can be used to estimate a maximum potential breeding population size.

For Royals this maximum assumes that every occupied site present in November/December represents a breeding attempt. In practice this never happens. Table 1 shows that at Taiaroa Head between 25-75% (mean 35%) of nest sites in November/December may be non-breeding and the amount varies every year so even the use of a mean figure creates a margin of error.

Thus, for the basic estimate, the counts required are **(A)** year one, in the last week of August to 1st week of September for chicks which will fledge that year and whose parents will be on 'holiday' the next breeding season; (B) year two, the last week of November or 1st week of December to assess 'actual' nest sites or the maximum potential breeding population; (C) year two, last week of March to first week in April for chicks which have hatched and survived the 'guard stage'. Potentially breeding adults who have failed at this point will return to breed the following season; (D) year two, Repeat of A, (E) year three, Repeat of B; (F) year three, Repeat of C; (G) year three, repeat of D.

This produces a method for providing a basic count from 'actual' nest sites made at these times:-

(C - D) + D + (E – F) + G + (F – G) = 'maximum potential breeding sites'

(This can be equated with maximum possible breeding pairs or, by multiplying by two, to equal maximum possible number of breeding birds.)

This count must be then subject to interpretation as stated earlier in this section, depending on how the original count was made.

Tickell (1968) demonstrated, by the experimental removal of all the eggs from a colony of Wandering albatross, how the actual population trying to nest in any one season fluctuated wildly for a number of years before the normal biennial breeding pattern was restored.

This experiment demonstrated a phenomenon which may be created naturally if there are large failures (or unnaturally by removals) of eggs or small chicks up to 35 days old, in one or more seasons. The result is up to 90 percent of the total breeding population can be trying to use the breeding ground at the same time, instead of a more normal 55-60 percent. Thus, **a high breeding population and high density nesting may not be the result of overpopulation,** as Tickell clearly showed.

3.3 Post 1973.

The Wildlife Service expeditions to the albatross islands 1973-1976 combined with aerial photographs provided by the Royal New Zealand Air Force 1972 – 1975 enabled the first detailed assessments to be made of the actual size of the albatross populations. It also demonstrated that Royal albatross and Island mollymawk could be reliably counted from aerial photographs. Regrettably because of their colouring the Northern Buller's mollymawk cannot yet be counted from photographs.

3.3.1 Chatham Island mollymawk.
Vertical photos taken on 28 November 1972 indicated 3965 nest sites occupied on Pyramid Rock, with an additional allowance made for the 'cave' and under the overhangs of a further 250 sites, giving a possible 4215 nest sites. Though little is known of the breeding biology of this species it is likely that a breeding pairs estimate could be about 3200. **A** visit on 21 February 1974 indicated only about 30 percent of the nest sites contained chicks. Assuming a similar nest count to 1972 this percentage could give a possible figure of about 1260 chicks as possible fledglings in that season. No further counts have been made since that time though colour transparencies from April 1991 have still to be counted.

It is considered that there are wide margins for error in any current assessment of this species. If Baucke's figure of 1280 chicks taken from the Pyramid in one season last century is correct, then in that year, assuming populations were similar, most of the chicks could have been taken.

Suffice to say this mollymawk is today the ***third rarest variety of albatross in the world,*** and is confined in its breeding to this one island. Our knowledge of its biology is unlikely to advance greatly in the foreseeable future due to the very difficult access and working conditions on the island.

3.3.2 Northern mollymawk.
Information on the biology of this mollymawk, only recently recognised as a different form from those found at The Snares, is known solely from the field expeditions of the 1970's (C J R Robertson in litt. and 1974, 1985). At the Sisters it is primarily a cliff hole and ledge nester with few on the open tops of the island dominated by the Royal albatross. No count is available, but breeding pairs were roughly estimated at 500 pairs for the Little Sister and 1500 pairs for the Big Sister.

At The Forty-Fours, aerial photographs and ground surveys, indicate a total colonial coverage of the top of the island of some 5.3 hectares (out of a total of 14 hectares) for this species. The terrain is rough and there seem to be few cliff nesting locations. Based on a probable density of one nest site per square metre over 45 percent of this area an estimated population of 23-24,000 nest sites/pairs is possible (Robertson 1974).

However, with the benefit of hind sight, allowing for possible non- breeding pairs which was not done in Robertson (1974, 1985), the breeding population could be more like 16,000 pairs in total. This can be classed as a crude estimate only, and a more accurate assessment would require an extended stay on The Forty-Fours for a ground count.

3.3.3 Northern Royal albatross.
Two series of aerial photographs from 1972-75 and 1989-91 are available for full assessments of the population of this albatross. Appendix J lists the actual counts of nest sites taken from the photographs. Examples of the photographs used are in Appendices F to I. Appendices M and N show graphically the 'actual' counts of the photographs. The April and August counts will closely relate to the number of chicks present in the colony at that time.

In Appendices J and K there are three examples which provide possible interpretations of the 'actual' counts when trying to estimate the breeding population. ***Example 1*** - estimates a total maximum breeding population with no allowances made for non-breeding birds. This could seem to indicate an increase of 17 percent in the 1970's to 1990's period. ***Example 2*** -uses the 10 percent allowance for non-breeding used by Robertson (1974, 1985). If this is applied to both series of counts then an increase of 11 percent could have occurred between the 70's and 90's. ***Example 3*** -shows a much more likely scenario using information not analysed in 1974 or 1985. As indicated earlier (Table 1) the non-breeding numbers on the ground at Taiaroa Head average 35 percent in November-December. To bring the 1970's counts to equal those of the 1990's then a percentage of 31.2 percent non-breeding needs to be applied to the 1970's to match the 35 percent allowance in the 1990's. This could show the populations as stable at the time of the two counts.

To a large extent these analyses are academic, for as was discussed earlier, they are based on two widely separated points in time when we do not know what normal annual fluctuations in the population could be expected.

It is probable, however, that the Royal albatross breeding population in the Chathams is presently between 6000 and 6750 breeding pairs.

A further study of Appendices J, M and N however, illustrates counts which do not require interpretation of breeding or non breeding status. Chick production each year can be estimated from the nest sites occupied in the August/September photographs (assuming no 'take' has occurred before the photographs were taken).

In the 1973/74 breeding season, when living on the Little Sister (October/November 1973 and January/February 1974) we estimated that some 80 percent of the population was trying to breed at one time (see also Appendix J). At the time we could not construe a reason for this, BUT we now know it implies a major failure of nesting (eggs and small chicks) the previous season. A similar phenomenen probably occurred on the Big Sister in the same year, but did not occur on The Forty-Fours.

Table 2. Variations in Annual Chick Production as a Percentage of Maximum Potential Breeding Sites at Royal Albatross Breeding Colonies in the Islands 1972-75 and 1989-91. (See Appendix J for source data)

DATE	LITTLE SISTER %	BIG SISTER %	FORTY-FOURS %	TOTAL Percentage of all nesting sites
1973	21	29	56	44
1974	43	59	45	48
1975	50	34	61	53
1990	31	15	3	11
1991	37	21	9	16

Table 2 demonstrates the massive difference in chick production between the 1970's and 1990's counts **(production is the number of chicks in the September photographs and is expressed as a percentage of the maximum potential breeding sites).** This type of catastrophic in breeding loss has not often been recorded before for albatrosses in a natural situation. It has been mirrored at Taiaroa Head, where, without remedial management (1989-1991), there would have been *two consecutive years of zero production.*

The 'take' from the Little Sister in late 1990 (Appendix E on page 70) would have accounted for between 14-24 percent of the chicks at fledging age that year on the Little Sister and between 7-11 percent of all fledging age chicks for the total population that year.

Catastrophic losses of chicks such as this will not show up in lower recruitment into the breeding population for 10 to 20 years. A similar pattern applies to the effect of any 'take of chicks' off the island (see discussion in sections 4 & 5).

Preliminary investigations at Taiaroa Head to determine the reasons for such a catastrophic loss are not yet completed and reported. However, factors including high ambient temperatures, low humidity and drought conditions, and poor food supply during the incubation, hatching and guard stage, plus fly strike on young or hatching chicks have all been implicated. Cycles of similar conditions have now been found in the long Taiaroa Head database which may indicate a linkage to long-term climatic and sea temperature cycles or changes in conditions, such as El Niño.

The air photographs of 1989-91 indicate extremely dry conditions on both the Big Sister and The Forty-Fours with low growth of vegetation normally used for nesting material and a possible reduction in the amount of soil area or depth on the islands. The physical structure of the Little Sister collects water, which means it is a wetter island than the other two.

It was found (C J R Robertson in litt.) in the Royal albatross research, that egg shell thickness decreased, and nesting failure increased, when nesting density increased. There was a significant difference in both shell thicknesses and nesting density between the Little Sister and The Forty-Fours at the time (nesting densities of up to 800 nests/hectare at Little Sister and 500/hectare at The Forty-Fours). Bob Riseborough who is an international specialist in the effects of pesticides and stress on birds' egg shell, advised (pers.comm.) that there were significant shell structure changes (in our samples he analysed) consistent with pesticide contamination in the samples.

However, these shell structure changes are also consistent with an increase in stress in the breeding birds, which can be a result of higher nesting densities. The higher densities also have the effect of pushing later nesting birds into more marginal nesting habitat (rockier substrate and less available nesting material) which produced greater egg breakage with the weaker shells.

Severe gales may also cause significant nesting failure and egg loss as was observed in January 1990 on the Little Sister (R Chappell in litt.). The 'Wahine' storm of April 1968 caused a major wreck of breeding adult Northern Royals along the south east coast of the North Island (Kinsky 1968). Only 20 percent of 91 Northern Royals found on beaches were immatures. This is the largest wreck of albatrosses at one time since the Ornithological Society of NZ's Beach patrol scheme began operating in the 1950's. It was however, a major cyclonic storm with winds up to 160 kilometres per hour.

No visits were made to the islands during hatching and early chick growth in 1990 or 1991 to see whether fly strike was a significant factor in early chick loss as seen at Taiaroa Head. Fly strike was not observed during the expeditions and it has only been seen at Taiaroa Head when conditions are very dry. E Waghorn (pers. comm.) has however, observed extensive fly strike on downy gannet chicks at Lawrence Rocks in Bass Strait, in very wet and humid conditions.

3.3.4 Northern Royal albatross at Taiaroa Head.
This population is closely studied and has a database going back to 1937 with detailed daily records during the period 1967-91. The present breeding population is 24 pairs and it is possible to make a good attempt at estimation of the total population including juveniles not yet returned to the colony. At present up to 80 individuals of various ages and breeding status may be seen at the colony during each nesting season. There is a steady but intermittent flow of immigrants and visitors from the Chatham populations. One bird recorded visiting at Taiaroa has been found breeding at the Little Sister, and at least one originally banded as a breeder at the Little Sister has visited Taiaroa Head. It is suggested from modelling using the data from Taiaroa Head, that without management and the present level of immigration (average of about 5 percent), that there are still not quite sufficient breeding pairs to sustain a viable natural population at Taiaroa Head.

C J R Robertson (in litt.) has found with gannets for example, that a colony with an initial 8 percent immigration needs to reach about 40 breeding pairs to sustain itself and expand as long as immigration is maintained for at least 15 years. Gannets breed at 4 years old and can produce chicks annually. Comparison with the breeding age and biennial breeding productivity of Royal albatrosses would suggest that a Royal colony could need 70-100 years to become self sustaining unless there was a much higher level of immigration. A trickle of some 50-60 birds in over 50 years as immigrants to Taiaroa Head can hardly be classed as massive immigration or a significant outflow from the Chatham parent population.

It has been argued by some, that the Royal Albatross population is expanding, as evidenced by the use of the term 'overflow' population at Taiaroa Head (Fleming 1939, Robertson 1974). However, experience with gannets has shown (Wodzicki *et al.* 1984 and Robertson in litt.) that even adjacent colonies can expand while the 'parent' colony declines rapidly. We do not know enough about the long-term population dynamics of Royal albatross to be certain what could be expected to be normal movements and fluctuations in the populations.

3.4 General.

There are no records of albatross populations before the arrival of humans in New Zealand or suggestions that they nested on the main islands of New Zealand. It is possible to suggest with some validity, based on the expansion of the gannet in the northern hemisphere, and other seabird species after the removal of human

predation, that the Royal albatross may only be just starting to recover towards population numbers which may have been present prior to the arrival of humans. As a result of modelling experiments (see section 4 and Appendix W) it is possible to suggest but one of many scenarios which may have occurred or could be occurring as a result of harvesting of albatrosses in the Chathams in the 1800's.

Further, if the albatross breeding at Pitt was a Royal and not a Wanderer, or if other fossil or archaeological evidence finds that albatrosses bred elsewhere on the main Islands, then the present island restriction and high nesting densities on them may be a forced artifact of humans and their associated mammalian predators now on the main islands. Modelling undertaken to answer questions later in this report shows that considerable periods of time are required to modify projected population changes in what is a long lived species with low annual individual productivity.

4 POPULATION MODELLING

As many of the questions asked by managers involve attempting to predict the effects of natural catastrophic events or a 'take' on the populations of the Northern Royal albatross, a simple life-table model 'spreadsheet' of the population has been developed as a predictive tool. Using a computer to make the thousands of calculations needed, we apply information on annual production of chicks, annual mortality at certain ages and percentage breeding success, to predict ('model') what the age structure or the size of the population will be at some point in the future (Appendix X). By changing any of the many population variables and introducing other natural and unnatural figures, these predictions can fit many scenarios to answer "What if' type questions. Similar predictions on life expectancy are used with actuarial calculations as used in the insurance industry to set premiums.

Any tool such as this is only as good as the data available to feed the model.

A close study has been made of data from Taiaroa Head (see Table 1) and Croxall *et al.* (1990) for productivity and survival data to develop the model. There are however, no data available for the annual variations of survival or productivity in the Chathams to be able to run the model in anything other than a coarse manner. The Taiaroa Head data are a very small sample, and that colony is a managed population with some immigration. The chosen model does include an immigration component variable, and using this the model has tested correctly against the known Taiaroa data.

Because many standard variables are unknown for the time spans of such long-lived birds, the model covers a period of 150 years, graphed for convenience, in most of the Appendices, at 10 year intervals. Ten year intervals can often suppress the evidence of rapid short term fluctuations (see Appendix R (a) and (b)). The model

can, if the data become available, be programmed with variables on an annual basis, but in this report **it only uses constant averages throughout.**

The model used is programmed to *remain* in *balance,* unless a variable is introduced such as a 'take'. **When the variable is removed the model returns to a balanced state,** but at whatever level the population had reached when the variable was removed.

All variables are introduced from year thirty to ensure the model is totally in balance at the start of any changes. For simplicity only one set of variables has been changed at any point in the modelling. This is to ensure that what the reader will see is the actual effect of that change. Where a change is made at another part of the graph an interval of no changes separates the new part from earlier changes (see Appendix W).

This enables the user to see the actual predicted effect of any change. In a natural state, any combination of other effects **may** combine to offset the result shown by the model. **It *must not* be assumed however, that other variables not included in the model can, or will, act in a beneficial manner to compensate for losses or increases.** For example a 'take' combined with a 'catastrophic loss' plus a coincidental shortage of food at sea may have a compounding effect many times more damaging than one or even two of the same events taken separately.

C J R Robertson (in litt.) when examining questions related to the failure of gannet nesting in 1987, found that Cape Kidnappers gannet populations could be adversely affected by (a) late nesting, (b) bad weather killing chicks at a critical time of the year (late December), (c) poor food supplies (January/February), (d) continuous periods of storms on the Australian east coast in May/July. On their own, each factor had a minor effect on survival and productivity.

However, any season with 3 or more of the factors combined, caused major nesting failure or chick losses. These failures clearly showed in the annual breeding population counts as reductions 5-8 years after the events. Major increases or decreases in the annual population caused by these good and bad years often had a continuing ripple effect through the entry of their own progeny into the population which was evident for more than 20 years.

As Royal albatross do not breed at Taiaroa Head until they are 9-10 years old, similar failures, if they occur in Royals (we don't know with certainty!), would not be expected to show in the breeding population for 11-16 years with any major fluctuations in annual populations continuing for up to 60 years. Equally such fluctuations may still be occurring from takes last century and early in this. Such an artifact could also contribute to catastrophic nesting failures with increased density of breeding waves many years after the causal event. (1968) shows a theoretical annual wave effect lasting for 20 years after his initial experimental removal of eggs assuming no other natural events in the meantime.

The biggest unknowns for modelling the Chathams population are the age of first breeding and the survival rate of juveniles and adolescents before reaching breeding age. This requires banded birds of known age. Though a sample was banded at the Little Sister in 1973 and 1974 it could take extensive field work to obtain any benefit from this sample after such a timespan. Accordingly these survival data must be based on data available from Taiaroa Head.

Existing literature suggests that in new and expanding colonies birds breed earlier as an artifact of lower density and less competition. If this were true for Royal albatrosses (we don't know!) and the case at Taiaroa Head, then we could expect breeding to commence later at the Chathams. This would have an *adverse* compounding effect on suggestions made by the model and published in this report, because of an even lower level of overall productivity per breeding individual.

It is also not possible to show in the model the probable effect of 'superior productivity' families. This has been shown in a 40 year study of Red-billed gulls (Lams novaehollandiae) at Kaikoura (Mills, 1989) where a small proportion of all the breeding adults produce the vast majority of progeny that survive to breed successfully. There is some evidence of a similar phenomena in Royal albatross breeding at Taiaroa where two family lines have shown significantly better survival and productivity. **Any random harvesting would have the potential to remove such individuals, with a subsequent (currently not predictable, but probable) disproportionate effect on future productivity.**

5 THE QUESTIONS ON TOROA POPULATION ECOLOGY

The questions asked by the Canterbury Conservancy (Appendix A) are in most cases those which require specific data or modelling to provide an answer. I have worked on the assumption that unless existing data demonstrate that there will be no effect caused by a human induced change, **any prediction or opinion made in the absence of such data must opt for a no change situation.**

While this position may not be satisfactory to either applicant or manager, it is the role of the scientific advisor to indicate the known factual basis of knowledge about the populations. This is but **one** component of the decision as to whether or not a 'take' should be allowed. That decision must be made in the light of social, ethical, political and conservation considerations, as well as on the basis of sound data. If the data are unsound or unavailable, that may be one reason leading to a decision, but not the only one.

5.1 population characteristics now cf. mid 1970's;

There are no data for the populations on the age structure of the population for any period including the 1970's and the 1990's.

It is not valid to imply this from the Taiaroa Head population, which is subject to intermittent immigration from the colonies at a mean of 5 percent per year, and which is subject to human management to improve productivity of nests which would normally fail in a natural situation. Further the Taiaroa Head colony is still too young to be exhibiting a normal distribution of ages.

5.2 an apparent population trend considering the 1970's and the 1990's data;

As is shown in Section 3 above (a) it is not possible to establish a trend from two widely separated points without knowing more about the long-term annual trends in the population; (b) from air photographs it is not possible to estimate the size of the non breeding population being viewed; (c) because we do not know the size of the non breeding population, any reasonable percentage used can be used to create a 'trend' showing an increase, decline or population in balance (see also Appendix J, K and especially L).

The best guess at present would be to suggest a relatively stable population with a long-term trend over 50 years for an small increase, assuming that catastrophic events are cyclic and that 'taking' continues to decline.

5.3 productivity over this 20-year monitoring period;

It is assumed that 'productivity' refers primarily to the number of chicks fledged each year. It is not correct to say that there has been a monitoring period of 20 years when there are potential chick fledging estimates for 5 years only, and assuming no illegal take (known to have happened in 1990, for example). Reference to Appendix J (Aug/Sept. counts) shows that the mean productivity (assuming no take) per annum for the period 1973-75 was 2550 chicks p.a. compared with a mean of 1087 chicks p.a. in the period 1989-91. Not only is this a significant difference, but the productivity of each island has varied markedly between and within each period. There are no data to indicate what, if any, difference there is in the subsequent survival of juveniles before breeding, between years of high and low chick productivity.

5.4 (a) population, and (b) age class implications of natural catastrophic events storms, poor food years, disease etc.;

In the absence of data on any of these topics for Chatham or other albatross populations, any answer has an element of theoretical speculation.

Catastrophic nesting loss has already been discussed in Section 3. The implications of one or more reduced cohorts (one year's chick produc-tion) of progeny can really only be predicted by modelling, and an example is shown as Appendix R (a) and (b). The operation of the model and its limitations, caused by not knowing various factors for the Chathams has been discussed in Section 4. However, the result does not have the same biological effect as taking chicks close to fledging (see Table 1).

Parents losing eggs or young chicks up to 35 days old usually again the *following* season. Parents losing chicks to a 'take' still take a year off on 'holiday' as if they had successfully reared a chick. Replacement of any losses caused by a 'take' are therefore slower because the adults do not have as many opportunities to replace the chicks lost.

If the world is undergoing a period of climatic warming, then it is possible that there will be an increasing effect on the food resources of oceanic seabirds. Recent research work in the New Zealand Antarctic have demonstrated significant and relatively rapid declines in some penguin and mollymawk populations at Campbell Island. Sea temperature increases seem to be a major contributing factor to these declines, and major catastrophic nesting failures of the Red-billed gull at Kaikoura (Mills 1989, 1991; Moore & Moffat 1990, Moore 1991; D Cunningham pers. comm.).

Disease is not known to be a factor. However, it is a possible adjunct to populations which come under stress for other climatic, density, or food change situations. There has, for example, been a tendency for pulmonary problems to occur in chicks at Taiaroa Head when they or their parents have been under stress from other factors.

Comment on storms may be found in Section 2.

5.5 (a) population, and (b) age class implications of a "one-off take" of 20 birds;

Of all the options raised by the questions here, a 'one-off take' would seem to have the least scientific problems for a manager and applicant, provided that it also meant, and was accepted there would be no more in the future. It must also assume that illegal 'takes' also cease. A repeating of a so called 'one-off take' and a continuation of 'illegal' takes in the future, clearly then puts the problem into the category of intermittent taking, discussed in Section 5.7.

The model shows that there is a discernible effect (Appendix T), however small. It can also be seen scaled up to 100 chicks in Appendix V (a). A potential of some 4 breeding pairs is removed from the population. Assuming that they only replace themselves then there is a continuing permanent reduction of that potential in the total population. It takes no account of any losses in the superior family effect mentioned earlier.

In human terms, the level of insignificance of a take of any sort is probably best paralleled by the motor accident statistics for young humans. The long-term effects of the loss of those persons and their potential contribution to the population can only be guessed at. The same must apply in Royal albatross where our knowledge of the population dynamic effects are considerably less than if we were harvesting humans or sheep.

5.6 (a) population, and (b) age class implications of a sustained harvest of 5 birds, 10 birds, 15 birds, 20 birds, 25 birds;

For reasons of space I have not shown a model for each number requested and have provided models which can be read in conjunction with question 5.8 below. Appendix S (a) to (d) demonstrates the effect on the Little Sister population of 'takes' of 5, 15, 25 and 65 chicks per annum on a continuing basis over the 150 years of the model starting in year 30.

There is a clear and discernible effect. An 'illegal' take is no different in modelling terms from a 'legal' one. It shows clearly that in 100 years at 65 chicks per annum, without outside assistance from immigration the Little Sister could become an extinct breeding colony. The decline would be much more rapid if cyclic catastrophic events were added to the losses.

5.7 (a) population, and (b) age class implications of an intermit-tent harvest;

As could be expected from section 5.6 an intermittent has a lesser numeric effect on the population than an annual harvest. However, the size of the intermittent is important. As no suggestions have been made I have used a take of 20 chicks each 5 years and assumed that there is no 'illegal' take occurring during the whole period. It shows when you compare over 150 years that there is only marginally little difference less in numeric terms between 20 once each five years and five every year. Compare Appendices S(a) and U.

5.8 could you provide some comment on the effects and impacts to the population of the reputed current (illegal) "take" of somewhere between 15 - 40 birds on average per annum, how is this compensated for during population modelling ?;

The problem lies in the definition of what is a 'take'. If it is a 'take' from a breeding island it must be treated in the same way as the proposals in 5.5 to 5.7 above if the birds are taken in September. Appendix S(d) shows the effect of an illegal take of 40 when added to a legal take of 25 - a take for that season of 65. The only effect on the

model is to changes the size or frequency of any 'take' for which a model is required.

If for example, as some recent comment would have it, Royals are being taken in April, then only adults and not chicks are being taken. The taking of adults has an *immediate* depressing effect on the breeding population size which is probably at least two and half times the long-term effect of a take of chicks. This is also the factor which occurs as an artifact of deaths caused by an incidental bycatch of adults by fishing vessels (Croxall et al. 1990).

Appendices V (a) and (b) compare the effects of taking 100 chicks or adults in one season over a fifty year period. Note the delayed effect of chick taking on breeding adult numbers and the smaller overall effect long-term.

5.9 are there any features which indicate (a) stability, and (b) instability in the albatross populations ?;

The only present features I can ascertain of instability or stability are the massive seasonal fluctuations caused by catastrophic losses of eggs and small chicks. As (1968) noted this creates wide differences in the numbers nesting and may lead some observers to suggest overcrowding or overpopulation, when it is only an artifact of the biennial breeding cycle. Where such fluctuations occur as the result of 'natural' phenomena, then they may indicate that part of the albatross environment is also unstable ie. food supply.

5.10 can the populations (as a whole and on an island by island basis) tolerate a sustained harvest regime, if so, what is the maximum number of birds which could be taken without putting in jeopardy the species population in its current situation ?;

The modelling undertaken has worked on the assumption that only one island (Little Sister) could be opened to harvesting because (a) we have more data available for this island and (b) it would then leave the majority (80 percent of the population) untouched and possibly (?) available to supply immigrants, though this has to be an assumption.

I am unable to give any precise answer on a sustained harvest regime on any island in the on the basis of present knowledge.

This is especially the case when current productivity of chicks is so low. I do not know, nor cannot speculate, whether this is a normal periodic fluctuation or a long-term change caused by other environmental factors. All the modelling undertaken has used standard averages (and assumed their constant application throughout the models) for all the known survival and productivity variables which affect the population.

The use of averages, or the intervals sampled, can clearly disguise the effects of periodic or annual movements, and changes in these variables (see Appendix R (a) and (b)). The averages are only as good as the base data from Taiaroa Head and the very few other studies with similar biennial species. Until the frequency and intensity of such periodic fluctuations or other long-term changes is better documented, it is not possible to answer this question with any certainty.

The result, may be a modelling prediction based on **one variable only** which represents long-term trends, but hides short term changes, which if they continue long enough, can change the long-term trends. The best comparative example is standard weather data collection to provide climatic trends. The averages always run well behind short term changes, and many decades of data are needed for a reliable average.

5.11 what is your estimate of the number of juvenile albatross "blown off' the islands each year (this may need to be an average over a number of years), what is the effect of this natural mortality on the population?;

I have no information other than the anecdotal for the number 'blown off' each year (see Appendix E). From my own observations, not all those taking off in such a way necessarily become cast on the water. Those that do, can fall prey to attack from Giant petrels.

As suggested, however, it is **natural mortality** and is therefore currently considered in the data and the model as birds fledging who do not return to breed. Accordingly the 'effect' on the population may vary from season to season, and cohort to cohort, as do other levels of mortality hidden by the long-term averages used in the model.

5.12 what options do these "blown off' birds provide to meet local use needs, say 10 - 50 birds per year, what problems do you envisage if this option is adopted ?;

Truly blown off chicks, dead in the water, or on the beach, (flotsam and jetsam) have no effect other than a natural one on the population. There is still the legal problem of 'possession' under the Wildlife Act, but that is a legal and management problem.

However, for birds taken on the water there is still the need for certainty on what is being taken. Dead birds are flotsam and natural loss. Live birds come into the potential category of a 'take' as long as they have the potential to survive and enter the breeding population. Adults throughout the year, regularly use the waters near the islands as individuals and in flocks for washing plumage (bathing 'clubs'). It is difficult for untrained personnel to distinguish between adults and fully feathered juveniles, *even ashore* on the breeding islands. In calm conditions at sea, when neither adult nor chick would be able to fly, the tendency will be to 'hunt' birds on the water which are not yet dead, and may well be adults.

5.13 can you provide some indication of how many northern royal albatross are being killed as a result of the fishing industry (competition, incidental catch and ship collisions), what is the impact of this to the population;

Robertson and Kinsky (1972) described the dispersal movements of the Royal albatross in its movements around the southern hemisphere. Though based primarily on data from the Campbell Island, Southern Royal albatross, the few Northern Royal recoveries now available, mirror the same pattern. I know of no current significant level of incidental catch for Royals, though historically band recoveries have shown some Southern Royals as caught by tuna boats in the South Indian Ocean and to the NE of New Zealand. Croxall *et al*. (1990) have given good evidence for a decline in Wandering albatross from South Georgia of at least 1% p.a. with a higher incidence for females because of their feeding localities.

Breeding birds from Taiaroa Head disappeared in the 1970's coincidental with the first major squid fishery in New Zealand. However, data analysis following recent mortality there during a period of catastrophic nesting failure, suggest that similar conditions may have applied on a less acute scale in the 1970's. This could be an alternative to fisheries incidental catch.

I know of no information suggesting any significant level of catch from local inshore or orange roughy fishing in the Chathams. Ship collisions seem to be rare occurrences, but are poorly documented.

5.14 is breeding success equal over each of the islands or, are some areas more productive than others i.e. are there fringe areas which do not provide recruitment to the population ?;

All chicks fledging seem, on the basis of Taiaroa data, to have an equal chance of survival to return to the colony (C J R Robertson in litt. and Robertson & Wright 1979). This is unlike other species such as Australasian gannets where the timing of the breeding cycle means that survival of chicks from later breeding adults have a lower chance of survival in that species (C J R Robertson in litt.).

Some areas of the breeding islands are more productive than others, in some years. Primarily this is the effect of shelter, substrate (soil, rather than rock), availability of vegetation for nesting material, and time of laying in the egg-laying cycle. However, even 'good' areas can become less productive in years of high density due to stress from close nesting neighbours especially for late laying birds who may be forced to use less favourable substrates. Further, it is not possible to tell after about July

where an observed chick has bred, as movement about the colony becomes increasingly common from then until fledging.

5.15 what are the continued monitoring requirements for the albatross and mollymawk populations? In addition could you comment on a practical monitoring system e.g. aerial counts, island visits (how many, when and who needs to carry them out), what sort of ground census (technique);

Monitoring should be continued at least at the present level of 3 aerial photographs per year for a minimum of 15 years. This will start to provide some data as to the annual fluctuations, if any, which occur and enable a trend to be established.

Periodic island visits should be made when significant changes from the normal breeding percentages occur, to see if any diagnostic features are indicated. Preferably the party should include an experienced colonial seabird observer or interpretation of results from an advisor experienced in albatrosses. These persons are not in plentiful supply worldwide! The techniques to be used are shown in Section 3 above.

5.16 if a sustained harvest is considered could you outline a harvest strategy which would minimise the impact to the long-term survival of the species, e.g. rotational harvest of the islands divided into segments so that each pair of birds theoretically could only have a chick removed every 7-8 years; harvesting from least successful zones on the islands i.e. areas from which little or no successful production takes place like the edge of a colony;

On the basis of present knowledge, I know of no sustained (continuing) annual or intermittent harvest strategy which would **minimise the impact to the long-term survival of the species**. This is a singularly imprecise phrase, which in using ***'minimise'*** sets no guideline for assessment or advice. What does 'minimise' imply - that if the population will become extinct in 500 years it is having minimal effect to have a harvest in the short term?

Any human harvest or 'take', whether it is one bird or 1000 birds, will have an impact on both the short-term and the long-term survival of the species. Certainly a take at the present time of low productivity would have far greater effect than in times of high productivity. The data are just not good enough to give the answer which seems to be required.

There are no other harvesting examples for similar species to compare with. However, the recently demonstrated levels of long-term decline from an indicated fishery by-catch in Wandering albatrosses from South Georgia, another long-lived biennial breeder (Croxall *et al.* 1990), and other albatross harvesting examples (see Section 1.8) give considerable cause for disquiet, should any possible theoretical suggestions be made.

Croxall et al. (1990) state after studying the significant decline in a Wandering albatross population:

> "Wandering albatrosses show low reproductive and high survival rates typical of albatrosses ... Despite one of the highest levels of breeding success recorded for such birds, their biennial breeding system results in an average annual production per pair of 0.25 chicks per breeding attempt ... The study exemplifies many of the difficulties in detecting and interpreting changes in population size and structure in long-lived species with naturally low reproductive and mortality rates. Detecting the 1% annual decrease in the breeding population size required nearly ten years data. Despite intensive recapture operations *(of marked birds),* detecting changes in demographic parameters would have been very difficult **without the earlier 'baseline'** and in all likelihood the present annual adult of 94% would not have been regarded as a significant problem."

Your suggestion of harvest 'from different parts of the colony' on the face of it has some merit, if it reduces the genetic loss to any family line. There is no place where no successful production takes place. If the bird dies on the colony then it obviously can't be taken. Production by implication is of birds which are able to fledge.

However, to ensure 'a different parts strategy' method was operated correctly and with precision, would require a marked (banded) population of adults, with chicks being also being marked for harvest about May/June before they started to move about the colony. This would seem to introduce an element of necessary monitoring and cost into the process of harvest, and the question of who should pay and who should supervise and monitor.

6 CONCLUSIONS

The history of albatross birding in the Chathams is not only a fascinating insight into the biology of complex and long-lived birds, but also demonstrates aspects of human cultural development in New Zealand from first settlement to the present day.

It is clear that albatrosses are long-lived breeders with a low reproductive rate (a pair need to successfully breed an average of eight times or a minimum of 16 years to replace themselves, compared with a mallard duck replacement in two years), and a seemingly irregular response to 'natural' environmental events which may not be observable until many years after the event. The albatrosses have evolved slowly over many thousands of years without land-based predators and have been exposed to human influences over a relatively short time. Worldwide, no human relationships except reservation of habitat, or protection, have yet to be shown as beneficial for an albatross in the wild.

Albatrosses seem to have once bred on easily accessible Pitt Island about the time of arrival of humans. They do not do so now. Harvesting of albatrosses has occurred on the presently known breeding islands during human occupation of the Chatham Islands. This harvest has had a totally unknown effect on the populations or species composition. The only fact is that three varieties of albatross breed there today. There are no data to say what a normal albatross population size should be now, or was, before human arrival.

There are no reproductive or survival data for the Chatham albatrosses and little from elsewhere to allow more than a theoretical prediction of the effects of a legal or illegal harvest of any size. Because of the long time needed for any changes, natural or induced, to be reflected in the population it is not possible to say whether or not modern style harvesting over the past 150 years is still having an effect on breeding, productivity and mortality variables within the population.

The present low annual productivity seems, from the parallel at Taiaroa Head, to be related to current climatic and food effects. The regularity and long-term effects of such events are not known. The effects of harvesting at times of low productivity can be proportionately greater than in more 'normal' years. The risk of a number of adverse climatic, food and breeding conditions combined with harvesting occurring together to depress the populations cannot be predicted, but neither can they be discounted. These effects do occur in other species, and by assumption similar events should occur in albatrosses.

There seems to be a long held assumption that if the **numbers** of an animal appear plentiful to a casual observer (whatever *plentiful* actually means) that a species is harvestable. This could be named *'the few won't matter* syndrome' and is generally unsupported by reliable information. The number of birds seen by such casual

observation takes no account of the breeding structure of the population, the biology of the animal, nor the environment within which it is currently living. Circumstances do change. In the history of the Chatham Islands, humans are themselves an example of how populations have changed in size, age composition and structure according to the prevailing conditions.

For any harvesting regime, a monitoring programme should be required. The assessment of any impact, from whatever cause can only be predicted on the basis of reliable data. As Croxall et al. (1990) demonstrated, only a secure baseline and continual monitoring will illustrate changes which in a casual short-term or random context may seem either insignificant or dramatic depending on the trend (see also Appendix L). In the case of albatrosses in the Chatham Islands, it is clear the data must also be long-term because of the longevity and slow breeding of the potential target species. Research would probably be needed for a minimum of 12-15 years to reliably provide the annual basis of information normally required in New Zealand for the harvesting of other species such as ducks, for game.

7 ACKNOWLEDGEMENTS

Any research of an 'illegal' topic requires a degree of confidence and trust by all participants. I am indebted to all those Chatham Islanders, old and young, past and present (some acknowledged in the text and many others equally important, but often at their own request unnamed here), who have participated in this research and related their knowledge of the history of birding. I hope that the combined results give no unwitting offence, where none is willingly intended, but contribute to an informed debate where all parties have access to a similar pool of information. To the albatross island owners, my thanks for your hospitality, the privilege of access to your land and many stimulating debates between 1973 and 1976. To Rhys Richards over 18 years and in latter days Michael King, my thanks for advice and pointing me to fresh historic resources.

Thanks are due to past colleagues of the NZ Wildlife Service, and especially Alan Wright, Rodney Russ and Brian Bell who participated in the expeditions to the islands which uncovered what we know today about the albatrosses of the Chathams, discovered new ways to get on and off islands and how to live with the 'fleas'; to our boatmen who got us to and from the islands and introduced us to fishing on the way, especially Cliff Clarke, Johnny Inkster, Bob Rowley and 'BunBun' Poki; to the late Lance Richdale for what he did at Taiaroa Head and shared with me in our many discussions during the 1970's. We could not have known, or even guessed what we know today, without the research started by him in 1936.

Grateful thanks: to present colleagues of the Department of Conservation for their advice and debate and those Otago Conservancy staff at Taiaroa Head who continue the daily data collection which underpins many other studies and allows us to make some predictions; to the Royal New Zealand Air Force maritime wing (who have as their logo, the Royal albatross) for their excellent photography in the 1970's; to librarians and archivists at all major New Zealand collections for access and advice on reference material; to curators at the British Museum, American Museum of Natural History, Smithsonian, Berlin Museum, National, Auckland, Canterbury and Otago Museums in New Zealand for access to albatross collections and advice; to Phil Millener of the National Museum for the Pitt Island albatross material and organising the urgent radiocarbon dates required; to Bert Rebergen who counted/marked the aerial photographs at least twice and therefore looked at over 100,000 images of Royals; to June Bullock who assisted with the typing of the Appendices; to M J Imber, R McColl, Brian D Bell, A Davis, A Grant, E Kennedy, K Hughey, M Cuddihy, J Owen, R Sadleir and John who reviewed the manuscript; and finally to my wife Gillian who has suffered my absences, read my manuscripts and is the only woman to have had the cultural honour of living on an albatross island in the Chathams.

8 REFERENCES

Anon, 1913. A trip to the Forty-fours. Otago Daily Times 1 March, 1913, p.4

Archey G and Lindsay C, 1924. Notes on the Birds of the Chatham Islands. Records of the Canterbury Museum, Vol II, 187-201

Baucke W, 1922. 'An Extinct Race, Morioris of the Chathams'. New Herald 8/7/22, 15/7/22, 22/7/22, 29/7/22, 5/8/22, 12/8/22, 19/8/22, 26/8/22, 2/9/22, 9/9/22, 23/9/22, 14/10/22.

Bell L C, 1955. Notes on the Birds of the Chatham Islands. Notornis, Vol 6 No. 3, 65-68

Bell B D and Robertson C J R, 1990. Seabirds of the Chatham Islands. Paper presented at the 20th World Conference of the International Council for Bird Preservation. In Press

Burt B, Manuscript papers Folio 18, in the Alexander Turnbull Library, Wellington

Chudleigh E R, 1950. "The Diary of E R Chudleigh 1862-1921". E C Richards (Ed.) Simpson and Williams, Christchurch.

Croxall J P, Prince P A, Hunter I, and Copestake P G, 1984. The Seabirds of the Antarctic Peninsula, Islands of the Scotia Sea, Antarctic Continent between 80°W and 20°W: Their status and Conservation. ICBP Technical Bulletin No. 2, 637-666.

Croxall J P, Rotheray P, Pickering S P C, and Prince P A, 1990. Reproductive performance, recruitment and survival of Wandering Albatrosses *Diomedea* at Bird Island, South Georgia. Journal of Animal Ecology, 59, 775-796.

Dawson E W, 1955. The Birds of theChatham Islands 1954 Expedition. Notornis, Vo1 6 No. 3, 78-82

Dawson E 1973. Albatross populations at the Chatham Islands. Notornis, Vol 20 (3) 210-230

Dieffenbach E, 1841. An account of the Chatham Islands. Journal of the Royal Geographical Society 11: 195-215

Falla R A, 1938. Distribution of the Royal Albatross in New Zealand Region. Records of the Canterbury Museum, Vol. IV, 213-217

Falla R A, 1960. Notes on some bones collected by Dr Watters and Mr Lindsay at Chatham Islands. Notornis 8(7): 226-227

Feare C J, 1984. Human exploitation. ICBP Technical Publication No. 2 691-699

Fleming C A, 1939. Birds of the Chatham Islands. Emu, Vol. XXXVIII, 380-413, 492-509.

Forbes H 0,1893. A List of Birds inhabiting the Chatham Islands. Ibis, Vol (6) 5, 521-546

Green R H, 1974. Albatross Island. Records of the Queen Victoria Museum No. 51

Hasegawa H and DeGrange A R, 1982. The Short-tailed Albatross, its status, distribution and natural history. American Birds, Vol. 36, No. 5, 806-814

King M, 1989. Moriori. Viking, Auckland

King M and Morrison R, 1990. A Land Apart. Random Century, Auckland.

Kinsky, F C, 1968. An unusual seabird mortality in the southern North Island, (New Zealand) April, 1968. 15 (3): 143-155.

Mills J A, 1989. Lifetime reproduction of the Red-billed gull. In Lifetime Reproduction in Birds (Ed.) I Newton. Academic Press, London

Mills J A, 1991. Reproductive failure in the Red-billed gull in relation to changes in oceanography off the coast. Department of Conservation Science Research Internal Report No 96 Vol. 2268-269

Moore P J and Moffat R D, 1990. Mollymawks on Campbell Island. Department of Conservation Science Research Internal Report No. 59

Moore P J, 1991. Investigation of probable decline of mollymawk populations of Campbell Island. Department of Conservation Science Research Internal Report No 96 Vol. 2262-263

Murphy R C, 1917. A new albatross from the west coast of South America. Bull. Am. Mus. Nat. Hist., 37: 861-864

Murphy R C, 1930. Birds collected during the Whitney South Sea Expedition. XI. American Museum Novitates No 419: 1-15

Richards E C, 1950. Diary of E R Chudleigh 1862-921, Chatham Islands. Simpson and Williams, Christchurch

Richards E C, 1952. The Chatham Islands: their Plants, Birds and People. Simpson and Williams, Christchurch

Richards R, 1962. 'An Historical Geography of the Chatham Island'. Unpublished M.A thesis, University of Canterbury

Richards R, 1982. Whaling and Sealing at the Islands. Roebuck Society, Canberra

Richardson M E, 1984. Aspects of the Ornithology of the Tristan da Cunha Group and Gough Island, 1972- 1974. Cormorant 12 No. 123-201

Richdale, L E, 1950. The pre-egg stage in the albatross family. Biol. Mono. 3: the author.

Richdale, L E, 1952. The post-egg period in albatrosses. Biol. Mono. 4: the author.

Ritchie T W, 1863-1900. Manuscript papers in Christchurch Public Library, Christchurch

Robertson C R, 1971. The Royal Albatross at Taiaroa Head. Wildlife- A Review 3: 46-49

Robertson C J R and Kinsky F C, 1972. The Dispersal Movements of the Royal Albatross (*Diomedea epomophora*). 19: 289-301

Robertson C R, 1973. Royal Albatross. Wildlife - A Review 4: 10-12

Robertson C J R and Wright A, 1973. Successful hand rearing of an abandoned Royal albatross chick. Notornis (1): 49-58

Robertson C R, 1974. Albatrosses of the Chatham Islands. Wildlife -A Review 5: 20-22

Robertson C J R and Richdale L E, 1975. Breeding phenology of the Royal albatross. Paper delivered at the 16th International Ornithological Congress. (Abstract) Emu Vol. 74 (suppl.) 292

Robertson C J R and Wright A, 1979. Taiaroa Head. Wildlife A Review 10: 35-36

Robertson C J R, 1981. Preliminary assessment of the impact on the Nature Reserve and Wildlife Sanctuary at Taiaroa Head of a proposed aluminium smelter and ancillary installations at Aramoana. NZ Wildlife Service, Wellington

Robertson C J R and Van Tets G F, 1982. The status of birds at the Bounty Islands. Notornis 29, 311-336

Robertson C J R and Bell B D, 1984. Seabird Status and Conservation in the New Zealand Region. ICBP Technical Publication No. 2, 573-586

Robertson C J R, 1985. Various albatross texts including Royal albatross, Buller's mollymawk and Chatham Island mollymawk. Complete Book of New Zealand Birds. C J R Robertson (Ed.) Readers Digest, Surry Hills

Robertson C J R, 1990. Lancelot Eric 1900-1983. In A Flying Start. (Eds.) B J Gill & B D Heather. Random Century, Auckland 194 -195

Robertson C J R, 1991. Population ecology of albatrosses in New Zealand. In Department of Conservation Science & Research Internal Report No. 96 Vol. 2:264-265.

Rounsevell D E and Brothers N P, 1984. The Status and Conservation of Seabirds at Macquarie Island. ICBP Technical Publication No. 2, 587-592.

Scott D, 1975. Ask That Mountain. Heinemann, Auckland

Shand A, 1911. The Moriori people of the Chatham Islands: their history and traditions. Memoirs of the Polynesian Society, Vol II.

Skinner, H D, 1923. The Morioris of the Chatham islands. Memoirs of the Bernice P Bishop Museum, Vol IX, No. 1

Sutton, H D and Baucke W, 1928. The Morioris. Memoirs of the Bernice P Bishop Museum, Vol IX, No. 5

Sutton D G, 1977. The Archaeology of the Little Sister, Chatham Islands. Anthropology Department, University of Otago. Working Papers in Chatham Island Archaeology 10.

Tickell, W L N, 1968. The Biology of the Great Albatrosses, *Diomedea exulans* and *Diomedea epomophora*. Antarctic Bird Studies. (Ed.) Austin O L. American Geophysical Union, Antarctic Research Series Vol 12, 1-56

Turbott E G (Convener), 1990. Checklist of the Birds of New Zealand. 3rd Ed. Random Century, Auckland

Williams A J, 1984. Status and Conservation of Seabirds on some Islands in the African Sector of the Southern Ocean. ICBP Technical Publication No. 2, 627-635.

Wodxicki K A, Robertson C J R, Thompson H R and C T, 1984. The distribution and number of gannets (*Sula serrator*) in New Zealand. Notornis 31(3): 232-261

Wright A E, 1984. Buller's Mollymawks breeding at the Three Kings Islands. Notornis 31: 203-207

APPENDIX A

Questions by the Cantebury Conservancy, Department of Conservation

17 May 1991
File BIR 014

Attention: Chris Robertson (S & R Directorate)

TOROA POPULATION ECOLOGY

The department has received applications from Moriori and Maori to take toroa from off shore Chatham Islands. Toroa (Northern royal albatross) are managed by DOC under the Wildlife Act. In making a recommendation with respect to any take the department must be clear about the popula- tion dynamics of the species, what size is the population, is it stable, growing or decreasing, what is its productivity, etc.

The timetable for management action is:

- paper to Minister of Conservation outlining proposal, departmental responsibilities, other considerations, etc., by end of June. Some basic ecological facts would be included in that paper.

-paper to the Chatham Island Conservation Board for its August meeting; to include full and up-to-date population ecology, so that the Board can make a recommendation to the department.

-paper to the Minister setting out the departmental position and recommendation (including the board position).

-the initial Moriori request requires an answer by the end of August if their application for use at the 200th anniversary celebrations is to be met. These celebrations peak in November 1991.

Clearly we urgently require the following population information for the population as a whole, and, if possible for the 44's and Sisters island groups separately:

I. population characteristics now cf mid 1970's;

II. an apparent population trend considering the 1970's and the 1990's data;

III. productivity over this 20-year monitoring period; a) population, and (b) age class implications of natural catastrophic events storms, poor food years, disease etc.;

IV. population, and (b) age class implications of a 'one-off take' of 20 birds;

V. (a) population, and (b) age class implications of a sustained harvest of 5 birds, 10 birds, 15 birds, 20 birds, 25 birds;

VI. population, and (b) age class implications of an intermittent harvest;

VII. could you provide some comment on the effects and impacts to the population of the reputed current(illegal) of somewhere between 15 -40 birds on average per annum, how is this compensated for during population modelling ?;

VIII. are there any features which indicate (a) stability, and (b) instability in the albatross populations ?;

IX. can the populations (as a whole and on an island by island basis) tolerate a sustained harvest regime , if so, what is the maximum number of birds which could be taken without putting in jeopardy the species population in its current situation ?;

X. what is your estimate of the number of juvenile albatross "blown off" the islands each year (this may need to be an average over a number of years) , what is the effect of this natural mortality on the population?;

XI. what options do these birds provide to meet local use needs, say 10-50 birds per year, what problems do you envisage if this option is adopted?;

XII. can you provide some indication of how many northern royal albatross are being killed as a result of the fishing industry (competition, incidental catch and ship collisions), what is the impact of this to the population;

XIII. is breeding success equal over each of the islands or, are some areas more productive than others

XIV. are there fringe areas which do not provide recruitment to the population?;

XV. what are the continued monitoring requirements for the albatross and mollymawk populations?. In addition could you comment on a practical monitoring system e. g. aerial counts, island visits (how many, when and who needs to carry them out), what sort of ground census (technique);

XVI. if a sustained harvest is considered could you outline a harvest strategy which would minimise the impact to the long-term survival of the species, e.g. rotational harvest of the islands divided into segments so that each pair of birds theoretically could only have a chick removed every 7-8 years; harvesting from least successful zones on the islands i.e. areas from which little or no successful production takes place like the edge of a colony;

XVII. to illustrate the information requested and to give a better understanding of the aerial census technique to CI Conservation Board members and the Minister could you provide a series of prints of the census slides (or relevant slides for us to get processed) and interpretive Specific areas which need to be illustrated are prints showing that aerial census is accurate and does provide the basis for the information presented; the physical condition and distribution of the island's vegetation in the 1970's and now in the 1990's; any prints which are relevant to information requested in 1 - xv above.

Could you please ensure this information is available by 22 July 1991 to meet the critical path shown above. Twenty copies of your report will be required to distribute to members of the board and other relevant persons.

Michael Cuddihy
Regional Conservator

APPENDIX B

Applications and submissions made to the Department of Conservation regarding the taking of Toroa.

MORIORI TCHAKAT ASSOCIATION OF REKOHU INCORPORATED

13 July 1989

P.O. Box 125
Waitangi
Chatham Islands

Rob Chappel
Department of Conservation
P.O. Box, Waitangi
Chatham Islands

Dear Rob,

The Moriori Tchakat Henu Association of Rekohu Incorporated has been invited by the 1990 Commission to construct a traditional Moriori waka to take to Waitangi, Bay of Islands on 6 February 1990 to take part in the celebrations of the anniversary of the signing of the Treaty of Waitangi. To enable the Morioris to be dressed in traditional fashion, as all other tribes will be, it will be necessary to obtain a quantity of seal skins. Would the Department of Conservation assist us with this by collecting skins off dead or dying seals. We have heard that there is a possibility of culling some seals in New Zealand colonies. If this is so could these skins be kept for the Morioris.

The albatross was very significant to the Moriori and we believe that it would be appropriate to make arrangements to allow enough albatross to be taken each year to satisfy traditional custom and for ceremonial occasions such as the launching of Dr Michael Kings book about the Moriori and the Treaty celebrations. This Society offers its assistance to your Department in organising and policing the taking of these birds.

One of the objects of the Society is to promote the development of the wise management, conservation and administration of the natural resources on Rekohu. The natural resources, such as whalebone and teeth should be used to develop local industry and create employment for the residents of Rekohu. We suggest that a whalebone and whaleteeth collections centre be set up and carving of same be promoted. We are at present trying to contact

people with appropriate expertise to revive Moriori arts and crafts and also offering to assist your Department to organise the collection and distribution centre. No whalebone or teeth should leave Rekohu before it has been carved.

Although 1990 is an important year in New Zealands history, 1991, the bi-centenary of the European discovery of Rekohu is more significant to Tchakat Henu Moriori. The members of this Society aim to promote and revive this unique culture before 1991 and seals, whales and albatross play a very important role in this. We request urgent attention be given these requests

Yours faithfully,

(Sgd) Pat Preece
Secretary.

Moriori Tchakat Henu Association of Rekohu Inc.

P.O. Box 125,
Chatham Islands

19th September 1989

File No: N8/210/5(2)

The District Conservator,
Dept., of Conservation,
District Office,
Private Bag,
Christchurch

Dear Mr. Forsyth,

Thank you for your letter of 1st September 1989. After a meeting of our Association I have been instructed to write to you about the following points.

1 We would like to reiterate that our Moriori Association wishes to work in partnership with your Department and its local representative at all time with this project .

In answer to your question about who will consume the Toroa (Albatross) it has been a sacred tradition of the Moriori people to share what they have. Therefore it would anathema to this ethos if at a ceremonial occasion (Moriori History Book Launching, 1991 celebration, launching of Moriori waka) we did not share our food with all people of Rekohu who attend these historic ceremonial occasions. Of the occasions mentioned above, only one, will not be on Rekohu (Chatham Islands, see 4 below.

3. In answer to your query about the number of birds required we have estimated that a of 20 per year would be required. This does not mean that 20 will be taken every year. For instance if there are no ceremonial occasions in a certain year then no birds will be taken that year. But in other years, like 1991, there may be two historic occasions. The planning for the next three years is:

1989	**Temuka Moriori History Book Launching**
1990	**No specifically Moriori celebration planned**
1991	**Launching of Moriori Waka (see No. 5 below) Bi-Centennial Celebrations of Rekohu**

4. As said above the Toroa will normally be consumed on Rekohu. However, on 5th November 1989 there will be a special launching of a History Book on the Moriori at Arawhenua Marae in Temuka.

The book has been researched over the last 2 years and written by Dr. Michael King. The book will formally be launched by the Rt. Rev. Sir. Paul Reeves, Governor General. This will truly be a historic occasion as he is from Te Ati Awa tribe. On this occasion it is seen that 6 Toroa will be adequate to take to Arawhenua Marae for this ceremonial launching of this long awaited history of the Moriori people. That the Toroa will be not be consumed in Rekohu would be seen as the exception by our Moriori Association. Given the historic nature of the book and also the distinguished guests we feel that due honour could be added to the occasion with the presentation of such special sharing on our part of Toroa (Albatross).

5. Unfortunately, the Moriori waka (canoe) will not be prepared for the 6th February 1990 celebrations at Waitangi. Instead a special canoe will be constructed in 1991 to celebrated the 200th year of discovery the Chatham Islands by Captain Broughton of the British Navy. The construction and sailing of this canoe will be filmed by 'National Geographic' so this will be another ceremonial occasion(s) of merit. It is not clear whether there will be one or two occasions when Toroa will be needed. There may in fact be two as one will celebrate the actual discovery of by Broughton and the other will be the sailing of the canoe to The Sister to catch Toroa with filming by National Geographic.

6. As for the number of seal pelts required for the canoes construction and the traditional dress for the 1991 Bi-Centennial of the Chathams the figure of 5 dozen pelts has been agreed upon by our Association. There will be a re-enactment of the Moriori discovering Captain Broughton so the canoe will be used for this occasion. The canoe will be launched from Te Awa Patiki, a very sacred area for Moriori. I am sure you are well aware from your own departmental officer that seals are already being caught in fishing nets.

We thank your Department for its attention to these matters and we look forward to your co-operation in these significant and historic occasions.

Yours with thanks,
(Sgd) Pat Preece
(Mrs) Pat. Preece
Secretary

cc. Mr Rob. Chappell

PO Box 56
Waitangi
CHATHAM ISLANDS

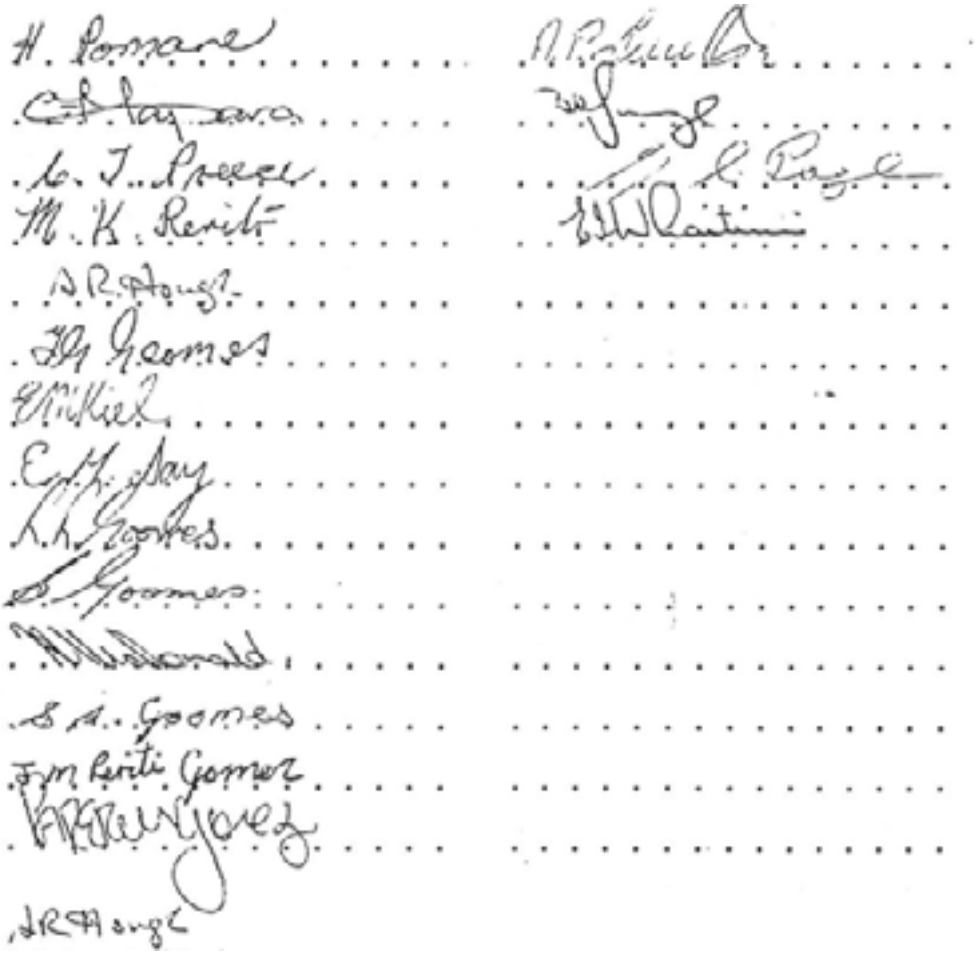
25 March 1991

Minister of Conservation
Office of the Minister of Conservation
Parliament Building
WELLINGTON

APPLICATION FOR TOROA: CHATHAM ISLANDS

We the undersigned Resident Owners and Beneficiaries object to the process of assuming the authority to approve application for Toroa to be taken from the Islands.

Such approval is held to be the right of the Owners who are Iwi.



A R Hough (Mrs)
Secretary Schedule of Owners

Cc Minister of Maori Affairs
Manatu Maori Policy Unit
Mr M Cuddihy, Regional Conservator
Mr P Scia Scia, Assistant General Director
Secretary, Islands Conservation Board

N.E. Page
Box 79
Waitangi
Chatham Is.

1 April 1991

Mrs McMillan
Secretary
Chatham Is. Conservation Board
Chatham Is.

Dear Madam

Re: Albatross on The Sisters and the Forty Fours

I wish to make an application, on behalf of myself and the owners listed below, to collect Toroa (Albatross) from the two islands Rangitutahi and Motuhara. Our intention is to have a management committee, with the local conservation officer as a member, to supervise the collecting and allocation of these birds, so that they can become our traditional food again.

Toroa was a traditional food in the early part of this century and was used on special occasions and hui. However, they were taken only by the owners or with the permission of these people.

We look forward to your early written reply to this application to me at 8 Somes Cresent, Newlands, WGTN 4.

Yours sincerely

(Sgd) N.E. Page

WHATI TUUTA
PAUL TUUTA
RAPE TUUTA
MAUROA POMANA (NEE TUUTA)
EILEEN WHAITIRI (NEE PAGE)
GEORGE PAGE
MAUI POMARE AND FAMILY

APPENDIX C

MINUTES THE MAORI LAND COURT

1865-1900 **Pages 91-98**

NOTE Copies of both the drafts and the minutes are held by the National Library. In the following text material inside brackets (….) is wording contained in the drafts signed by the witness. Material shown as underlined …. is material not contained in the signed drafts. As all of the original manuscripts are in long hand may be illegible text which has variations in spelling within this transcription. Totally illegible text has been marked with {?}. Annotations provided by R C Richards are shown in the text in *italic* within brackets {…..}.

February 2 1885

Presiding Judge
J Deighton Esq.
Native Assessor
Hamuera Mahuki

Court adjourned till Feby. 5th

February 5th 1885

Hirawanu Tapu claims the island called Motuhara or 44°.

Hirawanu Tapu on oath states:
-I claim the Island on account of its having belonged (it belonging) to my ancestors - Tamakorohinui was my ancestor who owned that Island - There were others also who claimed the island their names were Matua Tamarawhaki – Tihanjei{?}. Tamakorohinuis representative is Riwai – Tamarawhaki is my ancestor and more nearly related to me than Tamakorohinui. Tihanjei is Hapunona Pawas ancestor -I represent Matuas descendants. -The living representatives of Tamarawhaki are Tiutua Horomanu and myself - These are our ancestors who claimed the island – These were (are) the true owners of that land. I do not admit that this island was taken possession of but that the Island was taken by the Maoris - I am aware that Wharekauri (Chatham Is) was allotted to the Maoris by the Govt in 1870. We had reserves allotted to us at that time but our claim to the whole (of the) Island were not allowed. I did not hear what Mr Rogan said on that point, but the Maori claimants stated then (that) it was held by right of conquest in 1835 or 1836 -we say in 1836.

Signed Hirawanu Tapu

Wiremu Naera Pomare sworn states:-
I oppose Hirawanus claim on the ground that the Chatham Islands group was taken possession of us Maoris in 1836 and that our claim was allowed at the sitting of the Land Court in 1870 – Pitts Island was included and we consider the other islands as well. I claim it (Motuhara) for myself – Hamuera Koteriki is the actual owner - In the first instance Pomare my uncle took possession of the "Sisters". Afterwards Tatua, Hamueras father went and took possession of "Motuhara" -he went in a vessel- for that reason I consider it Tatuas property. I claim Motuhara because Koteriki and myself are equal -the reasons we are equal are that if any one wanted leave to go birding on the Island they had to ask leave of Pomare

as well as Tatua (Pomares leave and also Tatuas). The reason I am opposing Tapus claim and applying for this land is that Hamuera Koteriki is not here to support his claim on account of his being a "Te Whiti" follower (Te Whiti ite) and I oppose it on my own part so that the land may not go back to the Morioris.

I would consider that Hamuera Koteriki had a right to the Island even though it were assigned to me.

Mr Rogans word was that we should be kind to the Morioris was more in connection with our living with them as neighbours and not to (in) assign -(ing) them Blocks of land.

By Hirawanu Tapu

(I) Did not know (hear) Mr Rogan at the sitting of the Land Court say that half the rents of the (Land) at Island was to be given to the Morioris. I never heard any such words - anything that passed was put down in writing in the book now lying in front of the Judge.

I am quite certain that Tatua went on the Island first. Tiripa and Meri Nikua are witness (to) that this was in 1838.

Signed Wiremu Naera Pomare.

On former oath

I know the ship McClatchie came down here in -I don't remember the name or the Captain -but I remember Mr Hansen, Baron Aldsdorph and McClatchie – there were others but I do not remember their names – it was after the first settlers arrived in New Zealand that this ship came here {*Mr Hansen in June-July 1840. NZ Company's visit established second shore based whaling station at Okawa. Baron Alsdorf sent first sheep to Chatham Islands end of 1841 or early 1842*}.

These birds have been fetched many times by us immediately after the fight between (Ngati tamu and (Ngati) mutungas in 1841 or thereabouts [*Fighting began in the first week of February 1840*} – one of the vessels got the name Toroapirau because the birds were rotten (?) on board before they were landed – After the Ngatitamus were taken over to Okawa in the vessel the Gospel arrived on the Island and the war ceased and Pomare went up to New Zealand (Wellington) a year afterwards.

> *(NB. section was crossed through in the draft and not included in the final copy.*
> One year after Pomare had been in NZ he returned and it was then that they fetched the Albatross through which they gave the name of Toroa Pirau. It must have been about a year after the fighting that the Gospel was brought here and a year after that Pomare went to NZ.)

After Pomare returned from New Zealand the trip called Toroa Pirau took place and since that the island was always considered to belong to Pomare and Tatua to the present time.

signed Naera Pomare

It is true that Tatua brought birds from Motuhara - birds called "Rurus" - the people who went on the vessel were Parau – Iritana Tipari, Mere, and Oneri Hupoua -it was a small schooner the vessel -The Captain was called William Richards -Tatua went with this vessel to Motuhara to take possession of it - It was not a quarrel on shore that caused Tatua to go in the vessel - The ship returned to Whangaroa with the birds and landed them there - I don't whether any Morioris knew of the birds being landed at Whangaroa – Tipare and Mere of the landing of the birds. { *William Richards of Richards and Co of Sydney. Sealer,*

whaler and trader. His son began first shore whaling station June 1839 which father visited regularly.

Signed W.N. Pomare

Pirupi Niko sworn states".
I oppose both Naeras claim as well as Hirawanus and claim the Island myself on the grounds that my adopted parents who were also near relations of mine were first on the Island - Wirimu Kingi Mere Mere took three Morioris with him who are now dead to show him the landing on the island in order to get the birds from it. A Maori was with him, (named) his name was Tamu Kopai. I don't which year it was.

Signed Pipi Niko

On former oath
Wirimu Kingi lived on the Chathamm Is and the Island Motuhara remained his during his life. I don't know of anyone being a head chief when the Maoris first came on the Island but they all had equal rights - the only head chief of Ngatitama my tribe were Wiremu Kingi; Mere Mere, Nga Tuma and Tapiri -I know the Maoris fought amongst themselves at Waitangi and that Pomare took Waitangi - Ngatitamu lived at Waitangi when they first came from New Zealand. They landed at Whangaroa and came over (here) to Waitangi afterwards - Pomare was a Ngatimutunga.

This Island Motuhara is situated to the Eastern of the Chatham Islands - Ngatimutunga followed (the) Ngatitamus to the other end of the Island (Ch Is) and fought them there - The only thing that I heard was that Pomare was the head man in the quarrel between Ngatimutunga and Ngatitamu the Ngatitamu were adjudged (then) by the Land Court to be the owners of the NE end of the Island - They held their own against the Ngatimutunga each suffering loss - Tatua belonged to the Ngatimutunga - There was no fight that Island Motuhara. There were many times that the birds had been fetched off that Island by various people of Ngatitamu.

Ngatimutunga never got them - At the time I speak of Ngatimutunga never went to the Island -It is only lately that Apitia Pingu went there - he is a Ngatimutunga - Apitia was never quarrelled with for getting the birds.

Signed Napiripi Niko.

Mere Naera Pomare sworn states:-
I claim to have a right in Motuhara because of my relationship to Apitia and Koteriki according to genealogy. Apitia is the elder branch after him te Matoha after him Wi Piti Tatua Apitia is represented by his son Apitia Ponga of Owenga -Te Matohas child (a) daughter was Te Tau o te Rangi my mother - Afterwards Wi Piti Tatua whose son was Hamuera Koteriki – Inasmuch as the others have not appeared being Te Whiti(ites) men I wish to have Hamuera Koterikis share and Apitias allotted to me.

Signed Mere Naera.

Tumu (a Moriori) states on oath
The ship that took Wirimu Kingi belonged to McClatchie and went to Motuhara in 1834 - The Maoris came to the Chatham Island in 1836. I don't know the name of the captain of the ship that brought them -came here after the Maoris had in the Island - The vessel that he went on to the Island was built here at Kaingaroa by (Turanga), by McClatchies carpenter -Wirimu Kingi claimed the Island at that time - I remember a ship coming to take away the Ngatitamu to Kaingaroa from Waitangi {*Nz Company's 'Cuba' July 1840*} - I don't know the year but it was after this that the boat I spoke of was built I am mistaken when I say that McClatchie came here in 1834 it must have been 1843.

I admit that Wiremu Kingi took possession of the island and that he took the Morioris as guides - I only know that Wiremu Kingi went as I stated but I never saw Tatua bring any albatross from the island - I saw that Ngatitamu had the first vessel that went to the island to fetch birds - I went Owenga to Kaingaroa with a man named Rauponaha {?} and found that the vessel had gone for the birds -The time I went as described to Kaingaroa there were only a few huts there (at that time). {*July 1840 Pa began at Kaingaroa. This would be in fact the earliest Maori visit*}.

Signed Na Apiata

Hirawanu Tapu on former oath
The ship that took Kingi and the Morioris (to Motuhara) went there in the year 1843. The ship that took the Ngatitamus to Kaingaroa came here in 1840 or 1841. I don't remember her name but her captains name was Neucome – McClatchie came down (here) in the vessel Mr Hanson also and others - Three years after the arrival of the Maoris in the Island namely in 1836 the Ngatitamu were destroyed by the French Whaler - this was in the month of March 1839. {*Jean Bart massacre April/May 1838. French man-o-war 'Heroine' destroyed pas October 1838*}

February 6 '85

Wiremu Naera Pomare
On thinking it over I remember that it was after the arrival of the French Whaler here at Waitangi that Tatua got the birds from Motuhara because I was living at in dread of the French war vessels.

Claim thrown out - Hirawanu Tapu on the part of the Moriori no claim on the Chatham Islands were adjudged to the Maori in 1870 and the court is of the opinion that the adjacent islands were included in that judgement. The Court also consider that as Tatua was supposed to be the actual owner of the island in accordance with native customs that the relationship of Naera Pomare or Mere Naera or Piripi Niko are sufficiently near to warrant the granting of a certificate in this case which is left to be decided at the future sitting of the court.

Thursday 10 March 1887. **Page 134-135.**

Present Judge Deighton
Tamati Taintuhi - Assessor
Alexander Shand – Interpreter

New Claim No 1

Motuhara or Bertier Rock

Mere Naera Pomare sworn:-
I speak of Wiremu Naera's claim for Motuhara – This islnd was claimed by Wiremu and Hamuera Koteriki - when this was heard before the court previously Naera wished that it should be put in Hamuera Koterikis name as well as his own - This was in opposition to the Morioris claim – Hamuera was absent at the last hearing -I wish that Hamueras name be put in conjointly with the children of Naera I wish to have the former evidence of the hearing read in court.

Former evidence of Wiremu Naera Pomare read by clerk and interpreted to natives:-

I have a copy of the will of Wiremu Naera Pomare -will produced -The names of the children are Maui Pomare, Piri Taka Pomare, Te Hia Pomare, Te Pahi Pomare, William Damond, John Damond, Rangihanu Maraea Damon, Nga Rope Damon.

Kamuera Koteriki sworn:-
What Naera said is correct -I agree with what Naera said -I also agree that children shall take be admitted that is if Tiwae is allowed to share - Tiwae is the {..?..} child of Naera -If Tiwae is not put in I shall oppose the claim of Naera -Tiwae is my nephew - I wish to share the relationship of myself to Wiremu Naera Pomare -we are second cousins.

Mere Naera -
I agree to Tiwaes name being put in with the others -Tiwae Anikamu Naera is the name -

Order granted in favour of the children of Wi Naera Pomare Anikamu Naera included and Hamuera Koteriki.

MINUTES OF THE MAORI LAND COURT
1865-1900 **Page 87-88**

February 5th 1885.

Claimant Naera Pomare in the **claim of Te Rangitutahi or "Sisters"** a group of islands consisting of about 14 acres about 12 miles from the North East coast of Chatham Island.

Wiremu Naera Pomare sworn states:-
I claim this land through my uncle Pomare -he was the first man who landed on the Islands they were uninhabited. From the reason of his landing there first the Islands were considered his, it was a custom among us that the first person going to an uninhabited place claimed it as his own - There may be perhaps someone who opposes my claim -I do not know for certain. I produce a map made by Robertson (Marked A.SD) a licensed Surveyor who roughly surveyed the Islands in October 1884.
Signed Wiremu Naera Pomare

No Objections.

An order is hereby made for a certificate of title in favour of Wiremu Naera Pomare.
Costs Pd. £3.0.0.

18 January 1898

Claim No. 1 Original claim Mangere

Riakiao Ngaiorini {?} and applicants

Riakiao Ngaiorini {?} -
The right to this island is the same as that to Rangitira. The persons who have rights are Wharepa, Toenga, Paina Te Poki. I do not know of any others who have a right.

Paina Te Poki
I have heard the evidence of the last witness. It is correct. Paratane whose name is on the list for Rangatira has no right to Mangere because he did not land on it - he simply touched at the island when he was with us and then went on to Rangitira and Rangiania {?} and took possession of them. We took final possession of Mangere and …{?}… off the Morioris some time afterwards when Paratene was not with us.

Mr Shand.
Wharepa told me that Mangere was taken possession of on the first expedition when Paratene was with them. Paratene was related to Wharepa and Paina, he died before any of these lands were put through the court. His son was alive, but was only a young man.

Riakiao Ngaurina -
Some of Paratene's descendants have even gone to Mangere for purpose of catching birds - Wharepa considered that his rights were satisfied by his inclusion in list of names for Rangatira -is not an owner in Rangiauria {?}.

Mr Shand.
I believe Paratene has the same right to Mangere as the others, but I do not consider it worth while to call evidence as the property is almost valueless - in fact there is no evidence available.

No other claimants
List of names handed in by Riakiao Ngairini and affirmed.

Riakiao Wharepa (f), Rihania Wharepa (f), Tipunania Toenga (f), and Paina Te Poki (m).

Claim No. 3 Tarakoekoea Pyramid

The same evidence as in No. 1.

No other claimants.

The same list of names handed in and affirmed

APPENDIX D

William Baucke was born in the in 1848. He learned moriori and maori as a child. He worked at Maunganui and was regularly in the islands until 1885. His main published work on the (Skinner & Baucke 1928) is today the primary reference for birding methods and traditions in the Chathams. However, a series of articles on 'An Extinct Race, Morioris of the Chathams' appeared in The New Zealand Herald between July and October 1922, published under the initials W.B. As these articles form a useful adjunct to the 1928 paper and are not easily accessible, those relating to albatross are reproduced here in full to provide access to further background information.

NZ HERALD SUPPLEMENT 2/9/1922

The Albatross
By W.B., Otorohanga.

Ever since that incalculable long ago, following the cataclysmic shatter which crumbled a vast Pacific continent into the motley of islands - some may be sunk from sight - by which man dispersed to even the distant Chathams, the various rock pinnacles around these southern isles have been the nursing homes of albatross. Of the group, three only - Rangitutahi (sisters), Motuhara (fourty-four), and Tarakoekoea (pyramid) -were yearly ravaged by the Moriori of their young. A question of great interest has often been asked: Why only those named have been selected from the far more secure from enemy access, and convenience for nesting? But the fact is so, and the observer's wonder never less. Under Moriori tuition the later Maori also joined the rape; but instead of the former's clumsy unsafe raft-canoe, the Maori used the white man's boat.

To my birding sketch, I will choose one such Maori boat and one such rock Our trip this year shall be to Tarakoekoea, an islet southward of Pitt Island, distant seven miles, and rising from the sea in a 566 ft of, from one aspect, perfect pyramid, and, by clear moonlight, a towering majesty of frosted gold. It is the end of March. We are waiting for calm and tide at Glory Bay. Our boat's crew is a bunch of seven fearless stalwarts. No bribe will tempt admission of a white man to that crew. But I, knowing all the rites to be observed, and utterly trusted not to break them, am yearly "counted in". The night before we start the roll is called, and all the ancient rites handed down by the Moriori - in our case consisting of instructions for behaviour - are delivered with stern solemnity. No useless words no vague attention -to touch neither lizard, worm, small bird, or other living thing we meet but mutton bird and albatross, and, above all, instant obedience to every order, no matter what the hap or circumstance! Such as are feared that they may break these rules are weeded out, no matter who they are or of what lineage!

Effecting a Landing
The adventure we are on is not a play of jests - every nerve is tense with alacrity to serve. It is 4 a.m. and the boats are afloat. The "chok" in unison. Just as the sun looks over therim to see what we are at, we have arrived. A mass no longer of frosted gold with angled rules by master hands, but a distortion of eroded crag below, and piled tons of schist slabs, heaped in rocking libration higher up, glare down at us! No seeming landing anywhere! Yes, at one spot, 30 ft above reach, a narrow shelf juts out. But, how to get there! Watch us. Our captain lays us off two boat lengths or more and tensely judges the majestic moving heaves of ocean, hunch their backs and hurl their weight in ear-tending roars against the rock to half- way up and retiring fall in Niagaras of spume and froth, as if some stumbling titan had spilt his milk! Four times we make good our drift - those to land are forward in their place - a fifth sea-mountain approaches, we climb its camel bump -"Pull all!" We face the cliff, lifting with the rise; we all but touch the rock; "Jump!" The foremost and "jump" have leapt together! "Stem all!" and the boat sinks in froth and boom and smother! Not an instant must she linger, but be clear of the long rock-slope or impaled upon its jags! So the process is

repeated till those to land, with water kegs and biscuit bags, are landed. The same dexterity must be employed as we reship. The boat's nose rises to your level. Your captain nods. You claw hold somewhere, and hanging on clamber in as best you can! All this has been rehearsed in dumb show the night before, for in that roar and thrash, calls commingle with the tumult and are lost.

I pause here, as I have paused upon the spo,t How did the Moriori, in his water-logged raft, effect a landing there? "Impossible!" says commonsense. Yet that he landed there "our" landing proves, for we follow his instructions jot by jot! Our every act was taught by him. We ask him, "How?" He, pointing to his month, says, "Tchor!" (that). Has he not esoteric gifts which the alien Christian, despite explanation, cannot comprehend? Long after, by accident, I learnt that he, like we, lay off, and those to land leapt overboard with an inflated kelp bag lashed beneath the chin, and landed thus. Even so, only a courage of ironbark would dare the risk!

After the Albatross

We have landed. We look well before we tread; displace one of those rocking slabs and you set free a torrent of destruction to those below. Above the highest storm line our slaughter begins, for from there to the summit every the size of a waiter's tray contains a bird. It stares with glass-clear eyes at your approach and backs away, but your 18-inch long waddy clips it exactly where head and neck conjoin, and yon pass on. New chums hit it "on" the head, an insult its requites by squirting a stream of oil against your leg. Here and there yon see a mound of blue-moult with a monstrous beak attached; these are late chick, yon pass them by; for should yon interfere with them, or rock larks, or lizards, destructive storms will instantly maroon you there - a Moriori code we, too, observe.

The birds we are after is full-fledged, but not yet lean enough to fly, whom, since their pin-feather appearance, the parent birds have left to be nourished by their own enormous fat. A handsome fellow, he sits there waiting for release - not the release he meditates. Our slaughter is now ended, so we collect the slain into convenient heaps to throw them down in stages; one lot we had to shift 13 times! We pile our 1280 cadavers on the lee side of the rock to cast them in the sea. Two men grasp each a wing of one bird, swing it twice, and catapult it into space. Presently the sea below is dotted with floating blobs, which the waiting boats employed in fishing utterly disdain. At last I transgress the code anent "useless words" and hazard. "Call the boats, the birds will scatter!" My answer is prompt and stern, "You wait!" Even so; for presently, as if by magic of an unseen broom, the birds are swept into a long queue, like a tail to our monster rock. At once the boats row to its outer end, gathering up to the last bird of the tail. Then only I am given reasons why - that the mana of the Moriori in that ritual last night was still in force, for, had I not seen? Of course, I remembered that jargon which not even the two Morioris of our party understood! Alter a secret ponder the mystery cleared, as thus: The wind split into two streams by our rock, followed its curve, and seeking to rejoin, each swept up the flotsam in its path and laid it on the junction where their reunion met. On our return to shore I ventured to parade my "Ha! ha! listen to the infidel! kore rangona to kanga i wako! (fortunately your blasphemy was not heard at sea! or you had ruined us!")

I have attended these adventures many times, and at each met some previously undiscovered joy of life. For here was coarse fare... Coarse, but intimately understanding partnership of danger and mutual help . . . of various instant death and callous at the stare of it .. . of reading the meanings of customs, whose origins, ages long extinct and crusted, with the layers of the aeons are charged with and essences to such as open them with faith . . . here one reads the inmost worth of the words, "naked truth". My space is ended. In my next I shall show how we tried them out.

NZ HERALD SUPPLEMENT 9/9/1922

Preserving Albatross

By W.B., Otorohanga

Ornithological science tells us not to call our large ocean birds "albatross", but “mollymauks”, and our Tarakoekoea albatross a "gannet". Why, goodness only knows! To us they seem exactly alike, bar a handsome yellow smirch from beak to past a brilliantly watchful eye, which distinguishes our gannet from that majestic white soarer it hurts us to call "mollymauk", who disdains to herd or nest with others of the species but by its own select self breed only on "The Sisters" and "Forty-fours" - so called, because of lying lengthwise on that latitude -where it nobly lays its one egg on any flat or crevice available. One only other is permitted -but not at the same time -to invade the sacred precinct, that rusty black sea-scavenging pariah, who scents out stranded, decaying whales to glut his gorge which the Moriori called “Hoporur", and the Maori, “Ruru”.

Our gannet sociably with any, no matter how distant kindred, that must breed their young where predatory man may keep at bay. For such it has chosen the on whose uneven top I have counted a colony of 64, in all stages of age, from the almost lean enough for . . the in-between, full-fledged, but exactly prime conditioned, when the voluptuous fat of youth has been transmuted into the weighed proportions of fat and lean we are after him for .. . to the mound of blue mould waiting for its parent's return with food. On that top I have seen soaring like a swaying ship, but unerringly straight on, a parent bird returning with a laden crop, and unfearing of my seated presence, flop down among the crowd, and with still extended wing, stagger to its chick, which, on the parent's approach, opens a fearsome gape, the parent, also agape, meet the youngster in a cross-beak lock, during which that crop is emptied from throat to contact-throat. Anxious to of what that food consisted, I reached over and smartly twitched the to me extended wing, when out fell a 7 by 1 ½ by ¾ in length of squid tentacle, the edges frayed by partial digestion into oil, which the youngster, with a quick suction-motion the throat, slipped into its own - as one pours liquid from flask to flask without a spill!

An Albatross Expedition

Before the Maori arrived at the Chathams he knew little of these birds; all he later knew the Moriori taught him, also that he called our gannet “hopo-tchar”, which the Maori changed to “toroa-a-tara”, and followed minutely both birding ritual and instruction. Hence on these expeditions one feels a change of temper in one's fellows... a tense preparedness for any hap. The behaviour becomes stately and stem. The laugh, if at all is midway broken short. We are electric with expectancy -with dread lest we transgress! The only ones who do not seem to feel the stress are a couple of young man and maid, who do not fear the darkness into which they sneak but which the rest avoid by keeping in the radius of the light, with which the large fires of our camp emblazon the hemisphere of night.

These expeditions may extend into a month, for who can foretell what neglected rites the gods of wind and tide, of bird and spirits of past birding heroes may not avenge on children who forget! Therefore those of doubtful wives bring them along, to be under cover of the eye and wok! Both wise and useful this to us, who can thus wholesouledly devote ourselves to things in hand.

The birds are hung in pairs on straddles waiting to be plucked; so each one unhangs a pair and, for the softest boulder, begins his toil. For toil it is, as you will presently find out! The back and under-wing feathers pluck easy. It is at the breast feathers, with bulbous roots that can only be pulled three feathers at a pull, drawn between the fingers of the other hand, which press back the flesh lest it come away with those awful roots, where the toil begins! And unless the pulling fingers in rag, a nice elongated blister will cause you to repent the neglected forewarn!

The feathers are carefully basketed, but to make them endurable for pakeha beds, the

bulbous roots must be cut off, and the rest washed with steam-hot soapsuds and dried several times to remove the rancid oil smell to which the Maori does not object, and the Moriori taste prefers!

When the birds have been plucked and re-hung, the cutters pass along, who slice off the breast-flesh and thighs, and cast them in a tub. On the higher ground other helpers have set up large 18-gallon pots, in which already smokes some oil, saved for this from last year's stock. Into this a tub of flesh is emptied the while a ghoul, with a forked pote stirs the fuming mass. He is an expert - the expert of the trip - for on his experience depends the perfect culmination of the stew as also the instant when to dip the straining slice and lift the now reduced to crackling pieces to a shelf to drain and cool. Close handy stands an unheaded cask into which each piece, tenderly handled is closely packed. Each cask as filled is headed and laid down bunghole up into which the tried out fat is poured till absorption ceases upon which the bung is driven in -and there you have the whole process of how the Maori preserved his albatross ready to be shipped to Parihaka a donation from the to feed the yearly March 18 fathering of the tribes to hear Te Whiti's latest message to his race.

Use of Sea Kelp
Up to and including the cutting, both Maori and Moriori procedure has been identical, neither exceeding, nor omitting, the minutest jot, disgressing only where procedure was assisted by convenience of appliances, for instance:- As the Moriori had no trying pots, he either preserved his birds as he did his whale-flesh, cooked them in stone ovens and buried them in earth; or spitted the meat round fires at such an angle that the dripping fat was caught in cusps of paua shell beneath. After which the meat was packed in bags, made of a sea-kelp, known to science as *D'urvillea utilis*, to the Moriori as "rid-rap"' and to the pakeha seafarer as "bull-kelp", that grows on stems like a man's arms, from which spread fingers, which grow into flat blades up to 15 ft long, from 1 in. to 14 in. broad, and in these larger, 1 ½ in. thick The space between the tough skin is divided into large air-cells, this the Moriori cut into 3 lengths, passed a sharp flint between the skins to cut the air-cells to within 2 in. which he left entire. This he distended with grass, and when dry, in it packed his bird, and finished as did our Maori.

The sea growth was one of the Moriori's most precious nature gifts. Soaked in oil, it was indestructible. Of it he made his sea-journey water bags - not very tasty perhaps, but as he had a rubber palate this did not averse him from that which quenched a never failing thirst. Of it he made swimming floats, by which to land on dangerous birding rocks; as also to make buoyant his raft-canoes. As boys we used to gambol on and among the broad floating blades. A most dangerous pastime by one's self, for once a tangle round the limbs begins, violent struggles for release, make horrible embraces like those of living snakes. I have been there, so to my sorrow I know! Old bay whalers made blubber-working thigh-leggings of the broadest. Such drawn over the bare skin - with shorts -made a combination suit at once economical, original, and picturesque!

NZ HERALD SUPPLEMENT 23/9/22

Birding incidents
By W.B. Otorohanga

A great grief of my recent years has been abscission from the sea, the companion of my spring, my summer, and now the autumn hairs turn grey, the legends it once taught me seem far and indistinct. In the sleepless night-watches I listen! but only the murmur of fancy answers back! For I love old Mother Ocean - her symphonies of shallow wavelet whispers, her rising surf-beats urging on to action, her thundrous drumbeats of threat and storm, symbols that the fight is on, but may be won! It was the thrill of her eternal call that found me each year ready to join the birding fleet.

For the birding month has come. The elders have decided to go forth. At once boatshed doors fly back. Boats and gear again see light of day. The floor lining is lifted, and the inside

bottom tarred. Tholepin, cleats, thwarts, and all fastenings are carefully inspected. The boat is turned over, every seam examined, every suspiciously bulging nail-head putty picked out and replaced by fresh. A final coat of paint makes sure that assurance is assured. The sails are spread out on the grass, and all blemishes repaired. Every rope and halyard is unreeved and tested in a tug-o'-war between two men and a post. Water kegs are filled to spy out leaks. Nothing is left to luck or chance. The errand we are on has Peril for its watchword, and Caution for its hail!

The Birding Crew

We are lolling under easy sail. The seasick with necks across the gunnel seem waiting for an axe! The unsick sprawl and smoke, the which drifts towards the sick and makes their language vile! Suddenly a roar like nothing heard on earth, and a column fully 50 ft high, white and fine as snow, is shot into the air beside our boat and wets us on its fall! A whale has risen below to breathe, and startled by our presence, grunts, and like a vast revolving wheel, "sounds" (dives) and disappears. No whale follows the direction of its "sound". The newchum it does, till away to right or left, or rear, he hears another roar! Neither is it water that is so blown out, but deoxygenised air, forcing the water into spray as the creature nears the surface to expel the old, and breathe anew. No whale dare let water to its lungs!

Our destination is the Pyramid, 56 miles distant. The off-watch tries to sleep - we keep strict sea rules; our orders are in English, but all are understood. Night falls as we reach the danger of reefs, of scattered islets, of mill-race crosscurrents -now under the upper jaw of a gape, black down the throat of it - now just slid out of reach! For we are a daredevil crew, hands and eyes see every emergency, and fear is unknown!

We have arrived, wet, but happy, with a hunger sharp as new-filed saws! No sooner are the boats aground than our women, gowns under armpits, wade ashore, there to shortly prove their value as sorters of order out of darkness and diversity. Calls are heard and answered by Flares of fires, fueled the gods and our wahines alone know how! Blue cod are pierced with rods and spitted; potatoes are stirred among live embers; when one side of the food is you turn the spit and eat that side while the other cooks! Now! Ladies: Skip this if you want to! We "are" savages. But just you try it, and see if, with us, you do not glory in that savagedom!

Weather Bound

We have been to the rock and what we came for, ready to return. Suddenly, no one sees how, our natures change. The bow is unstrung and the relaxed fibres resume their natural grain. The stately behaviour and dread of transgressions are supplanted by the sporting genius of the race. It is the season of the autumnal equinox, and the sea too treacherous to trust our precious cargo to; in short, we are weather-bound. So here the student of humanity may see in one direction a contest of putting the heavy atone; in another a game of human grasshoppers; in yet another a checker board, ostensibly between two players, but actually between two rival crews, bawling orders to the players to make this or that clinching move, and laughing in uproarious surprise to see it with loss! For the decent Maori is a chummy chap; a sporting friend; yes, but a loyal mate, whom let no fastidious pakeha scorn to own as such. To know the descent Maori is to know a pebble, rough; also a pebble pure, when cut and polished to show the finer grain. It is in these peril zones one makes some valued finds, and forms judgements that remain! Here and there you see one - a wahine probably - sorting the long white, delicate underwing feathers that are first removed before the plucking starts. These are the famous 'raukura' emblems that you are a "Te Whiti man', and are mailed to distant relatives. Travel with one of those stuck in your hat, and every Taranaki Maori will present his hand, and, maybe, his nose!

A Master Tohunga

Perhaps nowhere is the vernacular of Nature so misunderstood, as when unsuspectful of such violence, she suddenly cries in your ear: "Beware!" Then the timid hesitate and leap the wrong way:- Among the fish caught by the waiting birding boats was the largest hapuka I ever saw, 4 ft 9 in. in length, and correspondingly broad, but unspeakably lean. The

pictorial fins were bulbous and red-edged with disease or age. One elderly man of our party opened it to get the liver, which he took out in two enormous lobes. One he hung up and the other spitted at the spitted to roast. Presently I saw him share his roast with two others. Two hours later, standing by his filling cask, he suddenly grasped his head with both hands and fell! While we alarmed were suggesting this and that, two others, with like contortions, fell! At once uproar and consternation neglected everything but wonder and guessing reasons for the calamity. The head chief of our party called: "Epa ma, he tatou!" (friends, we have done something wrong!) Our two Maoris were questioned for procedure in cases of transgression. I, being the only pakeha and most likely to transgress, though not charged, "felt" myself suspect. Still, they all knew me to be a strict observer of all customs I might privately deride. With great perturbance the old chief drew me aside: "Did you spit on your fingers while plucking birds? No? Did you perhaps say, “Ko tamete" when they plucked hard? No? Then what have we done wrong?"

Pondering among the confusion of exorcism, women crying and general tumult, an idea came to one which I went down to the other liver to verify. At once the mystery cleared: The liver was pitted with white spots, which, upon incision, I traced down to end in sac-like cysts! Laying the liver and my discovery before them I called out- "Inana te take e and e tatou" (here is the cause we are searching for). Though cautiously accepted then, great was my renown later as a master tohunga! As for our three patients, their bodies swelled, stupor, interspersed with feverish ramblings, preceded a week's recovery. But all the outer skin - of ears, nose, exposed part of chest, neck and hands peeled off in painless flakes - painless, if unassisted by pull, the whole tapering off with frequent headaches. Take warning, therefore, all who read this and leave hapuku liver alone!

APPENDIX E

SOME RECORDS OF THE NUMBERS, METHODS OF TAKING ALBATROSS AND THE EXPORT OF 'ALBATROSS OR FEATHERS' FROM THE CHATHAM ISLANDS

Compiled from

Anon (ODT,1913), Baucke (1922), Bell L C (1951, 1953 in litt.), Bell L C (1955), Burt mss., Daymond A (1974 pers. comm.), Fleming (1939), Goomes B (1974-1976 pers. comm.), Grennell H (1977 pers. comm.), Holmes D (1974-76 pers. comm.), Hough S (1977 pers. comm.), Inkster J (1974 pers. comm.), Jacobs B (1976 pers. comm.), Pohio J (1976 pers. comm.), Preece C (1976 pers. comm.), P (1976 pers. comm.), Richards (1962, 1982), Ritchie (1863-1900), Scott (1975), Thomas N (1974-1977 pers. comm.), Tuanui H (1976 pers. comm.), Tuuta W (1976 pers. comm.), Wotherspoon A (1977-78 pers. comm.).

C J R Robertson (in litt. 1973 -1991) has collected a large amount of anecdotal material from the 1920's onwards which includes names of birding participants. Apart from the narrator these names have usually been excluded from the following notes where they were not a party to the conversation. The majority of cases recorded this century have been verified from more than two sources using names, numbers of individuals, numbers of birds, vessels etc. A large number of individuals provided confirming sources of information, but where not adding new information, are here acknowledged for their assistance, but are not listed individually.

The following summary cannot be construed as a complete record of the numbers of albatross taken from 1840-1991. It does indicate however, a significant level of uncontrolled take, which at times, was for more than local consumption.

Date	'Albatross'	Feathers	Notes
1841?	?		Naera Pomare to Wellington
1864		209lb	
1865	?		Ritchie papers records 25 August 1865 "Jeremiah came for me to go to Omahana for some albatross he having some from the 44's.'. On 10 September 1865 he records "took no notes from this date up to 1st October, during this time the Maoris went to the 44's for albatross'.

1870	3 casks		Few shipping records 1871-75
1873	7 casks		Ocean wave
1874	?		Ocean Wave
1876	?		Omaha
1877	540 birds		Ritchie papers. Albatross taken from 44's using boat Island Lily and Matarakau and Pioanga natives between 20 & 25 October
1878	17 casks		Island Lily went to 44's 9-11 October.
1879	18 casks		
	22 casks		Omaha manifest 12/2/79 Waitangi-Lyttleton
	16 casks		Island Lily 25/2/79 Waitangi-Auckland
1881	23 casks	1 cask	
1884	1 cask		
1885	16 casks		Omaha wrecked
1889	9 casks		
1890	10 casks		SS Kahu 15/7/90 shipped by W Hood Waitangi-Lyttleton
1895	10 casks		SS Kahu 8/10/95 Shipped by Pina Waitangi-Lyttleton
1896	10 casks		
1900	?		A number of birders drowned returning from the Sisters
Early 1920's	Ca. 500 birds		From Big Sister
1923?	600-700		Taken from Pyramid using boat Marlborough
1924-25?	360-370		From Sisters ex Kaingaroa using vessel(s) Puanga(?) and Te Reno (?)

1928-29-30	up to 1000 birds	species not recorded (annually ?) taken into Owenga using vessels Libya, Loadstar, Defiance.
Early 1930's	180 birds	from Pyramid in first 2 weeks of April -a little late some birds very thin, but fully feathered. Rowed down from Waitangi in whaleboats.
Early 1930's	Ca. 1000 birds	from Sisters and Forty-Fours in total (a number of visits) Used to go specifically to 44's for Nellies (about a dozen)
1936?	100 birds	off Pyramid using the Marlborough
1937?	500 birds	2 Boats May(? Margaret) Speedy500 birds from Little Sister as could not land on Big Sister.
1941	900-1300 birds	Take for 'Maori Battalion' on or about 25 September 1941. Court case. Probably taken to Lyttelton on Port Many birds very thin.
1960	45 birds	from Little Sister in October
1962	127 birds	Ex Sisters. on 9 September 1962. See also Grennell. Court Case.
1965?	350 birds	Ex Sisters.
1975	40+ birds	Ex Sisters
1990	67-100 birds	Ex Little Sister at end of September

General notes and conversations with CJR Robertson

The ODT of 1 March 1913 records a trip to the Forty-Fours. "In the years gone by these islands were visited every year by the Maoris for the purpose of getting the young albatross; but since the beginning of this century until the advent of the blue cod-fishing a couple of years back, the islands have been unvisited, and their feathered and furry inhabitants left quite unmolested. It was the custom of the old-time natives to charter a schooner in early spring and make a raid not only upon the Forty-Fours, but upon all the outlying islands where the albatross makes its home and rears its young. They slaughtered the young buds in hundreds and many a royal

feast the chicks provided not only for the island natives, but for their friends in New Zealand as well; but the birding expeditions were given up after a disastrous trip to the Sisters Islands .....when all but two were drowned. From that time there was no more roast albatross until the cod fisheries introduced the motor boat".

Baucke records 1280 taken in one birding of the Pyramid (Chatham Island mollymawks).

Bell (1951 in litt.) "I was approached by several people seeking information about the possibility of once again having the right to take albatross and mollymawk chicks for food. The matter was brought up at a public meeting and freely discussed. I stated that if it could be proved that the taking of a stated number of chicks would not endanger the total population, then this Department (Internal Affairs) would consider granting permission to the owners. Some of the owners were at the meeting; they were very keen to have the right restored to them and considered that the taking and killing would have to be under strict supervision. I asked 'Whose supervision?' and they replied 'The Owners'. I then pointed out to them that these birds are practically international and that we New Zealanders have a duty to the rest of the world to protect their breeding place, and furthermore the owners did not now require these birds for food. This fact more or less placed them in the luxury class. Continuing, I said that it appeared to me that, for our Department to ask Parliament to pass a law or act to allow perhaps 12 families the privilege of having a luxury, was to say the least, a fairly tall order. The majority of those present seemed to see the logic of this and the matter was dropped after they had offered to take me to the outlying islands during any future visit".

Bell (1953 in litt.) "After the tragedy in 1900 when many of those taking part in a birding expedition to the Sister lost their lives in a storm, there was no birding done until 1911". "The only birds worked regularly (up to 1943) were the Shy and Royal albatross (Toroa Tataki = gannet). These were taken on Forty-Fours and Sisters and Pyramid Rock. Usually only half the Forty-Fours was worked; I did not hear that this was done with any idea of conservation, but I did hear that only half the island was worked because it was too far to carry the birds to the cliff at the far end. Apparently there is only one place where birds can be thrown into the water. From 3-500 birds would be taken on a trip and at times more than one trip would be made in a season. The Sisters were also visited but usually only the eastern one was worked because the west one was to difficult to climb, although one man told me the islands were worked alternately. These young royals were taken in September". "The Chatham Island or Shy mollymawk (Toroa A-ruru) which breeds on the Pyramid Rock was taken in March. There would be up to 200 of these taken on a trip and this was done fairly regularly". 'Buller's Mollymawk (Toroa-A-tara) breeds on the Sisters and the Forty-Fours and the young are ready to take in June. I was told that these birds were never really worked, someone may go ashore while fishing and take a few.

Bell (1955) ref. Sisters - Royal Albatross. "The islanders once took supplies of callow young for food from the eastern island and sometimes from the west island.

Bell (1955) ref. Bullers Mollymawk. "According to the islanders only a few young were taken each year in June before birding ceased in 1943".

Bell (1955) ref. Forty Fours - Royal Albatross. "The islanders also took unfledged young from this island for food before 1943. They state that three to four hundred birds were taken each trip and that sometimes more than one trip was made in a season".

Chatham Island Court records. March 27 1942, December 21 1962. Includes names of those prosecuted.

Fleming records one observation of 'as many as 700 birds were obtained on one trip'.

Goomes related that the mollymawk off the Pyramid tastes better than Royal - flesh darker. Nelly chicks taste the same -taken in January – mollymawks (Pyramid) taken in March. Bullers not taken at all (?). In more recent times, birds which have been blown off the islands have been taken, as have those found dead on beaches. Rules for Birders -wooden clubs (no metal or steel); no food or alcohol (one bottle of brandy on boat as medicine); bird hit on back of head to kill.

Grennell related that birds hit on head with broom handle. They had been told when children that nothing was to be left on the island, especially personal things -only club was to be taken ashore. Approx. 400 chicks on Sisters Island at that time (1962) when 127 were taken. Dusty Miller gave him some dressed birds off Forty-Fours in June which were Giant petrels or Mollymawks. Remembered getting stomach ache from eating marrow from wing bones after the 'Maori battalion' take. Each bird takes about 15 minutes to pluck. No evidence of large numbers of birds being blown off the islands.

Holmes can recall notices in the put up to say albatrosses were protected birds. Piri Pomare used a big whale boat to go to the Pyramid for Molly's in April - 36 hour round trip from Waitangi, though sometimes sheltered at Pitt if a south-wester came up. Tells of a load on the 'Omaha' that went bad. Many of the buried where present plantation is at back of Holmes property -trees planted in 1886.

Hough recounted a take reputed to be 350 birds taken Little Sister in 1965 and were allocated all round island. In 1920's to 30's owner kept the birds, and only the outsiders who helped to pluck got any. Feathers were used for beds.

Inkster related occasional big losses caused by storms in August-September when chicks are blown off but not ready to fly. Big loss of this sort about 1966.

Jacobs related a visit with 3-4 others using launch 'Defiance' that took 2-300 birds from Forty-Fours in 1923. Two to three hours were needed for the collection and buds were thrown off east end, 3-4 in a bundle. He suggested that there were approx. 2000 young present.

Preece recounted that the 1941 take Forty-fours used the vessel Silver Fern on 2 trips for total of about 900 birds. Sent, as tried down meat in kerosene tins, to Kaiapoi.

Prendeville recounted that in late 20's they were in camp for up to a week processing birds. They were hung up by the feet to stop them going bad -for plucking, the big feathers from the breast were removed until the fingers got blistered, then moved to the down - after cleaning they were cut up -wings and neck cooked for immediate eating -gut taken out and grilled after contents squeezed out - liver and bones and frames (skeleton) used as food while working -stomach contents went into the pots to help provide oil - often put intestines in netting basket to keep them together during cooking - after carcass was boned out the meat and fat were cooked in fat until the pieces floated -'the longer the cooking the longer the keeping' -meat dried right out and then tinned and covered with the oil and fat -not fit to eat for 6 months or so until the meat had taken up the fat again -'must not eat flesh while cooking or would run out of fat' -one of tastiest pieces was breast, but very fatty -down used for mattresses and pillows -fat and oil a standard recipe for coughs and colds and used for rubbing on rheumatic joints.

Scott (1975) records the assistance to TeWhiti about 1885. "None worked harder than the Chatham Islanders.... they sent huge quantities of fledgling albatross, too plump to fly and salted down or preserved in their own fat;"

Thomas recounted that chicks were driven close to where they were to be thrown over before being despatched with a blow from a 'waddy' behind the head. Had to make sure they were thrown well out to avoid hanging up on the cliff. The first bird was thrown away on the island as a gift for ‘muru’ but was thrown away from the live birds. At the table, after the korero over the bird, a pinch was thrown three times over the shoulder for 'muru' and the ancestors of birders. When the birds were sent to only the remnants, head and neck were kept on the island. Oils from the stomach and other fat cooked together. Was drunk for coughs and colds. In the 1931 Whooping cough epidemic it was the only thing that would ease the cough. Sometimes mixed with kerosene. As treatment for influenza in the epidemic after the First World War, pads of cotton wool impregnated with oil were placed on the chest.

Tuanui recalled going to both Sisters and Forty-Fours before 1936 with a total of about 1000 taken -all birds were used in the Chathams.

Tuuta recounted that albatross oil sometimes used as a preservative for other meats

Various. A lot of birds taken by 'mainland' fishermen during crayfishing boom of 1960's.

Wotherspoon. Visited 44's in August and November 1935 and again in July 1937. Some details in Fleming (1939). 6 birds collected November 1935 and given round Kaingaroa Camp. No one seemed to regard the islands as owned by anyone at that time. Remembered the plucking at Owenga in 1941 of take for 'Maori Battalion'. "Enough white feathers on the boat beach to make it look as though covered in snow -big boilers kept going to help plucking'. Flavour of albatross like 'tongue'.

PAGES 75-82 OMITTED

Due to the high resolution photographs on these pages they have being omitted from this electronic version for the purpose of reducing of file size.

Please contact Knowledge Services at the Department of Conversation for a copy of these images.

knowledge.services@doc.govt.nz

Thank you.

APPENDIX J

COUNTS OF ROYAL ALBATROSS POPULATIONS, CHATHAM ISLANDS

All counts taken from Aerial photographs, counted by the same person
Includes 3 examples of possible breeding population sizes according to variable percentages of non-breeding nest sites
Shaded counts indicated estimate for no photo or photo too early (Oct-73)

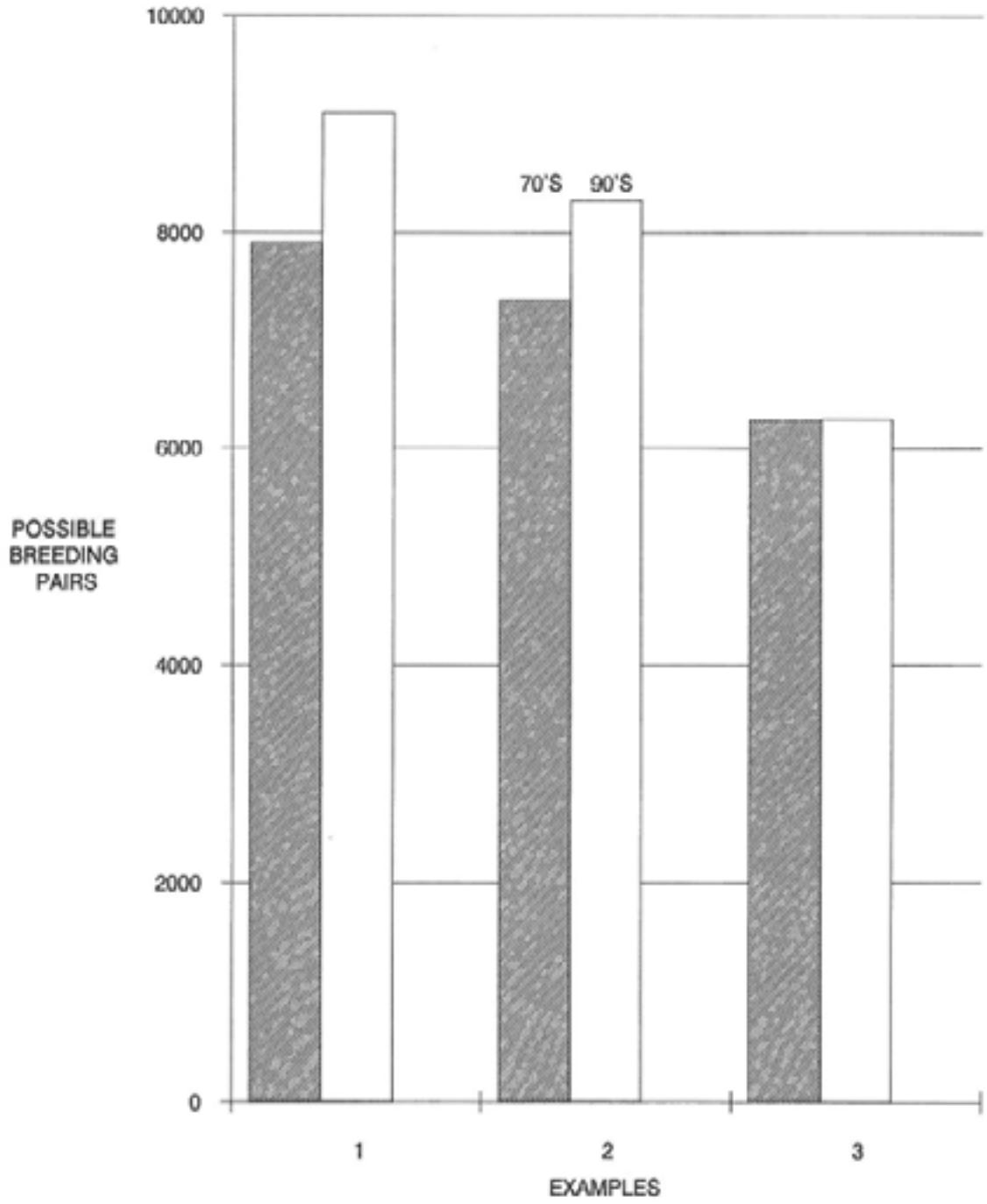
COUNT DATE MONTH	'Nest' Sites ACTUAL COUNT L Sis	'Nest' Sites ACTUAL COUNT B Sis	'Nest' Sites ACTUAL COUNT 44's	'Nest' Sites 'Actual' TOTAL	'Nest' Sites Adjusted for Non Breeders	Example 1 ESTIMATED TOTAL POSSIBLE BREEDING PAIRS	Example 2 ESTIMATED TOTAL BREEDING PAIRS	Example 3 ESTIMATED TOTAL BREEDING PAIRS
1972-75					Example 3	*No correction for non breeders*		
09-72				2600				
11-72	750	1240	3285	5281	3633			
05-73	160	426	1905	2500	2500			
08-73	155	366	1829	2350	2350			
10-73	1150	1350	3450	5950	4094	*7881*	*7353*	*6233*
04-74	516	860	1749	3125	3125			
09-74	496	797	1538	2831	2831			
11-74	672	1196	2846	4714	3243	*8300*	*7705*	*6444*
05-75	330	443	1890	2569	2569			
08-75	338	406	1734	2478	2478			
11-75				0	0	*7545*	*7074*	*6074*
1972-75		*EST. MEAN TOTAL PAIRS 70'S*				*7909*	*7377*	*6250*
1989-91		*EST. MEAN TOTAL PAIRS 90'S*				*9104*	*8292*	*6264*
1989-91								
09-89	201	179	719	1099	1099			
12-89	1339	2424	4562	8325	5411			
03-90	485	416	123	1024	1024			
08-90	413	355	115	883	883			
12-90	1065	2315	4520	7900	5135	*9424*	*8592*	*6510*
04-91	407	505	412	1324	1324			
08-91	380	480	400	1260	1260			
12-91				0	0	*8783*	*7993*	*6018*
04-92				0	0			
09-92				0	0			
12-92				0	0	*0*	*0*	*0*

Estimated percentage of KC (non-breeding) nest sites in November-December - see page 25 in text.

	Example 1	*Example 2*	*Example 3*
1972-75	*0.00%*	*10.00%*	*31.20%*
1989-91	*0.00%*	*10.00%*	*35.00%*

APPENDIX K

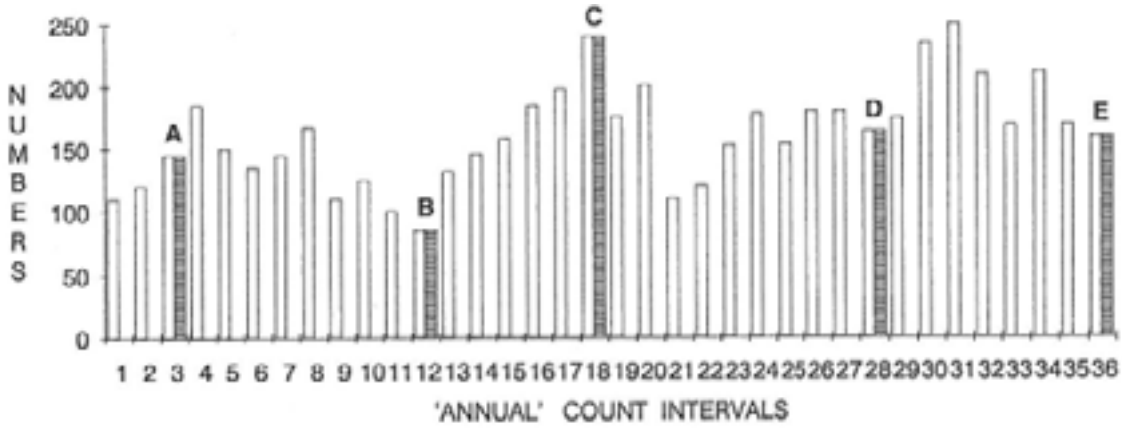
ROYAL ALBATROSS IN THE CHATHAM ISLANDS. VARIATION IN POSSIBLE ACCORDING TO ESTIMATE OF NON-BREEDING SITES IN NOV/DEC AERIAL PHOTOGRAPHS. Data from Appendix J.
See comments in text in Section 3.2 of Report



APPENDIX L

EXAMPLES OF REGULAR AND IRREGULAR COUNTS MADE ON THE SAME SAMPLE POPULATION.

NON REGULAR COUNTS MARKED AS A – E



This is designed to show the difficulties of the interpretation of irregular annual counts when trying to establish a trend.

THE OVERALL POPULATION IS SHOWING A SLIGHT INCREASE OVER 36 YEARS.

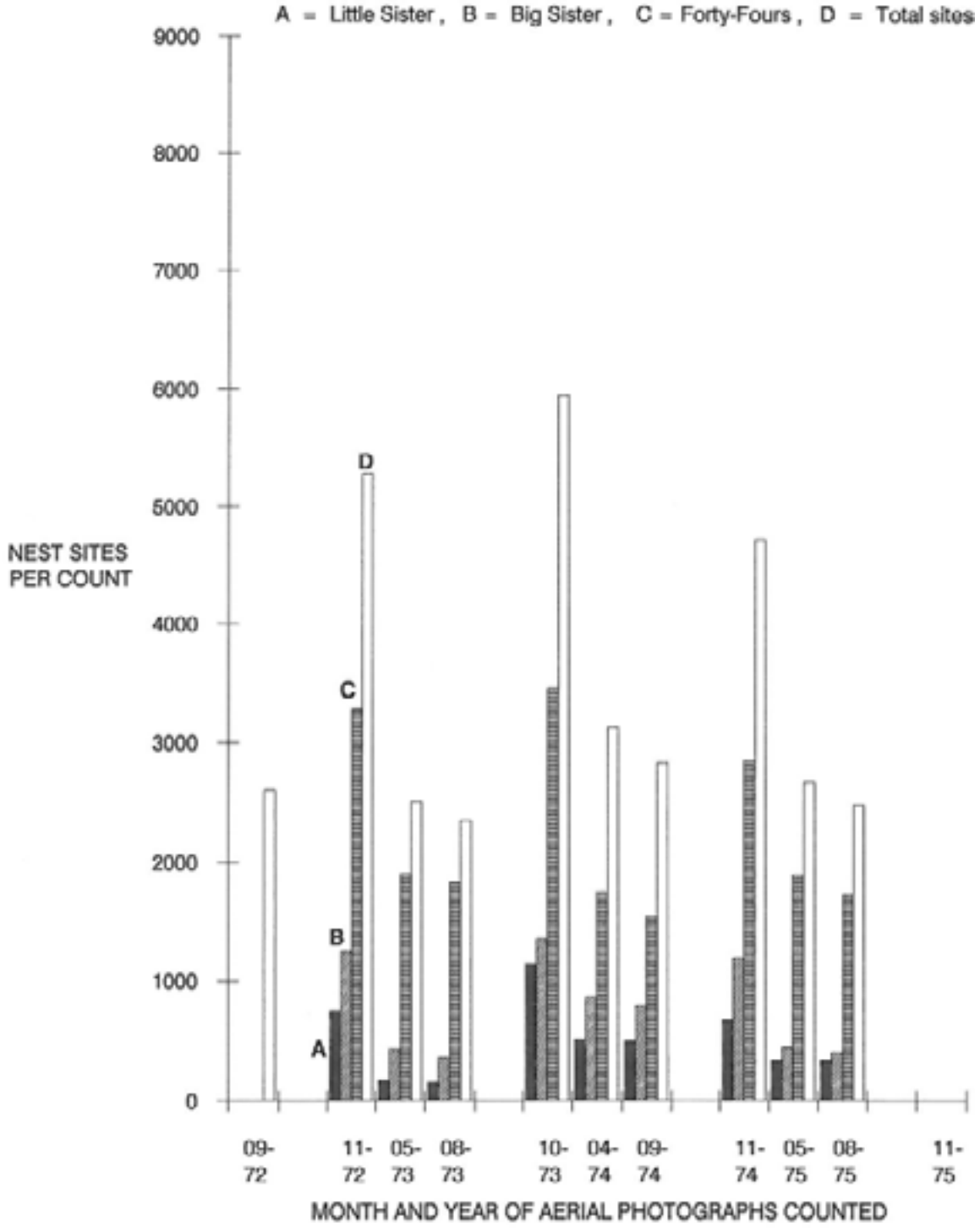
However, the following examples could all be valid interpretations of counts taken in the short-term, while being in ignorance of the long term trend.

A & B or C & D = severe decline
C & E = moderate decline
B & C = rapid increase
B & D = moderate increase
D & E = static
A & D & E = probably static
C &D&E = declining towards a stable pattern

APPENDIX M

SEASONAL NUMBERS OF POSSIBLE ROYAL ALBATROSS NEST SITES, ON BREEDING ISLANDS, ISLANDS 1972 – 1975

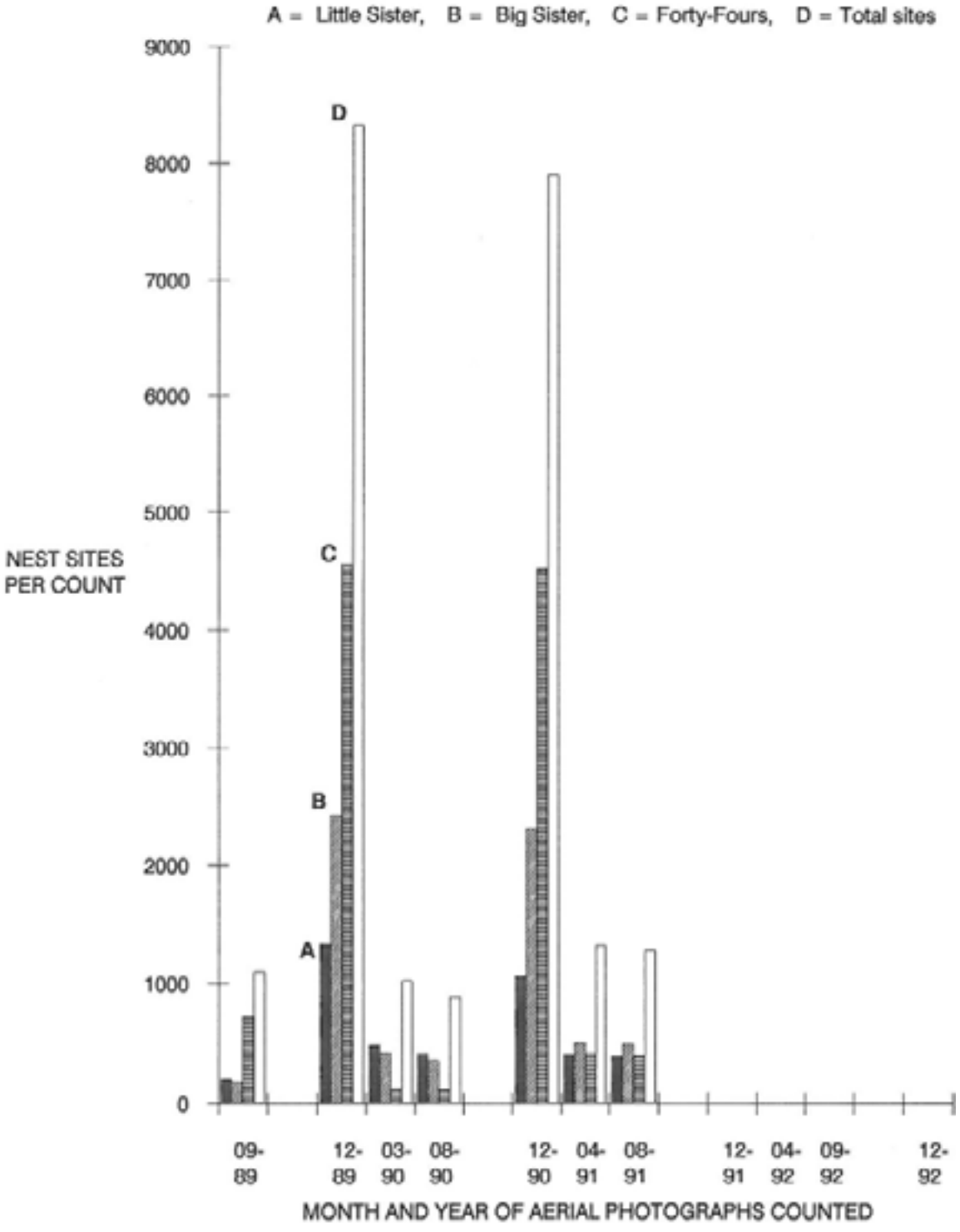
See comments in Section 3.2 of the Report



APPENDIX N

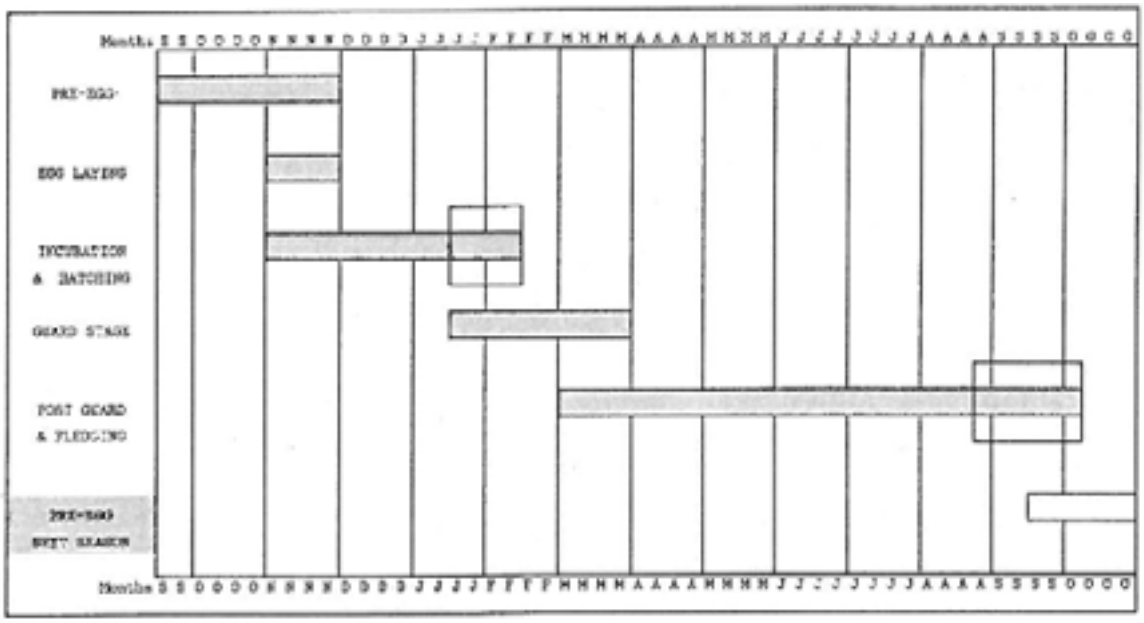
SEASONAL NUMBERS OF POSSIBLE ROYAL ALBATROSS NEST SITES, ON ALL THREE BREEDING ISLANDS, CHATHAM ISLANDS 1989 - 1991

See comments in Section 3.2 of the Report



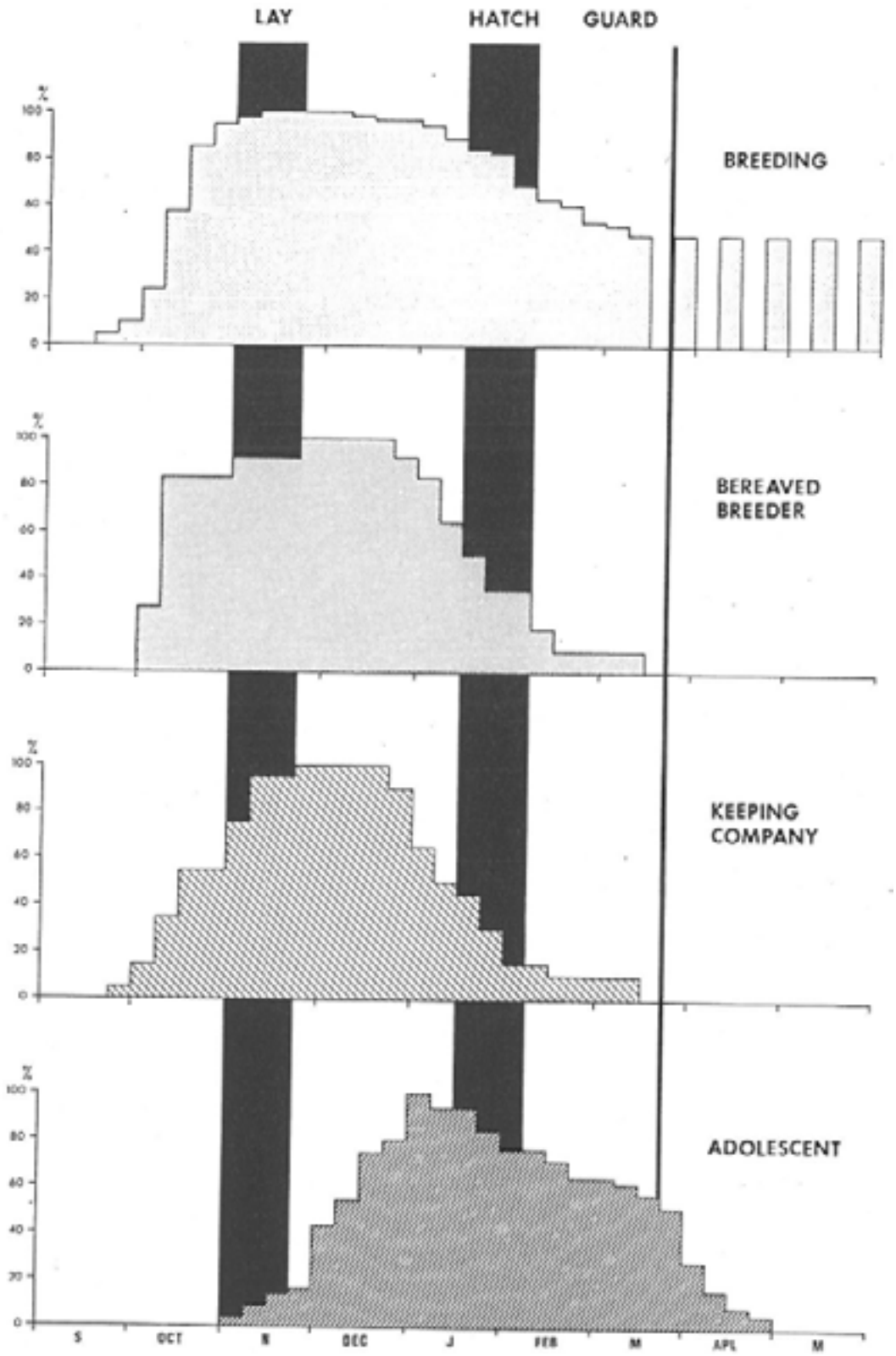
APPENDIX O

BREEDING CYCLE OF THE NORTHERN ROYAL ALBATROSS



APPENDIX P

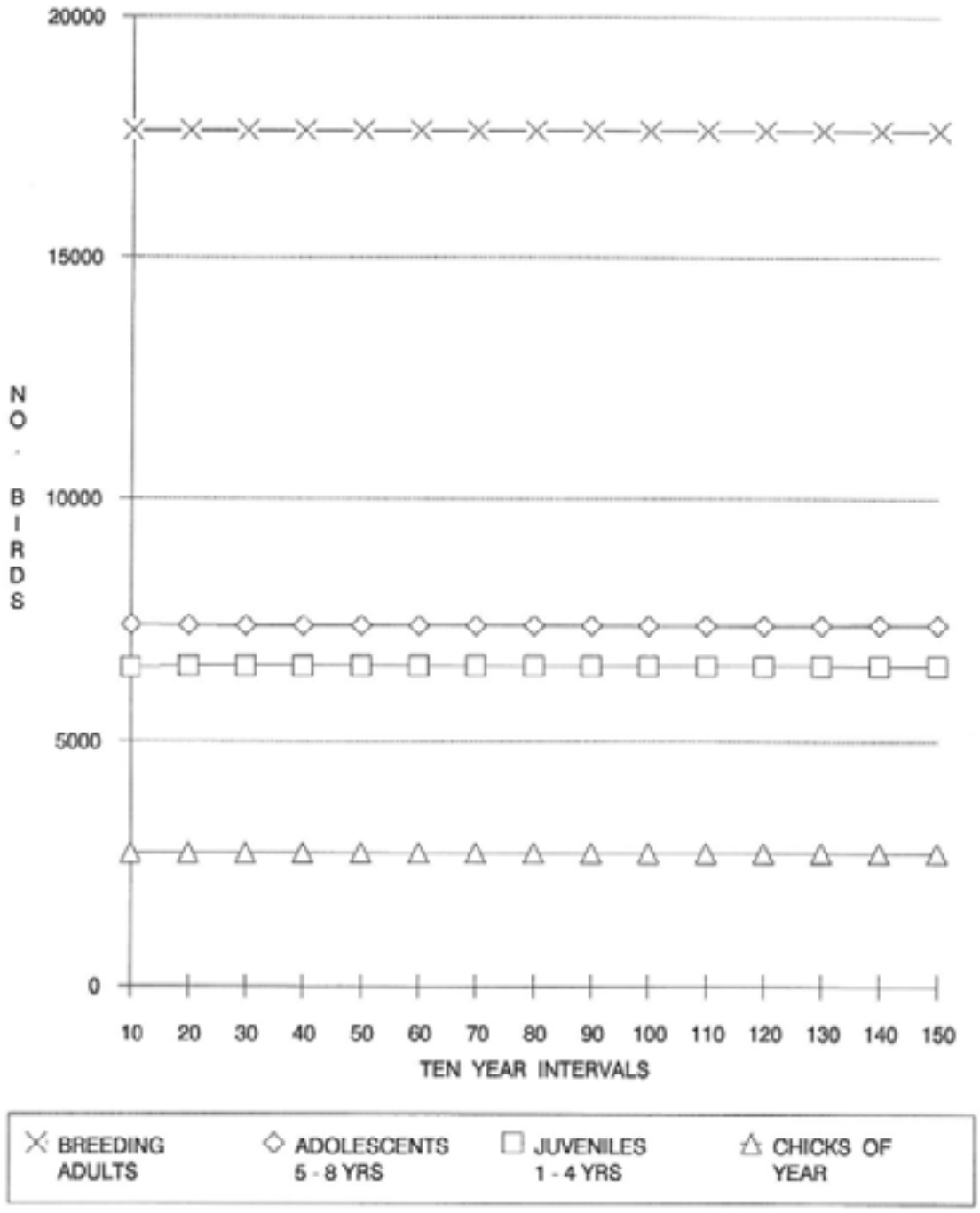
ATTENDANCE OF BREEDING AND NON-BREEDING NORTHERN ROYAL ALBATROSS FROM SEPTEMBER TO MAY EACH BREEDING SEASON



APPENDIX Q

TOTAL ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

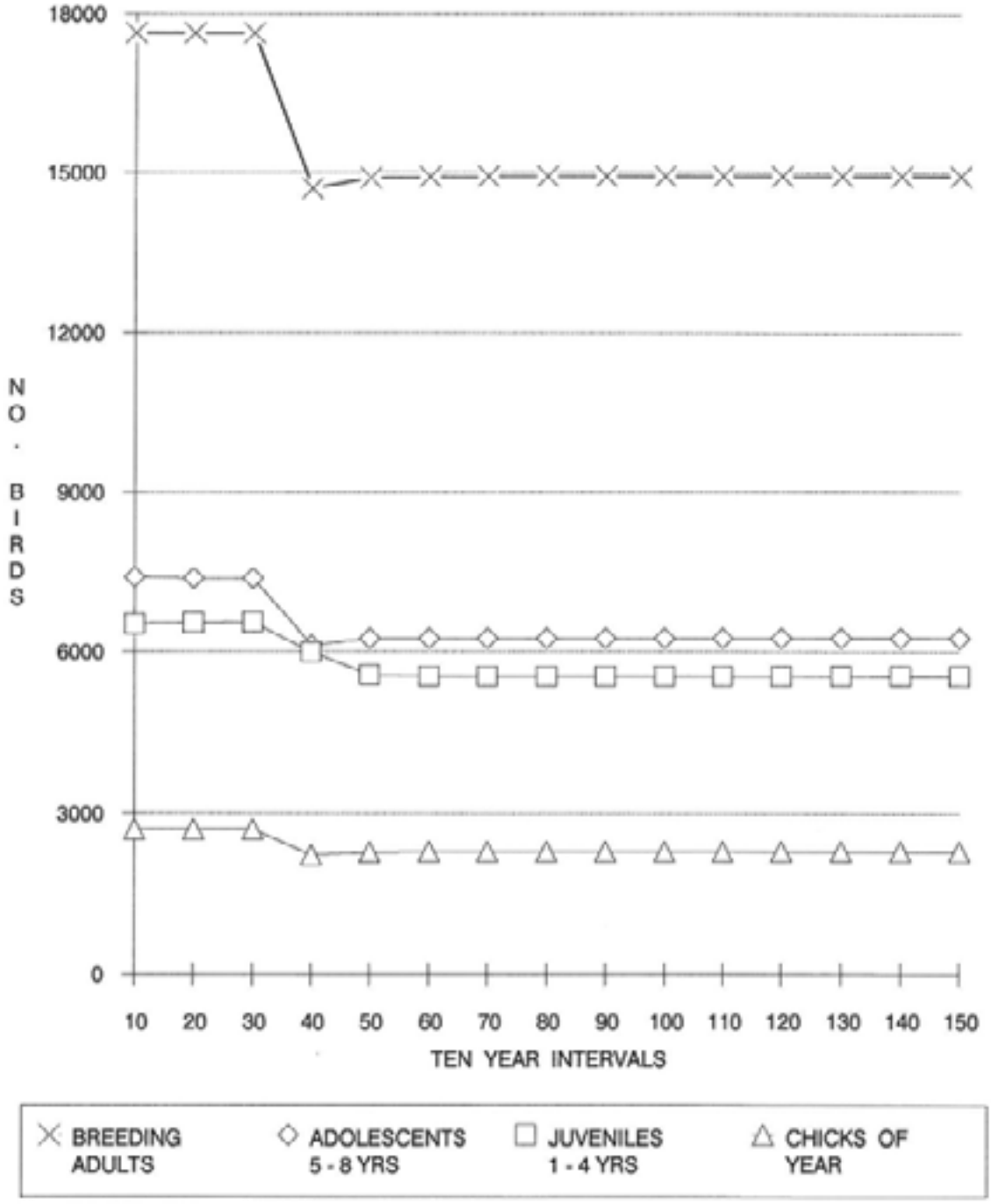
Model Population in Equilibrium



APPENDIX R part (a)

TOTAL ROYAL ALBATROSS POPULATION, CHATHAMS ISLANDS

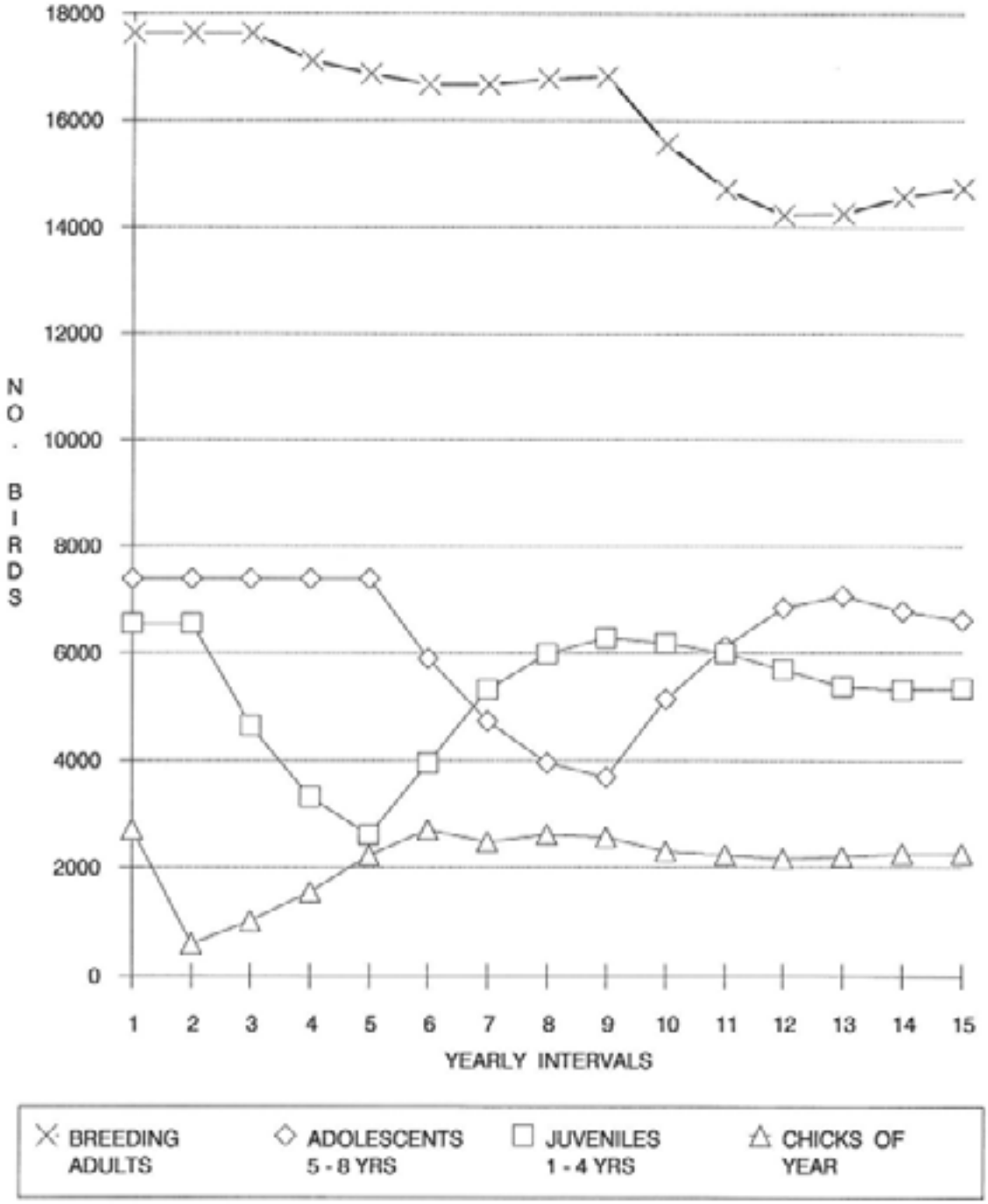
Model to show effect of catastrophic nesting losses of 88, 85 and 60 percent in years 31 to 33 inclusive



APPENDIX R part (b)

TOTAL ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

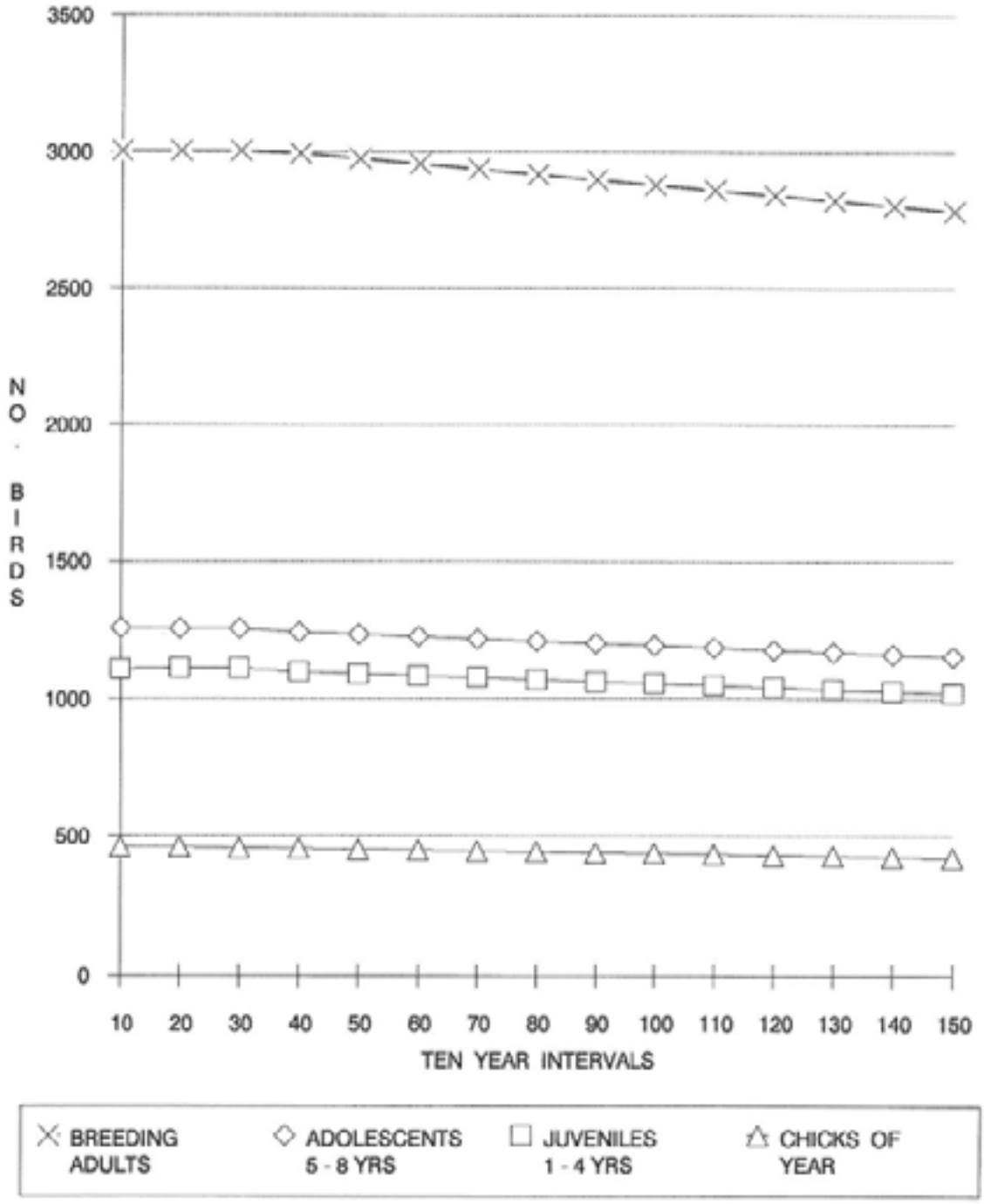
Model to show ANNUAL effect of catastrophic nesting losses in years 31-33, starting at year 30, as shown in Appendix R part (a)



APPENDIX S part (a)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

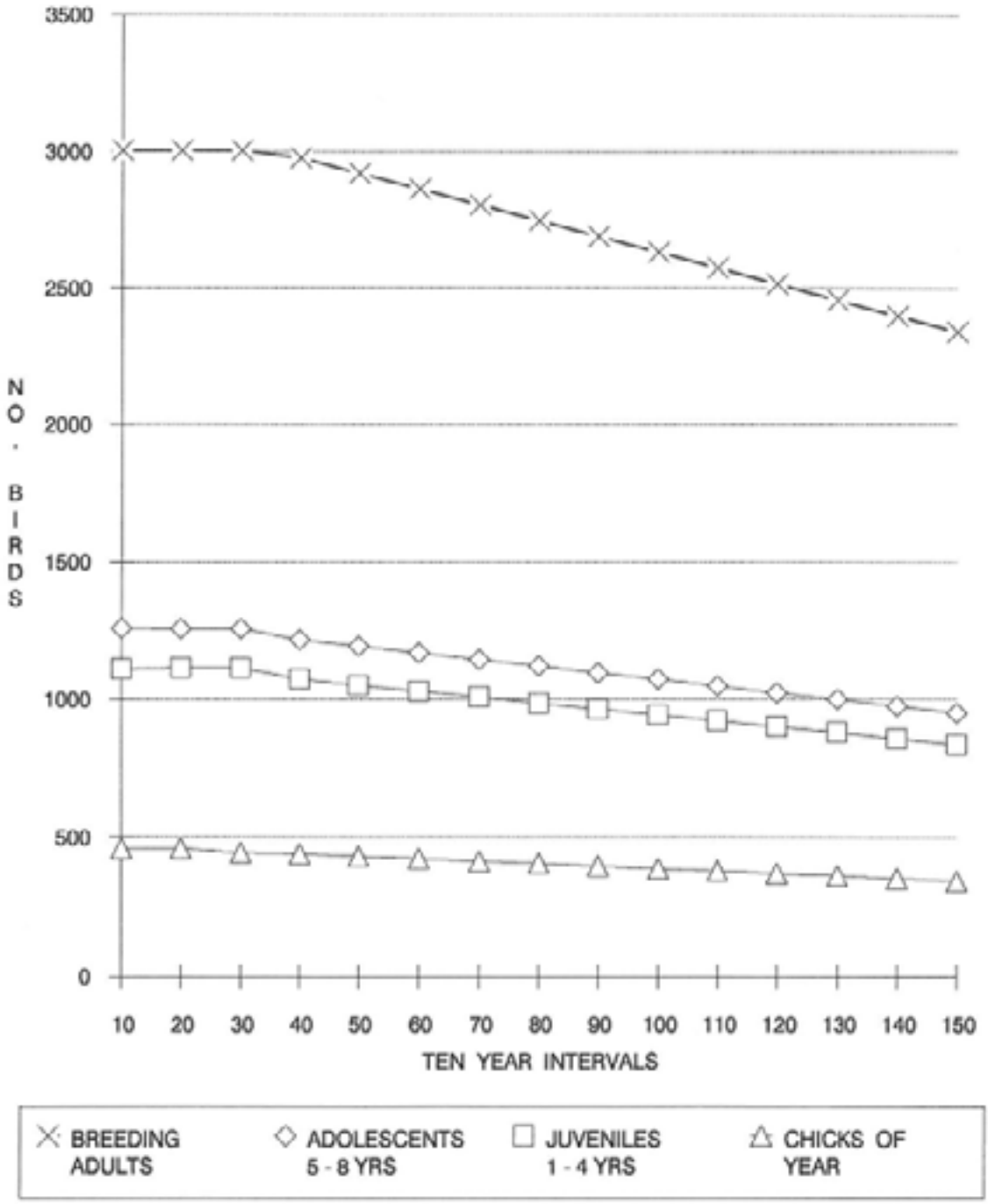
Model to show effect of 'taking' 5 chicks per year, from year 30, over 150 years



APPENDIX S part (b)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

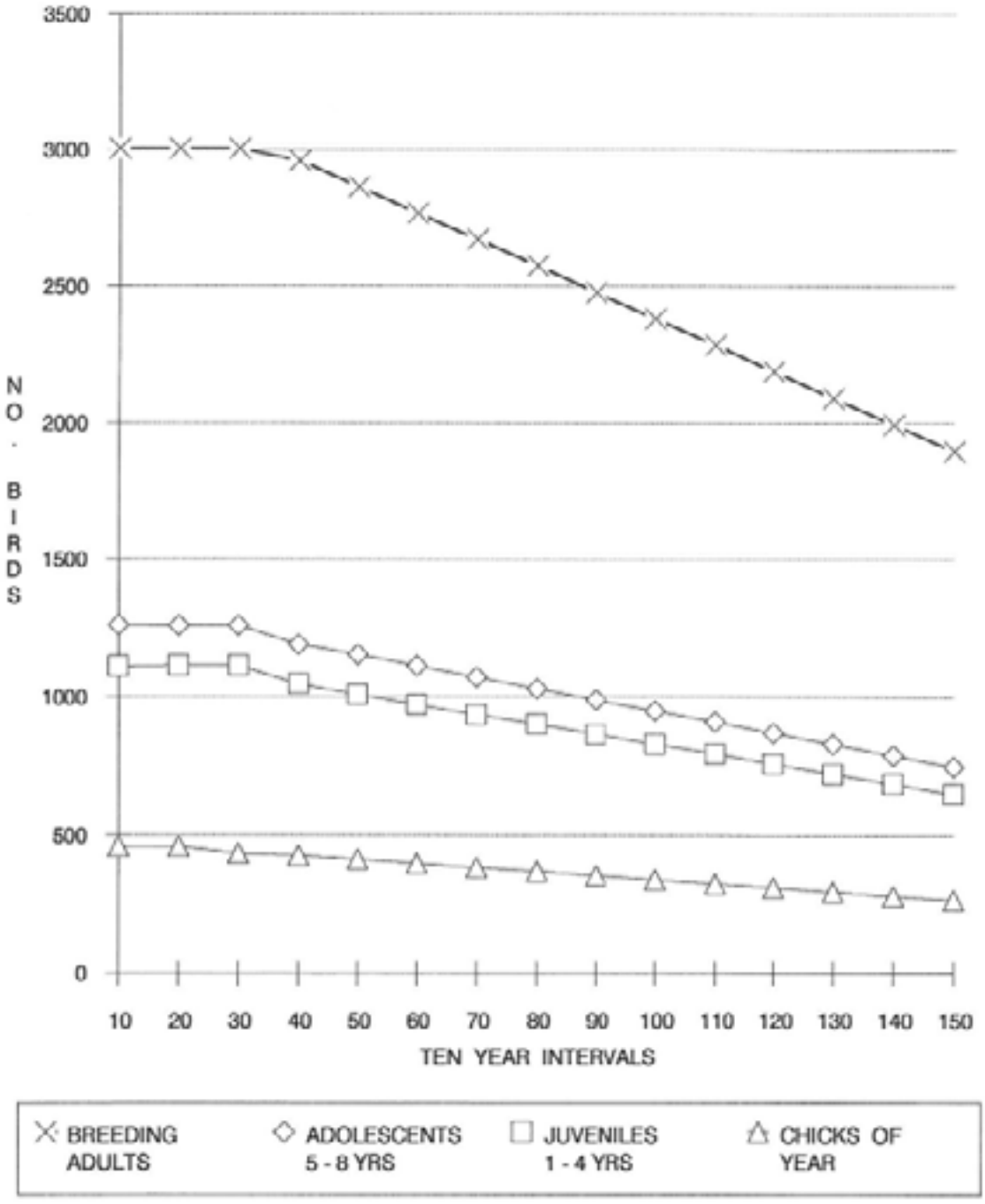
Model to show effect of 'taking' 15 chicks per year, from year 30, over 150 years



APPENDIX S part (c)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

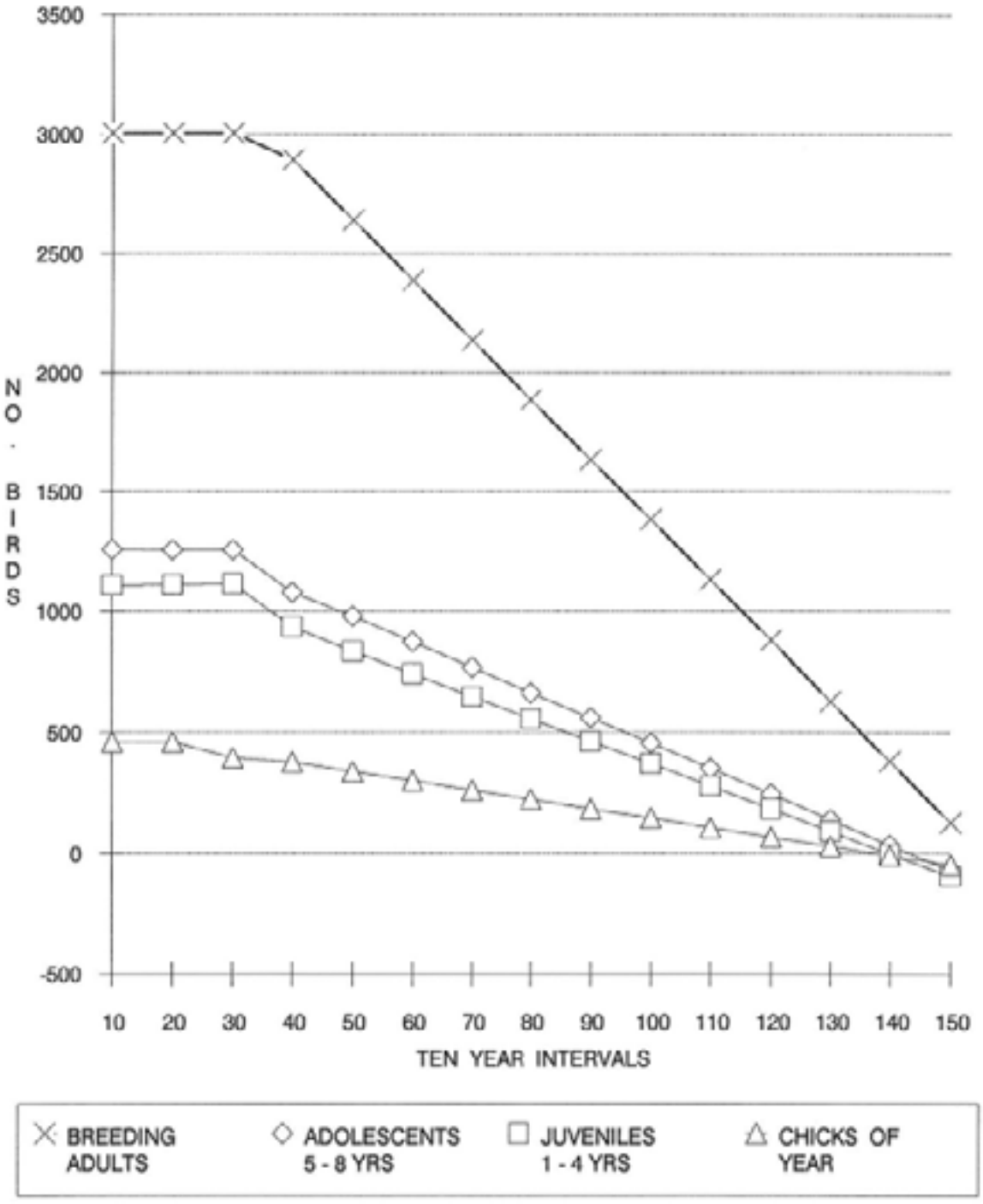
Model to show effect of 'taking' 25 chicks per year, from year 30, over 150 years



APPENDIX S part (d)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

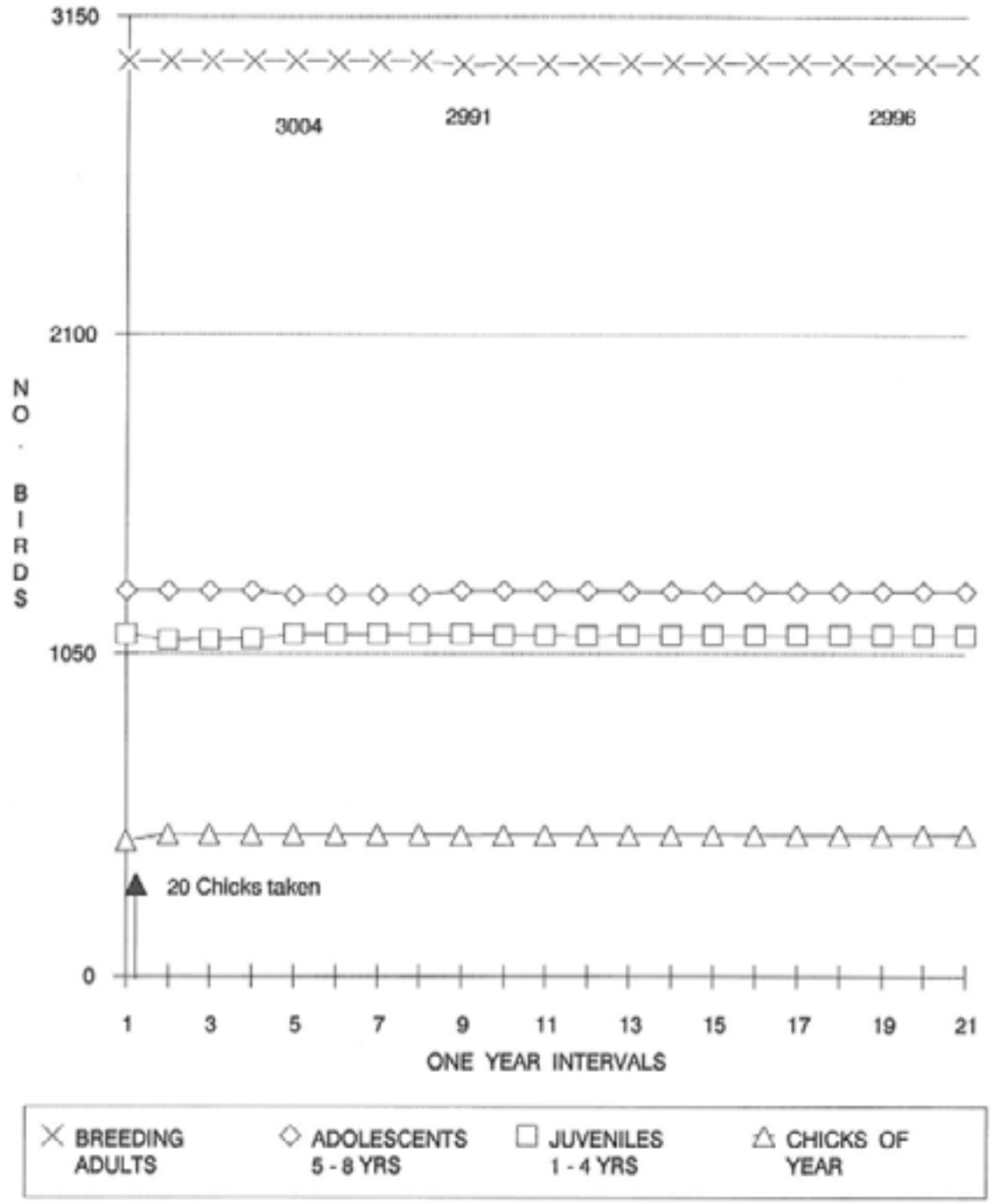
Model to show effect of 'taking' 65 chicks per year, from year 30, over 150 years



APPENDIX T

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

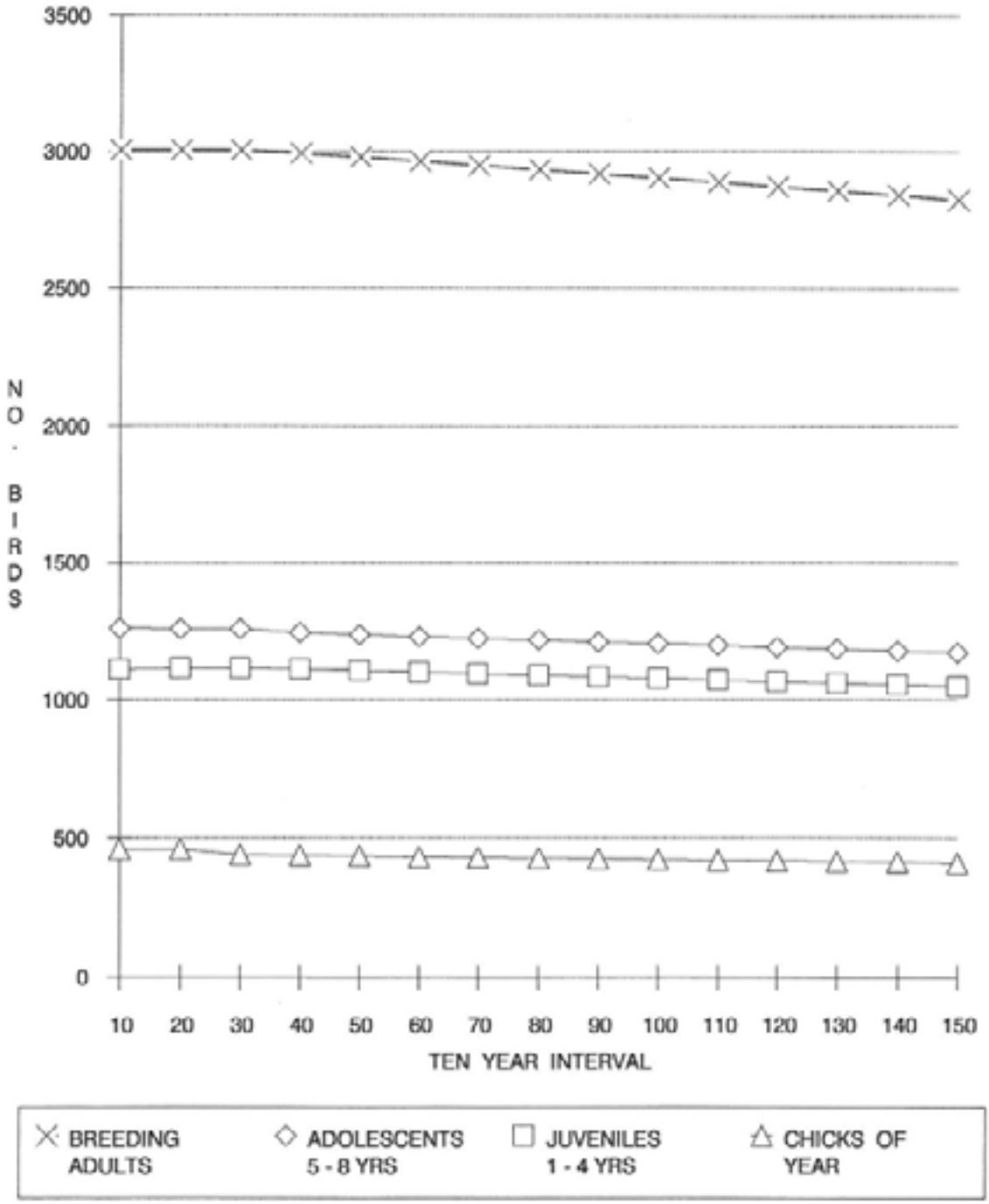
Model to show ANNUAL effect of a single 'take' of 20 chicks in year 30, until year 51



APPENDIX U

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

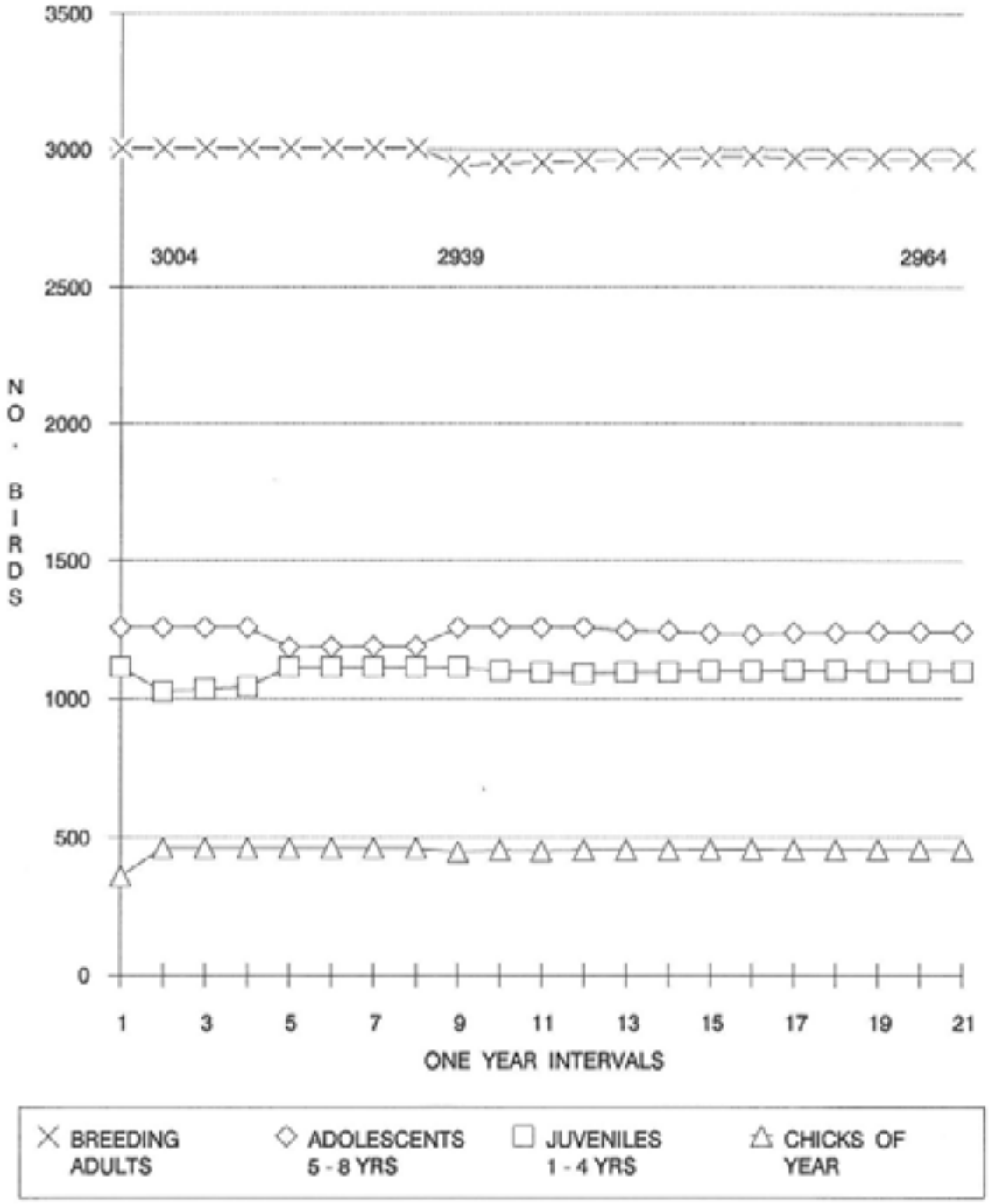
Model to show effect of INTERMITTENT 'takes' of 20 CHICKS each 5 years from year 30, for 150 years



APPENDIX V part (a)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAMS ISLANDS

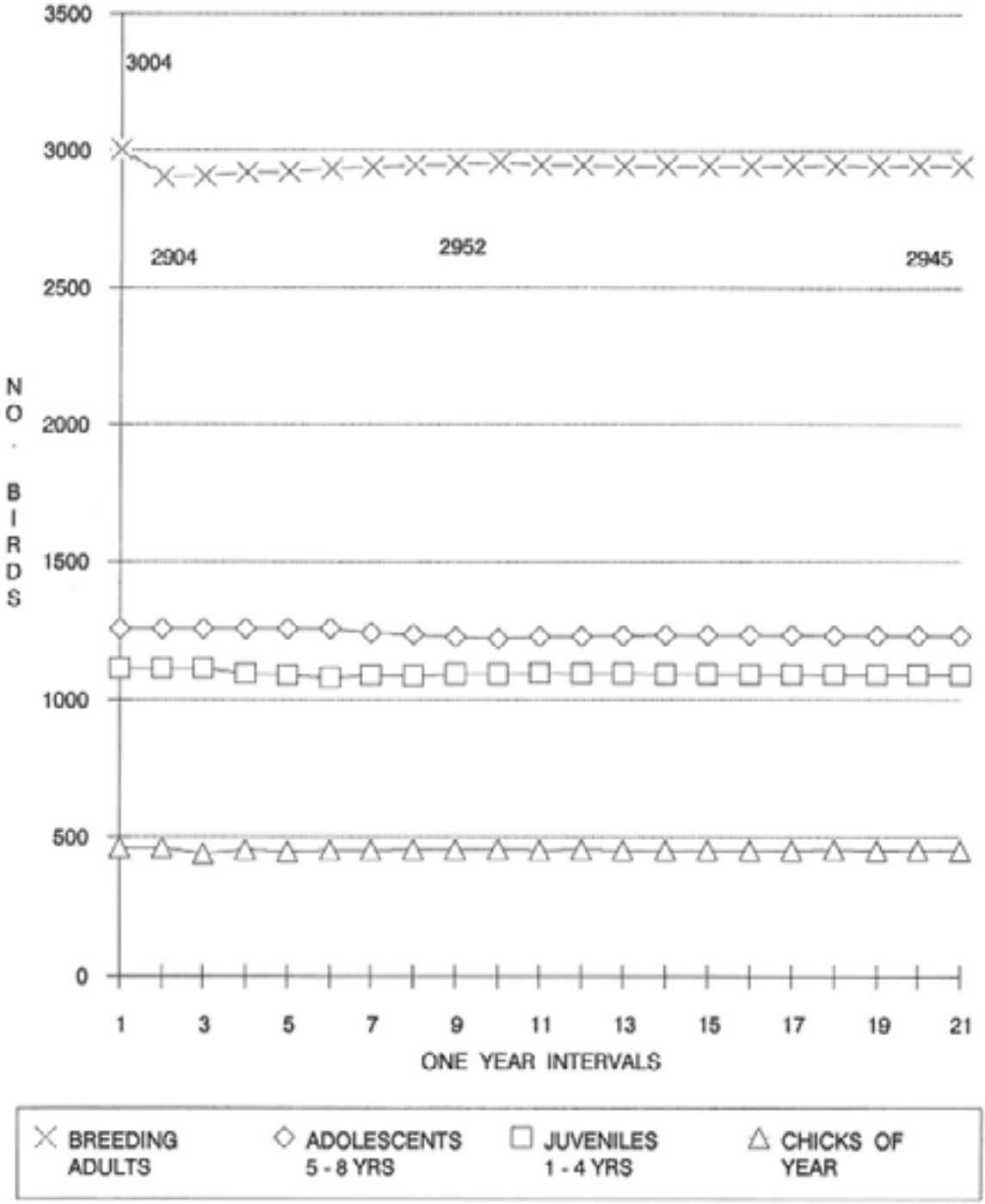
Model to show ANNUAL effect of single 'take' of 100 CHICKS in year 30 over next 21 years



APPENDIX V part (b)

LITTLE SISTER, ROYAL ALBATROSS POPULATION, CHATHAMS ISLANDS

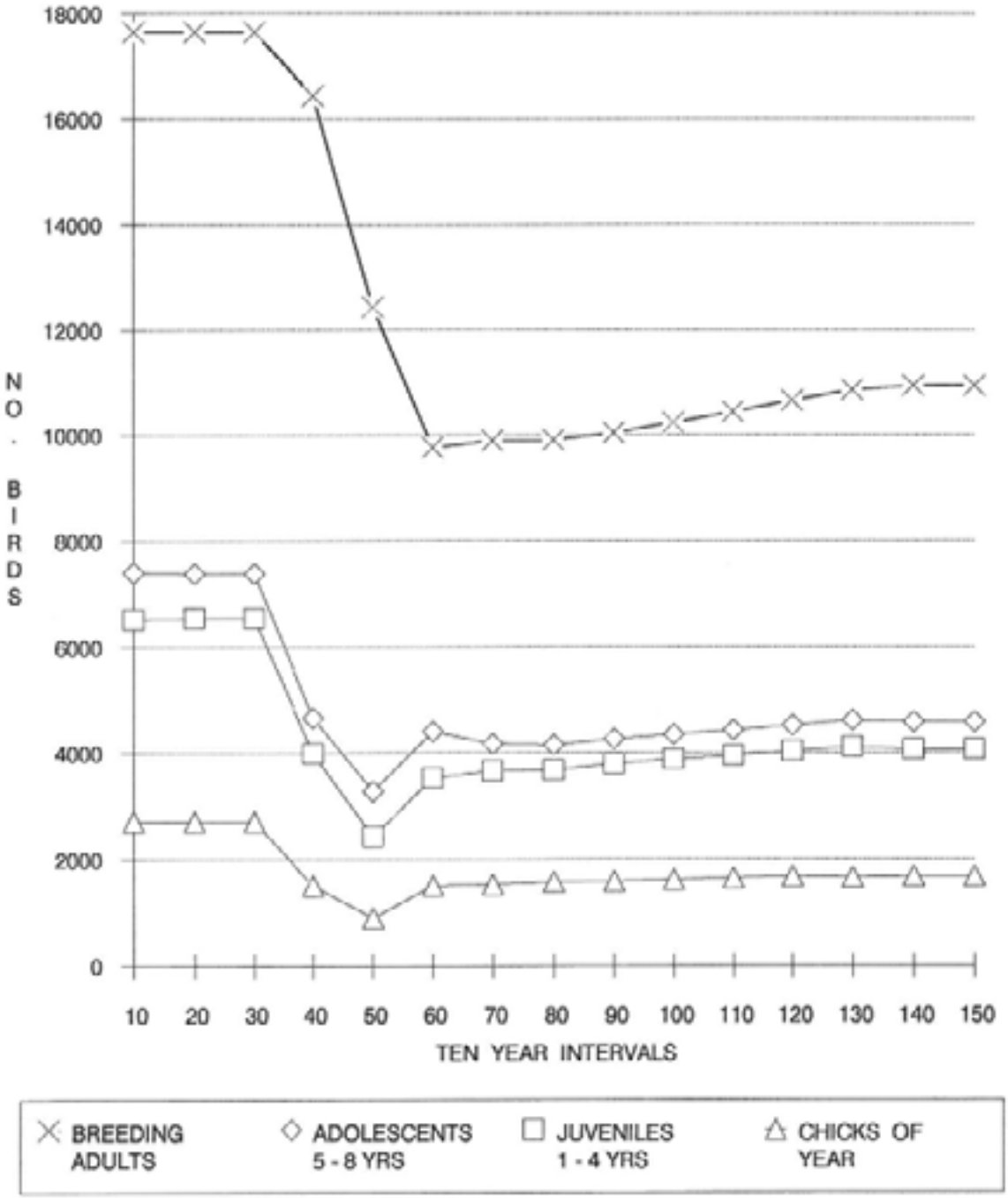
Model to show ANNUAL effect of single 'take' of 100 ADULTS in year 30, for next 21 years



APPENDIX W

TOTAL ROYAL ALBATROSS POPULATION, CHATHAM ISLANDS

Model of population to show effect of 1000 CHICKS 'taken' ANNUALLY, for 20 years from year 31 - then increasing the average percentage CHICK PRODUCTION by 2 % p.a from years 80 to 130



APPENDIX X

A SIMPLE LIFE-TABLE PREDICTION MODEL FOR NORTHERN ROYAL ALBATROSS

Section 4 of the report introduces the use of a population model for predicting the effect of changed population variables. For ease of use a model was constructed using an Excel spreadsheet and covers a period of 150 years. This is a theoretical model and does not in any way represent the 'actual' size of the Northern Royal albatross population. The present known information on population size is found in Appendix J and Table 1.

There are two parts to this Northern Royal albatross model which is for a biennially breeding species: (a) a calculation section and (b) a variables section for each of the 150 years.

In the calculations, the assumption is made that all adults are able to breed from 9 years old, that an Adolescent is from 5-8 years old, that a Juvenile is from 2-4 years old, and that a Chick Fledged is a bird of the year. Additional to Breeding Aged adults, are Bereaved Breeders who have lost mates and do not breed, and Breeding Adults on Holiday who do not breed. When combined, however, these three categories of breeder make up the total modelled breeding stock of the species.

In the variables are a series of survival percentages, based on data from the Taiaroa Head colony of Royal albatrosses, plus the ability to remove or add birds from the population as a harvest of chicks in August/September, to remove adults as a result of a harvest (or a to fishing for example), or add birds to the population as immigrants at six years old. Additonal variables can be added be added if necessary, but the formulae in the calculations section must be changed accordingly.

At the start of modelling the variables are set according to the known data about the species (these are shown here as constant averages for all of the 150 years because annual changes are not known) and the population is in balance. To ensure the model is stable no changes are introduced until year 31. Any one, or all of the variables can be changed in any one or all years, which gives many thousands of variations or which can be modelled. Once the changes to any variables are removed the model uses the standard averages again and the model returns to being stable -but at the new level which the population may have reached.

As the model is on a spreadsheet, the box references for each calculation or variable are shown along the top and left hand side of the page. For example on page 104, box reference AH31 contains the number 1000 and the box is shaded. AH31 is referred to as part of the calculation in AH23 where the 1000 harvested chicks are subtracted from the number of chicks who would have fledged that year if the variable was not introduced. On page 105 it is possible to follow the effects on other parts of the population model of the one take of chicks, by following the shaded boxes up through the calculation part of the model.

The information on pages 104-105 form part of the model shown graphically from year 30 in Appendix W on page 102 opposite. Information on the graph on page 102 comes from the CHICKS FLEDGED, TOTAL JUVENILES, TOTAL ADOLESCENT and TOTAL BREEDERS figures of individual birds found on lines 23, 22, 18, and 11 on pages 104 and 105 respectively.

On page 104 the formulae consist of box references and standard mathematical use. Variations in signs are / = divide, and * = multiply. The $ sign should be ignored as it is only used to the position of a box in the spreadsheet. The formula =SUM(AG19:AG21) means that all the results in boxes AG19, AG20 and AG21 are added to together and totalled.

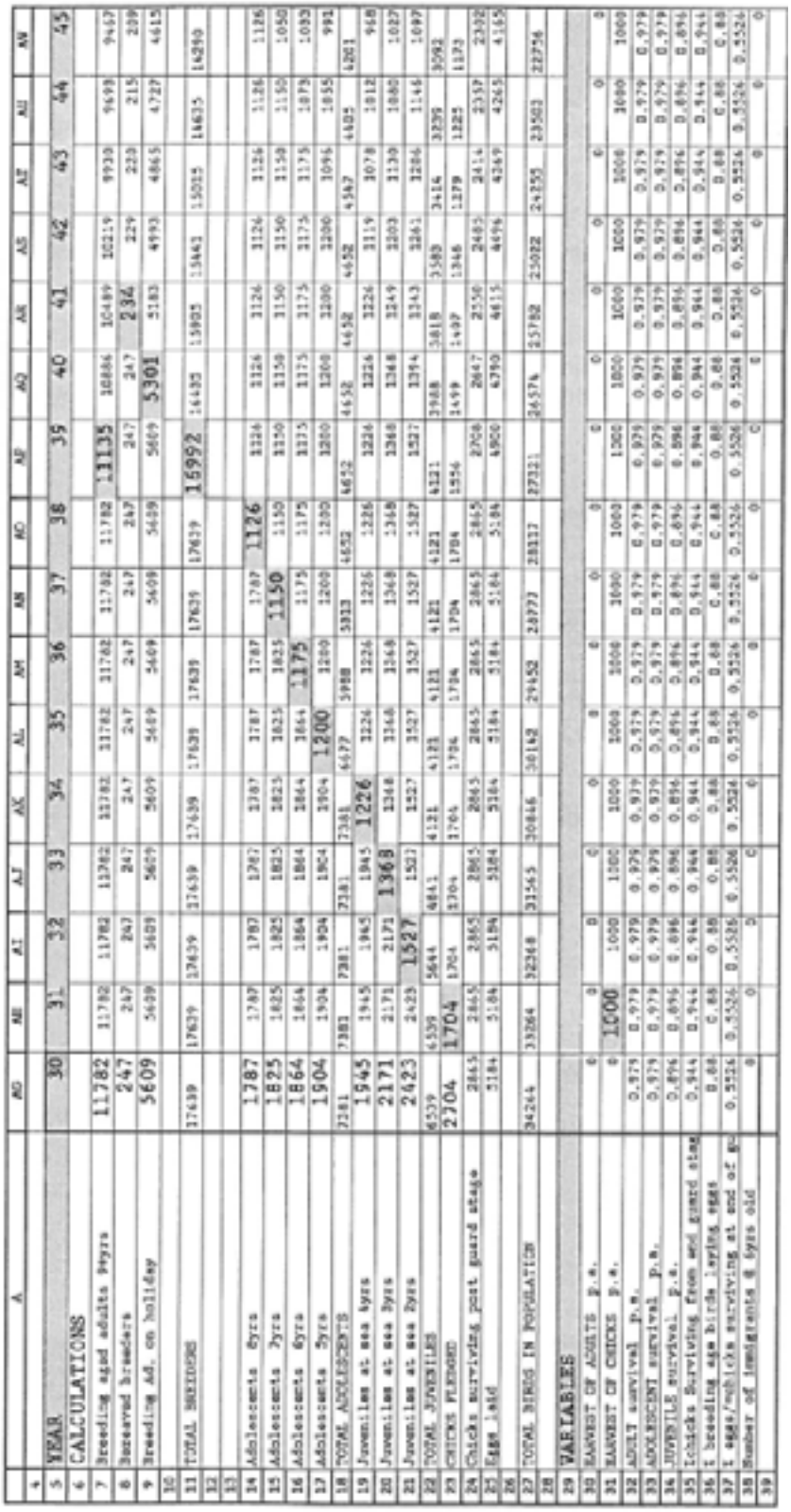
APPENDIX X

EXAMPLES OF THE RESULTS OF CALCULATIONS AND VARIABLES USED IN THE ROYAL ALBATROSS MODEL

	A	AG	AH	AI
4				
5	YEAR	30	31	32
6	CALCULATIONS			
7	Breeding aged adults 9+yrs	=((AF9+AF14)+((AF25-AF24)*2))*AF32	=((AG9+AG14)+((AG25-AG24)*2))*AG32	=((AH9+AH14)+((AH25-AH24)*2))*AH32
8	Bereaved breeders	=AE7-(AE7*AG33)	=AF7-(AF7*AH33)	=AG7-(AG7*AI33)
9	Breeding Ad. on holiday	=((AF24*2)*AG32)-AF30	=((AG24*2)*AH32)-AG30	=((AH24*2)*AI32)-AH30
10				
11	TOTAL BREEDERS	=AG7+AG8+AG9	=AH7+AH8+AH9	=AI7+AI8+AI9
12				
13				
14	Adolescents 8yrs	=(AF15*AG$32)	=(AG15*AH$32)	=(AH15*AI$32)
15	Adolescents 7yrs	=(AF16*AG$33)	=(AG16*AH$33)	=(AH16*AI$33)
16	Adolescents 6yrs	=(AF17*AG$33)+AG38	=(AG17*AH$33)+AH38	=(AH17*AI$33)+AI38
17	Adolescents 5yrs	=(AF19*AG$33)	=(AG19*AH$33)	=(AH19*AI$33)
18	TOTAL ADOLESCENTS	=SUM(AG14:AG17)	=SUM(AH14:AH17)	=SUM(AI14:AI17)
19	Juveniles at sea 4yrs	=(AF20*AG$34)	=(AG20*AH$34)	=(AH20*AI$34)
20	Juveniles at sea 3yrs	=(AF21*AG$34)	=(AG21*AH$34)	=(AH21*AI$34)
21	Juveniles at sea 2yrs	=(AF23*AG$34)	=(AG23*AH$34)	=(AH23*AI$34)
22	TOTAL JUVENILES	=SUM(AG19:AG21)	=SUM(AH19:AH21)	=SUM(AI19:AI21)
23	CHICKS FLEDGED	=(AG24*AG35)-AG31	=(AH24*AH35)-AH31	=(AI24*AI35)-AI31
24	Chicks surviving post guard stage	=AG25*AG37	=AH25*AH37	=AI25*AI37
25	Eggs laid	=(AG7/2)*AG36	=(AH7/2)*AH36	=(AI7/2)*AI36
26				
27	TOTAL BIRDS IN POPULATION	=AG11+AG18+AG22+AG23	=AH11+AH18+AH22+AH23	=AI11+AI18+AI22+AI23
28				
29	VARIABLES			
30	HARVEST OF ADULTS p.a.	0	0	0
31	HARVEST OF CHICKS p.a.	0	1000	1000
32	ADULT survival p.a.	0.979	0.979	0.979
33	ADOLESCENT survival p.a.	0.979	0.979	0.979
34	JUVENILE survival p.a.	0.896	0.896	0.896
35	%chicks Surviving from end guard stage to fledging	0.944	0.944	0.944
36	% breeding age birds laying eggs	0.88	0.88	0.88
37	% eggs/=chicks surviving at end of guard stage	0.5526	0.5526	0.5526
38	Number of immigrants @ 6yrs old	0	0	0
39				

APPENDIX X cont.

EXAMPLES OF THE RESULTS OF CALCULATIONS IN THE ROYAL ALBATROSS MODEL (Also shown graphically in Appendix W)



	A	AD	AE	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
4																	
5	YEAR	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
6	CALCULATIONS																
7	Breeding aged adults 4yrs	11782	11782	11782	11782	11782	11782	11782	11782	11782	13135	10886	10489	10219	9930	9698	9467
8	Unreared breeders	247	247	247	247	247	247	247	247	247	247	247	234	229	229	215	209
9	Breeding Ad. on holiday	5609	5609	5609	5609	5609	5609	5609	5609	5609	5609	5301	5183	4993	4865	4727	4615
10																	
11	TOTAL BREEDERS	17639	17639	17639	17639	17639	17639	17639	17639	17639	15992	16435	15905	15441	15025	14635	14290
12																	
13																	
14	Adolescents 6yrs	1787	1787	1787	1787	1787	1787	1787	1787	1126	1226	1226	1226	1226	1226	1226	1226
15	Adolescents 5yrs	1825	1825	1825	1825	1825	1825	1825	1150	1150	1150	1150	1150	1150	1150	1150	1150
16	Adolescents 4yrs	1864	1864	1864	1864	1864	1864	1175	1175	1175	1175	1175	1175	1175	1175	1175	1093
17	Adolescents 3yrs	1904	1904	1904	1904	1904	1200	1200	1200	1200	1200	1200	1200	1200	1200	1095	991
18	TOTAL ADOLESCENTS	7381	7381	7381	7381	7381	6477	5988	5313	4652	4652	4652	4652	4652	4547	4485	4261
19	Juveniles at sea 4yrs	1945	1945	1945	1945	1226	1226	1226	1226	1226	1226	1226	1226	1226	1119	1078	1012
20	Juveniles at sea 3yrs	2171	2171	2171	1368	1368	1368	1368	1368	1368	1368	1368	1368	1249	1203	1139	1080
21	Juveniles at sea 2yrs	2423	2423	1527	1527	1527	1527	1527	1527	1527	1527	1394	1343	1343	1284	1146	1097
22	TOTAL JUVENILES	6539	6539	5644	4841	4121	4121	4121	4121	4121	4121	3988	3818	3589	3414	3299	3042
23	CHICKS FLEDGED	2704	1704	1704	1704	1704	1704	1704	1704	1704	1554	1499	1497	1346	1279	1225	1173
24	Chicks surviving post guard stage	2865	2865	2865	2865	2865	2865	2865	2865	2865	2706	2647	2556	2485	2414	2337	2238
25	Eggs laid	5184	5184	5184	5184	5184	5184	5184	5184	5184	4900	4790	4615	4496	4369	4265	4165
26																	
27	TOTAL BIRDS IN POPULATION	34264	33264	32348	31545	30446	30162	29452	28773	28117	27321	26574	25782	25022	24255	23503	22754
28																	
29	VARIABLES																
30	HARVEST OF ADULTS p.a.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	HARVEST OF CHICKS p.a.	0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
32	ADULT survival p.a.	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979
33	ADOLESCENT survival p.a.	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979	0.979
34	JUVENILE survival p.a.	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896	0.896
35	Chicks Surviving from end guard stage	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944
36	% breeding age birds laying eggs	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
37	% eggs/chicks surviving at end of gu	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526	0.5526
38	Number of immigrants 4 5yrs old	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39																	