APPENDIX 4

CAPTIVE BREEDING OF TUATARA

A total of 149 Cook Strait tuatara (all from Stephens Island) are held in captivity in New Zealand and could potentially be used to establish successful captive breeding procedures. A further seven adults and 18 juveniles from the same population are held overseas. However, success with captive breeding has not been high (Cree and Daugherty, 1990). Most of the New Zealand animals (82) are juveniles that were hatched from wild-collected eggs during incubation studies at VUW by Thompson (1990). The remaining Stephens Island tuatara in captivity in New Zealand include 27 adults held in mixed pairs or groups in which breeding could potentially occur, two adults in isolation, 30 juveniles hatched from eggs laid in captivity and 9 juveniles hatched in captivity by zoos from wild-collected eggs (Table 2). In addition, one aged female, 130 juveniles and hatchlings and c20 incubating eggs from the Brothers tuatara, and 35 adults and 14 juvenile Northern tuatara are held.

No institution has yet raised juvenile tuatara to maturity (the oldest is nine years), and thus, no self-maintaining captive population exists. Probable reasons for the lack of success in captive breeding include high adult mortality, inappropriate cues for reproduction, lack of social interactions, improper nutrition, high densities, poor egg quality, inappropriate incubation conditions and high juvenile mortality (Cree and Daugherty, 1990 and unpubl.). Recent research on reproductive biology (Appendix 1) means that several of these contributing factors should now be overcome.

Areas in which further research is urgently needed include nutrition (including that leading to high egg quality), and the reasons for high juvenile mortality. To illustrate the latter, 87 juveniles have been distributed during the last 2-4 years from incubation experiments at VUW to a total of seven husbandry institutions, but only 47 (54.0%) survive. Deaths have occurred at all institutions, but because autopsies have not been required, detailed information on the likely causes of death is often not available. Circumstantial evidence from curators suggests that acute overheating (>25°C?) has been involved in many cases. Many surviving juveniles in captivity have chronic calcium deficiency resulting from improper nutrition and lack of natural sunlight (A. Cree, unpubl. obs.). This deficiency can be overcome by appropriate design of enclosures to allow exposure to natural sunlight without risking overheating, by provision of artificial light sources that produce wavelengths mimicking natural sunlight, and by providing dietary supplements containing vitamin D₃ and a high calcium: phosphorus ratio.
A further area of captive breeding in which improvements are required is in the institutional structure of captive breeding programmes (Cree and Daugherty, 1990). Until 1990, institutions holding tuatara in New Zealand had no formal procedures for sharing information among themselves or for providing detailed, regular reports to DoC. Improved communication and record-keeping, preferably supervised by DoC, is essential to ensure that: (i) experience in husbandry techniques is shared; (ii) inbreeding is avoided; (iii) reasons for mortality are known; and (iv) adults are kept in sufficiently large colonies to provide a reasonable chance of successful breeding (some institutions may have admirable facilities for raising juveniles but not for maintaining adults, and some currently rearing juveniles may end up with a small number of related adults of only one sex). To assist in these matters, a workshop was held in 1990 for all institutions maintaining tuatara in captivity in New Zealand and a national co-ordinator to liaise between these institutions and DoC was appointed (Blanchard, 1991).

Further information to assist the captive breeding of tuatara can be found in Newman et al. (1979), Thompson et al. (1988) and in the DoC pamphlet "A guide to the keeping of tuatara in captivity".
APPENDIX 5

SURVEY DATA SHEETS

PROCEDURE

Surveys should be carried out in warm, moist weather (17°C or higher) during October-March inclusive. On very small islands, one night of searching in suitable weather may suffice, but on larger islands 3-7 nights should be allowed for.

Mark area surveyed on a photocopy of a map of this island and enclose with this report.

On completion of survey, please lodge copies of data sheets with:

(1) Conservation Advisory Scientist, Regional Conservancy Office, Department of Conservation

and (2) Science and Research Directorate
    Department of Conservation
    Box 10-420
    WELLINGTON

If blood samples are to be collected, please contact the following for details of sampling procedure and additional morphological details to be recorded:

Dr C.H. Daugherty
School of Biological Sciences
Victoria University of Wellington
Box 600
Wellington

GENERAL INFORMATION

Island surveyed: ..........................
DATA TO RECORD EACH NIGHT

<table>
<thead>
<tr>
<th>Parameters to record</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. previously toe-clipped animals caught</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. animals not toe-clipped caught</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. animals toe-clipped tonight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total no. caught</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total no. person-hours searched</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capture rate (no./person/hour)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air temperature at 10pm (°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative humidity at 10pm (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rain or mist?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark area searched on map</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes to explain table on next page

1. AC number = number assigned to animal during 1988/1989 VUW/DoC survey (leave blank)

2. If not absolutely sure of the sex, insert a question mark.

3. Snout-vent length (to nearest millimetre).

4. Vent-tail length (to nearest millimetre).

5. Length of tail regeneration (to nearest millimetre).

6. Weight (to nearest 10 grams).

7. Looking down on back of animal:
   LF = left front; RF = right front; LR = left rear; RR = right rear.
   Number the toes from inside to outside of limb, i.e., thumb (innermost) = 1, outermost toe = 5.

8. Any comments on unusual appearance (aged/wounded/scared etc.) or behaviour.
DATA TO RECORD FOR EACH TUATARA CAUGHT

<table>
<thead>
<tr>
<th>Your identifying number</th>
<th>ΔC no.¹ (leave blank)</th>
<th>Sex²</th>
<th>SVL³ (mm)</th>
<th>VT⁴ (mm)</th>
<th>R⁵ (mm)</th>
<th>Wgt⁶ (g)</th>
<th>Toe-clip⁷ LF RF LR RR</th>
<th>Comments⁸</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 6

PEOPLE WITH EXPERIENCE IN LEADING FIELD TRIPS TO SURVEY AND/OR COLLECT BLOOD SAMPLES FROM TUATARA

Surveying and blood-sampling:

Dr Alison Cree
Department of Zoology
University of Otago
Box 56
Dunedin
Ph: (03) 479-7482

Mr Derek Brown
Havelock Field Centre
Department of Conservation
13 Mahakipawa Road
Havelock
Ph: (03) 574-2019

Dr Charles Daugherty
School of Biological Sciences
Victoria University of Wellington
Box 600
Wellington
Ph: (04) 472-1000

Mr Donald Newman
Conservation Sciences Centre
Department of Conservation
Box 10-420
Wellington
Ph: (04) 710-726

Mr Ian McFadden
DoC Science and Research
62 Tatariki St
P.ipakura
Ph: (09) 298-5888

Mr Phil Thomson
Waikato Conservancy
Department of Conservation
Private Bag 3072
Hamilton
Ph: (07) 838-3363

Dr Mary McIntyre
School of Biological Sciences
Victoria University of Wellington
Box 600
Wellington
Ph: (04) 472-1000

Dr Michael B. Thompson
School of Biological Sciences
Zoology A08
University of Sydney
NS W 2006
AUSTRALIA
Ph: (61-2) 692-3989

Mr Tony Whitaker
Ngatimoti
RD 1
Motueka
Ph: (052-468) 703

Surveying only:

Dr David Towns
Conservation Sciences Centre
Department of Conservation
Box 10-420
Wellington
Ph: (04) 710-726
APPENDIX 7

SOME FACTORS TO CONSIDER WHEN CHOOSING NEW ISLANDS FOR TUATARA

Tables 5a and 5b illustrate some factors to consider when investigating new islands as possible sites for tuatara populations. The examples given are islands that have been suggested as possible sites for the first two new populations of the Brothers tuatara (Table 5a) and for a further population of Cook Strait tuatara. Further information on factors or questions to consider in transfer attempts should be sought from Atkinson (1990), Towns et al. (1990) and the Transfer Guidelines For Indigenous Terrestrial Fauna and Flora (DOC Policy 17 September 1990).

TABLE 5a: Comparison of five islands suggested as possible sites for a new population of the Brothers tuatara.

<table>
<thead>
<tr>
<th>Factor considered</th>
<th>Island</th>
<th>Till</th>
<th>Outer Chetwode</th>
<th>Motuna</th>
<th>South Brother</th>
<th>Mana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (ha)</td>
<td></td>
<td>31</td>
<td>80</td>
<td>58</td>
<td>8</td>
<td>217</td>
</tr>
<tr>
<td>Evidence for past presence of tuatara?</td>
<td>No</td>
<td>Possible (Hauser, 1894)</td>
<td>No</td>
<td>No</td>
<td>Possible (bones in midden)</td>
<td></td>
</tr>
<tr>
<td>Approximate distance from North Brother Island (km)</td>
<td>30</td>
<td>35</td>
<td>15</td>
<td>&lt;1</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Approximate no. of tuatara that could be supported²</td>
<td>1500</td>
<td>4000</td>
<td>2600</td>
<td>200</td>
<td>5000+</td>
<td></td>
</tr>
<tr>
<td>Presence of potential tuatara predators?</td>
<td>Norway rats eradicated 1970s</td>
<td>Weku</td>
<td>Kore (eradication carried out in 1990 - apparently successful)</td>
<td>None</td>
<td>Harriers, takahē, black backed gulls</td>
<td></td>
</tr>
<tr>
<td>Is the island beyond the swimming distance of rodents or mustelids from any nearby sources?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Forest with soil suitable for burrowing?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Very small area of windswept scrub</td>
<td>Small area (but could be increased)</td>
<td></td>
</tr>
<tr>
<td>Insects suitable for food?</td>
<td>Tree wetas and spiders abundant; Tree wetas and Mimopeus</td>
<td>Tree wetas and Mimopeus</td>
<td>?</td>
<td>Tree wetas, giant wetas, Mimopeus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small nesting seabirds?</td>
<td>Few, if any</td>
<td>Few fluting shearwaters</td>
<td>Few diving petrels on cliffs</td>
<td>Fairy prions</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
Details from Brian Bell, D. Brown, I. Miller, D. Towns (pers. comm.) or from reference given in body of table, except for number of tuatara supported.

Approximate number of tuatara supported calculated by assuming a density of 100 tuatara/ha over half of each island, except for South Brother which probably has only about 25% of its land area suitable for tuatara.

Conclusions from table 5a:

Both Titi Island and Outer Chetwode Island appear to have considerable potential for tuatara and should be investigated further. The fauna on Titi Island has been degraded by the past presence of Norway rats, which have now been eradicated. Wekas would need to be removed from both Inner and Outer Chetwode Island. Should Outer Chetwode be chosen for tuatara. Both Titi and Outer Chetwode would probably benefit from re-stocking with small petrels to enhance their suitability for tuatara. Duvaucel’s gecko may be present on Outer Chetwode, but would not necessarily be harmed by tuatara as this species co-exists with tuatara on many other islands. The release of tuatara on Titi or Outer Chetwode need not be in conflict with the possible release of other threatened species such as the saddleback there (Roberts, 1990), provided all desired uses of the island are considered from the outset and releases are timed and
located accordingly. Motuara Island also appears to have similar biological potential for tuatara once
kiore are eradicated, but is probably not appropriate as a sanctuary for the rare Brother Island species in
the short-term because of its unrestricted public access.

South Brother Island is in more-or-less pristine condition and the release of tuatara here would conflict
with recommended transfer policy (Atkinson, 1990; Towns et al., 1990); its very small size of
(suboptimal) habitat and its extreme difficulty of access also make it unsuitable (it should, however, be
searched to determine whether tuatara already exist there). Mana Island has the potential to support a
very large population of tuatara, but appears unsuitable in the short-term until a restoration/recovery plan
is prepared for the island.

Somes Island in Wellington Harbour once supported a tuatara population and has the potential to do so
again. It was not considered as a desirable site for either of the first two releases of Brothers tuatara
because the high level of human activity on this island make; it potentially more vulnerable to rodent re-
introduction, but may be appropriate as a site for Cook Strait tuatara (see below).

TABLE 5b: Comparison of three islands suggested as possible sites for a new population of the Cook
Strait tuatara.

<table>
<thead>
<tr>
<th>Factor considered</th>
<th>Mana</th>
<th>Somes</th>
<th>Timui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (ha)</td>
<td>217</td>
<td>25</td>
<td>89</td>
</tr>
<tr>
<td>Evidence for past presence of tuatara?</td>
<td>Possible (bones in midden)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Approx. distance from nearest island with Cook St. tuatara (km)</td>
<td>70km</td>
<td>95km</td>
<td>10km</td>
</tr>
<tr>
<td>Approximate no. of tuatara that could be supported?</td>
<td>5000+</td>
<td>1250</td>
<td>4450</td>
</tr>
<tr>
<td>Presence of potential tuatara predators?</td>
<td>Harriers; takahē</td>
<td>Black-backed gull, barrier</td>
<td>Black-backed gull, barrier, Norway rat</td>
</tr>
<tr>
<td>Is the island beyond the swimming distance of rodents or mustelids from any nearby sources?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (rodents) No (stoats)</td>
</tr>
<tr>
<td>Forest with soil suitable for burrowing?</td>
<td>Small area (but could be increased)</td>
<td>Small area</td>
<td>Small areas</td>
</tr>
</tbody>
</table>
Conclusions from Table 5b:

Of the three islands listed here, Maria is considered as a possible site for Brothers Island tuatara in the longer term, so it might be decided that this species should be given priority there over Cook Strait tuatara. Tinui Island has Norway rats, but a feasibility study to assess the potential to remove these and restore habitats on the island has been developed so it may be suitable for tuatara in the future. A re-introduction of Cook Strait tuatara to Somes Island is the subject of a current proposal (see Objective 13). The primary purpose of establishing a further population of Cook Strait tuatara is to allow the public to see the animals in the wild under controlled conditions (Objective 13), so questions of control of access and impacts of visitation on other island values will need careful consideration.

<table>
<thead>
<tr>
<th>Insects suitable for food?</th>
<th>Tree weta, giant weta, <em>Mimopeus</em></th>
<th><em>Mimopeus</em>, ?tree weta</th>
<th>Not known</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small nesting seabirds?</td>
<td>None (experiment commenced to attract fairy prions to breed)</td>
<td>None</td>
<td>? None</td>
</tr>
<tr>
<td>Suitable nearby source island for re-stocking with insects and pets?</td>
<td>Cook Strait Islands</td>
<td>Cook Strait Islands</td>
<td>Cook Strait Islands</td>
</tr>
<tr>
<td>Open areas of soil for nesting?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Species present that could be endangered by tuatara?</td>
<td>Giant weta; goldstripe gecko; McGregor’s skink</td>
<td>None</td>
<td>? None</td>
</tr>
<tr>
<td>Reserve status</td>
<td>Scientific reserve (with restricted public access and tracks)</td>
<td>(High security quarantine station, MAF)</td>
<td>No (Maori owned)</td>
</tr>
<tr>
<td>Boat access</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Possible conflicts with other goals for the island?</td>
<td>Presence or possible release of incompatible species</td>
<td>Possible release of endangered invertebrates</td>
<td>None known</td>
</tr>
<tr>
<td>Permanently staffed</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
APPENDIX 8: IMPACT ASSESSMENT

Introduction

The major actions proposed in this recovery plan for the next five years are the eradication of kiore from seven islands, and the (re)establishment of tuatara populations on eight islands (three reintroductions to supplement or re-establish nearly extinct populations; three reintroductions to islands where tuatara have been extinct for about 100-200 years; and two introductions to islands where tuatara are not known to have definitely been present). These actions have implications for the existing endemic fauna of these islands, for endemic species that might be introduced in the future to these islands, and for two introduced mammals (kiore, rabbits) currently present on some tuatara islands. Possible impacts from these proposals are discussed below.

Implications of proposed mammal eradications

Both kiore and rabbits were introduced to New Zealand by humans and are thus not part of our native fauna. More are widely distributed throughout South-East Asia, Indo-Malaya, the Pacific Islands and some islands in the Indian Ocean (Atkinson and Moller 1990). They were brought to New Zealand by the Polynesians, who arrived about 1000 AD, and kiore have since spread either accidentally or deliberately to many offshore islands. The dates that kiore first appeared on islands inhabited by tuatara are not known and may for at least some islands have been as recent as 100-200 years ago. Kiore apparently had both positive and negative outcomes for the Maori: they were eaten, but also probably contributed to food spoilage; the extent of a possible role in the spread of disease is unknown (Atkinson and Moller 1990).

Kiore became almost extinct on the New Zealand mainland following the introduction and spread of European rodents. However, they still survive in Fiordland and on many offshore islands, most uninhabited by tuatara. Research is currently being carried out to establish whether there is significant genetic variation among these kiore populations. Excluding Fiordland, kiore were present in 1984 on 55 offshore islands totalling 240,928 ha in area. Between 1984 and 1991 they were eradicated from four of these islands totalling 124 ha. This recovery plan advocates their eradication on a further seven (854 ha) by 1995; this represents 13.7% of the 1991 total of 51 populations and only 0.4% of the 1991 total of 240,804 ha occupied. Thus, the magnitude of the eradication proposed is small and will have no significant effect on the survival of kiore in New Zealand.

Rabbits are present on one island (Stanley) occupied by tuatara. Rabbits were introduced to New Zealand by Europeans in 1777 (Gibb and Williams 1990), and to Stanley about the turn of this century (Towns et al., 1990). There is no evidence that the population on Stanley is genetically distinct from any other population in New Zealand. Rabbits remain widespread throughout much of the North and South Islands and their eradication from Stanley has no implications for the survival of the species in New Zealand.

Both circumstantial and experimental evidence indicates that kiore and rabbit eradication will have many significant benefits for the flora and fauna of these islands, independent of benefits to tuatara. These include increased forest regeneration, and increased abundance of invertebrates, lizards and small seabirds (Towns, 1991 and pers. comm.).
Impact of tuatara (re)introductions on existing and potential endemic island fauna

(Re)introduced populations of tuatara are unlikely to have significant undesirable impacts on the physical environment of their islands. The only major physical modification carried out by tuatara is burrow construction, but the extent of this will probably be insignificant compared with the burrowing activities of co-existing healthy seabird populations. The impact of tuatara on the flora will also probably be small. Tuatara are primarily insectivorous carnivores, and although fragments of plant material (stems, etc.) have been found in their faeces (Walls, 1981) this probably represents material accidentally ingested when catching animal prey. The movements of tuatara about the forest floor could reduce seedling establishment to a small extent, but again the effect is likely to be negligible compared with that caused by healthy seabird populations.

The primary impact of (re)introduced tuatara is likely to arise from predation on prey species. Total daily intake of prey species by tuatara has never been measured and thus it is difficult to predict quantitatively what the overall impact of (re)introduced tuatara might be. Qualitatively, their effect is likely to be much smaller than for an introduced mammal or bird species reaching similar body size and density. This is because reptiles, which are cold-blooded, require only about 10% the level of energy intake required by mammals or birds of the same size (Pough, 1980). Furthermore, tuatara are likely to have even lower food requirements than most other reptiles, because their metabolic rates are extremely low as a consequence of adaptation to cool temperatures (Wilson and Lee, 1970; Wells et al., 1990). Captive tuatara are, for instance, known to survive months without food (Buller, 1877, 1879).

Dietary studies on Stephens Island indicate that the impacts of introduced tuatara are likely to be greatest on ground-dwelling invertebrate prey (see Appendix 1). The major prey item is likely to be beetles such as Mimopeus species, although further information on the diets of genetic stocks of tuatara other than the Cook Strait form would be helpful. Provided that healthy populations of invertebrates are present, the impact of (re)introduced tuatara on lizard and bird populations is likely to be small. Diurnal Leiolopisma skinks are too fast to be frequently caught by tuatara, and nocturnal geckos (Hoplodactylus spp.) are probably too arboreal and fast to be frequently caught. Nocturnal Cyclodina skinks are probably also too fast to be predated in significant numbers. Seabird chicks are probably taken only by adult tuatara and only those species breeding during late spring-autumn would be vulnerable, as tuatara have low activity over winter. Strong evidence of the ability of rare species of lizards and invertebrates to co-exist with safely with tuatara comes from Middle Island in the Mercury Group and from Stephens Island. On Middle, tuatara co-exist with the endangered tusked weta as well as 10 species of lizards, including two endangered species of Cyclodina. On Stephens, rare giant weta and seven lizard species, including the rare striped gecko Hoplodactylus stephensi, co-exist with a high density of tuatara.

Tuatara (re)introductions will only take place following an approved DoC Transfer Proposal, which will include assessment of the impact of tuatara on any sensitive species. Where necessary, tuatara could be released on a distant part of the island from that where sensitive species are present or to be introduced, or even penned where necessary until potential prey populations have reached a pre-determined target population size. This may be particularly relevant for islands recently inhabited by rats, on which prey abundance is likely to be depleted and may take several years following rat eradication to recover. Overall, however,
the small number of individual tuatara likely to be available for reintroduction, plus their low
energy intake, sedentary behaviour, low growth rate, prolonged time till sexual maturity and
low reproductive rate, mean that the impact of tuatara (re)introductions will probably be
small for many decades. Prey species are smaller, faster to mature and reproduce more
quickly than tuatara, and are thus likely to recover more rapidly following rat eradication
than are tuatara, which will probably take decades to even double in numbers. For instance,
based on estimates for nesting frequency, clutch size, incubation success, juvenile
survivorship and age till maturity on Stephens Island, an introduced population of 20 adult
tuatara (five males, 15 females) would require about 15-20 years to reach double the number
of adults (40).

Finally, because of the lack of information on potential success and impacts of (re)intro-
ductions of tuatara, it is important that well-monitored trials with releases of both juvenile
and adult tuatara are carried out in the near future. Efforts under discussion to re-establish
non-endangered genetic stocks of tuatara on islands such as Whale and Somes useful in this
regard. Research to monitor the effects of introduced tuatara on invertebrate populations and
the extent of tuatara dispersal from the release site would be valuable.

Conclusions

The tuatara (re)introductions proposed here have implications for both introduced mammals
and for endemic species potentially or currently present on islands proposed for (re)intro-
duction attempts. More eradication will be required on seven islands representing 0.4% of
the area inhabited as of 1991 on offshore and outlying islands in New Zealand by kiore.
Eradication will thus have no significant effect on the total area occupied by this introduced
species in New Zealand, but will have highly significant positive effects for tuatara. The
re-establishment of healthy populations of tuatara on seven islands previously occupied by
kiore represents 23% of the current number of tuatara populations. More eradication on
these seven islands and rabbit eradication on Stanley will benefit many other aspects of the
biota of these islands in addition to tuatara.

The impact of (re)introduced tuatara will probably be greatest on ground-dwelling
invertebrate prey. To help predict the effects of tuatara (re)introductions on endemic faunas,
research on diets of the different types of tuatara would be useful. DoC Transfer Proposals
are required before the release of tuatara on any island, and these will highlight the presence
of species sensitive to introduction of tuatara. Where necessary, restocking of invertebrate
food supplies and/or temporary penning of released tuatara could be considered. However,
(re)introduction of tuatara need not prevent the introduction or survival of rare prey species
on the same island, provided the introductions are spaced appropriately in both space and
time. Finally, the low metabolic rate, long time till sexual maturity, and low reproductive
rate of tuatara, and the low numbers proposed for release, suggest that the impact of
(re)introduced tuatara will probably be small for many decades, and much less than the
effect that kiore had prior to eradication.
REFERENCES


Newman, D.G. 1987b. Burrow use and population densities of tuatara (Sphenodon punctatus) and how they are influenced by fairy prions (Pachyptila turtur) on Stephens Island, New Zealand. Herpetologica 43: 336-344.


