

Final Report for the Ministry of Environment, Lands and Agricultural Development

Compile and Review Invasive Alien Species Information

Shyama Pagad
Programme Officer, IUCN SSC Invasive Species Specialist Group



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Glossary and Definitions

NATIVE SPECIES

Plants, animals and other organisms that occur naturally on an island or in a specified area, having either evolved there or arrived there without human intervention.

INTRODUCED (= ALIEN SPECIES)

Plants, animals and other organisms taken beyond their natural range by people, deliberately or unintentionally.

INVASIVE SPECIES

Introduced species that become destructive to the environment or human interests; can also include some native species that proliferate and become destructive following environmental changes caused by human activities.

BIOSECURITY

Sometimes used to include all aspects of invasive species management, but in this document used in the more restricted sense of preventing the spread of invasive species across international or internal borders, including between islands.

SURVEILLANCE

Monitoring to detect the arrival of new incursions of invasive species.

MONITORING

Programmes to detect change, e.g. in the distribution of invasive species, the success of management projects etc.

CONTAINMENT

Keeping an invasive species within a defined area.

CONTROL

Reducing the population of an invasive species.

BIOLOGICAL CONTROL / BIOCONTROL

Controlling an invasive species by introducing a natural enemy, such as an insect or fungus, that specifically attacks the target species and does not attack other native or economically important species.

Definitions as set out in the *Guidelines for Invasive Species Management in the Pacific*



Compile and Review Invasive Alien Species Information – Final Report

Introduction

A Global Environment Facility (GEF) funded project is currently being implemented in Kiribati titled the “*Prevention, Control and Management of Invasive Alien Species in the Pacific Islands*”. This is a multicountry project and includes the Niue, Federated States of Micronesia, Cook Islands, Marshall Islands, Papua New Guinea, Palau, Tonga, and Samoa. Activities within the framework of this project include the conservation of priority species and ecosystems and the management of invasive alien species. Please see Table 1 below for list of key deliverables identified by the Government of Kiribati

Table 1: List of Activities identified by the Government of Kiribati for implementation as part of the GEF funded project 'Prevention, Control and Management of Invasive Alien Species in the Pacific islands'. This information has been extracted from the table of 'Key Deliverables'

| Relevant OUTPUTS | IDENTIFIED ACTIVITIES |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1.2.1 National invasive Species Coordinators are appointed and multi-sectoral national invasive species committees are formed for seven participating countries and carryout regular meetings 2 or more times per year | Position established to coordinate activities under this project. |
| 1.2.2. Seven participating countries update or write National Invasive Species Strategies and Action Plans to ensure a high quality & that they are harmonized with the regional Guidelines for Invasive Species Management in the Pacific | Revise National and Line & Phoenix Islands invasive species strategies and action plans. |
| 1.2.3 Training/capacity needs are identified and training programs for key invasives management issues are developed and implemented in Kiribati, Niue, PNG and Samoa. | Carry out an invasive species training needs analysis |
| | Training and capacity building on risk assessments and pathway analysis. |
| 1.2.4 National invasive species management facilities and equipment are reviewed, and development plans produced, facilities improved in Niue and Kiribati. | Improve quarantine inspection and decommissioning facilities on S Tarawa, Kiritimati and Canton |
| 1.2.6 Kiribati uses regional invasives services to strengthen its capacity for planning, implementing, monitoring and evaluating its invasive species activities. | Participate in PILN and other regional invasive species planning fora. |



| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 2.1.1. Surveys or monitoring systems are implemented in 5 countries to document the status and/or impact of invasives and native biodiversity in marine and terrestrial sites (including protected areas), include in local or regional databases All countries will implement monitoring as part of management under component 3. | Surveys of IAS to establish status and distribution and form a basis for detecting change. |
| 3.1.1. Inspection and treatment procedures are improved to ensure that invasives are not transferred from one country to another or between islands of the same country. The general strategy will be tried in Kiribati but specific measures for high risk taxa identified <i>a priori</i> are under 3.1.2 | Improve pest control on Kiribati-registered inter-island transport. |
| 3.1.2. Early detection and rapid response (EDRR) procedures are established for priority potential invaders (e.g. snakes, ants, mongoose, plants etc.) for the 5 countries identified in Appendix 6 of the Project document. | Write and implement an EDRR plan. |
| 3.2.1. Best practices are determined and implemented for invasive species management of priority species and sites identified in Appendix 6 of the Project Document. | Write a management plan and implement it for two myna species in Betio, Tabiteuea North and Onotoa. |
| 3.2.2 Priority invasive species are eradicated (completely removed) from islands where feasible (7 projects in 5 countries identified in Appendix 6 of the Project Document). | Conduct feasibility studies for pest eradications on uninhabited islands, draw up plan of action and begin priority eradications. |
| 5.1.1 UNEP standards of transparency, accountability and success metrics are objectively assessed for all ten participating countries. | Inception workshop, independent evaluations, audits |

appropriate priorities for the formulation of an effective and practical strategy and action plan. Biodiversity information management including data and information on the threats to biodiversity are critical to the success of these projects. Access to, and availability of current and credible biodiversity data and information are a must for setting conservation action priorities, managing pathways of introduction, spread and control of invasive species and other threats to biological diversity.

The following areas were identified for this Desk-top review leading to the development of a comprehensive **invasive alien species database for the Government of Kiribati**



- ☞ An annotated inventory of IAS by island, invasiveness and habitat including risk assessment ranking
- ☞ An annotated inventory of key endemic and threatened species at island and site level
- ☞ An annotated inventory of designated natural areas and ecosystems with notes on threat/pressures on these areas
- ☞ An annotated inventory of 'at risk' invasive species in neighbouring countries with pathways of introduction and dispersal
- ☞ An annotated inventory of all invasive species prevention, management/control related projects undertaken in Kiribati including on-going initiatives

A comprehensive desk-top review was undertaken. Journal articles, reports, project documents and data and information from all significant databases was surveyed for relevant information. All the data and information collated was structured into annotated inventories.

A concise discussion is presented based on a synthesis of the data and information collated highlighting key invasive alien species already occurring in the country or at the verge of potential invasion (considering pathways of introduction), key endemic and threatened species, and threatened ecosystems with description of threats/pressures.

The discussion is presented in four sections

- ☞ Section 1- presents a comprehensive account of alien and invasive species in Kiribati including their impacts on native and endemic species and natural
- ☞ Section 2- presents information on 'at risk' alien and invasive species present in neighbouring countries and key trading partners including pathways and vectors of introduction and spread
- ☞ Section 3- describes key endemic and threatened species of Kiribati as well as threats to these species
- ☞ Section 4- describes the priority conservation areas and ecosystems of Kiribati as well as threats to the ecological integrity of these sites
- ☞ Section 5- describes all invasive species related management action undertaken in Kiribati including completed, on-going and planned

All data and information collated are compiled in sortable annotated lists in Excel format that facilitate analysis and allow users to store, filter, manipulate and graph data. These inventories are annexed to this report (see **Kiribati Inf 1- Inf 4**). All source information collated has been stored and will be presented.



SECTION 1

Alien and Invasive Species in Kiribati

The Guidelines for Invasive Aliens Species Management in the Pacific describes invasive species as “Introduced species that become destructive to the environment or human interests; can also include some native species that proliferate and become destructive following environmental changes caused by human activities.” Invasive species can negatively impact native ecosystems and the species they contain. These impacts may disrupt the ecosystem processes, degrade habitats, reduce biodiversity and introduce diseases to flora and fauna

Island ecosystems appear to be more vulnerable to invasions. Island ecosystems tend to have fewer species present and are less complex with distance from the continent; simpler systems are less resilient to new arrivals. Introduced mammal predators (rats, feral cats, mongooses, stoats and pigs) and herbivores (rabbits, deer, goats and sheep), alien invasive plants and introduced diseases have had devastating effects on native and endemic island species and their habitats.

A comprehensive desk-top review was undertaken to compile an annotated inventory of introduced and invasive species recorded in Kiribati that have impacts on native biodiversity and natural areas (see **Kiribati-Supporting Inf**).

Key Information Sources

Five main online resources were used they are the IUCN ISSG Global Invasive Species Database (GISD)¹, Pacific Island Ecosystems at Risk (PIER)², CAB International Invasive Species Compendium (ISC)³, FishBase⁴ and SeaLifeBase⁵. Additional searches were conducted on Biological Abstracts Database, Google Scholar and other reports.

The GISD focuses on alien species known to have negative impacts on native biodiversity and ecosystems. It features over 850 species profiles of some of the most harmful species. While there are taxon and geographical biases on selection of species (due to funding sources and priority themes) that are featured on the GISD, the Oceania region is well represented with a large number of harmful species listed. Other information extracted from the GISD included

¹ Global Invasive Species Database < <http://www.issg.org/database/welcome/>>

² Pacific Islands Ecosystems at Risk < <http://www.hear.org/pier> >

³ CAB International Invasive Species Compendium < <http://www.cabi.org/isc/default.aspx?site=144&page=4066>>

⁴ FishBase < <http://www.fishbase.org/>>

⁵ SeaLifeBase < <http://www.sealifebase.org/>>



information on taxonomy, species organism type, common names, habitat type, biome, biostatus information and information on pathways of introduction and spread of these species.

The PIER database is focused on plant species that are known to have been introduced to the Pacific region including the Pacific Rim. Information extracted from PIER included biostatus of alien species at island level, common names in Pacific languages, habitat information and most importantly links to risk assessments conducted for the Pacific region.

CABI ISC is an encyclopedic type of database on invasive alien species that impact biodiversity and livelihoods. CABI maintain compendia on Crop Protection, Forestry, Aquaculture and Animal Health and Production. The CABI ISC lists invasive species that impact biodiversity as well as pests of crops and pathogens. The focus for this project was on species that are known to impact biodiversity and ecosystems.

FishBase and SeaLifeBase are databases focused on all fish species known to science. Data and information included in FishBase includes ecological information, information on traits and distribution at country and ecosystem level including in the introduced range of fish species in the aquatic system (both marine and freshwater). SeaLifeBase consists of similar information on marine species.

Results of information review

Results of the desktop review indicate that 202 alien/introduced species that are known to have invasive traits (invasive and potentially invasive) have been recorded in Kiribati. Of these 175 are plant species, and 27 animal species. A majority of these species occur in the terrestrial system (185), followed by terrestrial/freshwater (11), 2 each in freshwater and marine, and 1 each in marine/brackish and terrestrial/brackish (see **Kiribati-Invasives Inf 1.1 in Supporting Inf-1 Excel file**).

A review of databases and literature was conducted to assign biological status to the species based on evidence of impacts and any notes on aggressive growth. 89 species have been classified as 'invasive' while the 'invasiveness' of the remaining 113 species have been listed as Alien indicating that invasiveness has not been specified (see **Kiribati-Invasives Inf 1.1 in Supporting Inf-1 Excel file**).

Records of alien and invasive species occurrence have been created on where this information was known. Annotations have been recorded for each of the species include higher taxonomy, common names in English and I-Kiribati, organism types, species preferred habitats, pathways



of introduction and spread, risk assessment scores with links. (see **Kiribati-Invasives Inf 1.2 in the Supporting Inf-1 Excel file**)

Results of 2004 Survey of Invasive Plants of Environmental Concern

A survey of invasive plant species of environmental concern, was conducted by the US Department of Agriculture, Forest Service, Institute of Pacific Islands Forestry in 2003, at the request of the Government of Kiribati

The survey was carried out on the islands of Tarawa, Abemama, Butaritari and Maina (a substitution for Beru).

The objectives of the survey were to:

- (1) identify plant species presently causing problems to natural and semi-natural ecosystems;
- (2) identify species that, even though they are not presently a major problem, could spread more widely or are known to be problem species elsewhere;
- (3) confirm the absence of species that are a problem elsewhere and, if introduced to Kiribati, could be a threat there; and
- (4) make appropriate recommendations.

(Source: Space and Imada 2004)

Results of this survey (Space & Imada, 2004) (recorded in tables) that are relevant to this study (see below) have been reproduced as part of this database of information. It must be noted that all the results of this study have been included with appropriate annotations.

Introduced species that are invasive or potentially invasive on Tarawa, Abemama, Butaritari or Maiana, and (see **Space and Imada 2004 Inf 1.3 in the Supporting Inf- 1 Excel file**)

Other species that are reported as invasive or weedy elsewhere and are common, weedy or cultivated on Tarawa, Abemama, Butaritari or Maiana (see **Space and Imada 2004 Inf 1.4 in Supporting Inf-1 Excel file**)

The review process is a critical part of this project. It is envisaged that all the records created will be reviewed and corrections made and gaps identified. Revisions to the dataset will be made based on comments before finalisation of the invasive alien species inventory.



SECTION 2

Pathways of introduction and spread of invasive alien species

Information on the identity of the pathways of introduction and spread of invasive alien species along with details of vectors are necessary for the prevention of introduction of potentially invasive species and also for the containment of further spread of established invasions. This knowledge allows conservation managers to a) Prepare for the arrival of known (and unwanted) potentially invasive species (and other species of uncertain status that may prove to be likely to become invasive as determined by a risk assessment), b) Develop monitoring systems for yet unknown (and unwanted) potentially invasive species applicable in specific areas or industries, c) Establish barriers (physical, legislative, community-managed) to the introduction of unwanted species, d) Prepare for the spread of recognized invasive species that have already entered a country (or ecosystem) and e) Develop communication campaigns and codes of conduct addressing key stakeholders to support preventative measures (from the Invasive Alien Species Pathway Management Resource⁶)

The two key pathways of entry of introduced and potentially invasive species into island nations are through the Air and Shipping (including visiting yachts) services.

Where pressurized aircraft cabins and holds are not screened or treated it is possible for mammals and invertebrates to enter these areas prior to a flight, survive the journey and be released on arrival at the destination. Whilst this may not always happen in adequate numbers for the species to establish in the new location, however it has been shown that for some invasive species the main vector for transference has been an aircraft. For example- Yellow crazy ants (*Anoplolepis gracilipes*) have been spread from their natural range by becoming accidental stowaways on aircraft causing these species to establish globally. The yellow crazy ant through its ability to forage night and day and extremely competitive foraging techniques is causing severe environmental damage through displacing keystone species and by degrading leaf litter, reducing seedling recruitment and speeding up microbial decomposition processes.

Ships ballast water has been the introduction pathway for many damaging and costly invasive species. The ballast water that is pumped into tanks to stabilise cargo ships is continually loaded and discharged to balance a continually changing freight manifest. Water can be taken on in large quantities in one harbour and then discharged in the next; this may be a few

⁶ The Invasive Alien Species Pathway Management Resource is a toolkit under development
<<http://www.pathway-toolbox.auckland.ac.nz/>>



kilometres away, or in a new country several thousand kilometres away. When the water is taken on board and likewise when it is discharged there are few controls on what is taken on board in the water, in this way species are spread around the planet and this vector has been the cause of the spread of a large number of pest species.

Ships including yachts also move simple static species when these attach themselves to the ship and form a small colony on a ship's hull. This can develop during a voyage, or between periods of renewed anti-fouling, and are spread merely by their normal processes of reproduction being on a mobile substrate. Depending on the methods of anti-fouling, when a ship is taken into dry dock and has its hull cleaned species that are removed, if not carefully disposed of, can establish locally when the dock is re-flooded or in adjacent waterbodies and drains. This vector provides for the spread of many mollusc, fanworm, algae and aquatic plant species (Information on pathways from the Invasive Alien Species Pathway Management Resource)

Knowledge of pathways and vectors of spread of established invasive alien species is crucial for their containment. Assessing the risk of spread of species is important especially for taking decisions regarding the allocation of scarce resources for the control of established invasive species. Information on pathways of introduction and spread has been included in **Kiribati-Invasives Inf 1.2 in Supporting Inf-1 Excel file**- see SPREAD/DISPERSAL- notes have been reproduced for plant species from PIER (2013) and ISSG (2013)

A pathways of introduction resource prepared during a similar project has been included (**see Kiribati Pathways Inf 2.1 in the Supporting Inf- 2 Excel file**). Inventories of species both native and known invasive species were created for some of the key Pacific Island nations and trading partners of Kiribati – Fiji, Tonga, Samoa United States of America, Australia and New Zealand (in terms of potential introduction of species through human mediated introductions). Over 1300 species were identified. Pathways of introduction were identified for each of these species and listed. The pathway terms were adopted from the schema used in the documenting of similar information in the ISSG (2013). It must be noted that this exercise of identification of species that may be of potential risk to Kiribati was merely one of matching lists of species. No research was conducted to evaluate the potential risk based on climate matching etc.

Space and Imada (2004) developed a list of “*Invasive species present in Fiji, Guam, Hawai’i, the Marshall Islands, Nauru, Samoa or Tonga but not present in Kiribati* “. This table has been reproduced as it provides important information on invasive plant species that are a potential threat to Kiribati (**see Space & Imada Inf 2.2 in Supporting Inf- 2 Excel file**). Pathways information for a majority of these species has been included in the two outputs **Kiribati-Invasives Inf 1.2 and Kiribati Pathways Inf 2 in Supporting Inf- 1 Excel file**.



SECTION 3

Kiribati and its biodiversity

Kiribati is a group of 32 coral atolls and one raised coral atoll on the Equator, lying about half way between Hawaii and Australia. The atolls can be divided into Banaba, Gilbert Islands, Phoenix Islands and Line Islands. Twenty-one of the 33 islands are inhabited; Banaba is one of the three great phosphate rock islands in the Pacific Ocean. Heavy pollution in some parts of the country, such as the lagoon of south Tarawa atoll, is a major environmental issue. In 2008 Kiribati expanded the Phoenix Islands Protected Area, creating the world's largest marine protected area.

Great marine biodiversity has been recorded, including more than 120 species of coral and 520 species of fish, some new to science. Some 115 hard coral species have been recorded from Tarawa and Abaiang Atolls in the west alone. The Vulnerable blue coral (*Heliopora coerulea*) is reported to be widespread, although uncommon in the Pacific. Many of the atolls in Kiribati, and especially some of those in the Line and Phoenix Islands, are internationally important for their huge concentrations of breeding seabirds. Because all but one island in the Phoenix Islands is uninhabited, many of the islands feature relatively intact ecosystems.

Conservation of Biological diversity in Kiribati

Kiribati is a Party to the Convention on Biological Diversity (CBD)⁷. The 's commitments to the CBD are the basis of all priorities related to the conservation of biological diversity. The Government of Kiribati acceded to the CBD in 1993. The principle instrument for implementing the CBD at the national level is the National Biodiversity Strategy and Action Plan (NBSAP). Kiribati National Biodiversity Strategy and Action Plan (K-NBSAP) was developed in 2005 by the Environment and Conservation Division- Ministry of Environment, Lands and Agricultural Development, Government of Kiribati and submitted to the CBD in 2006.

Measures taken for the implementation of the Convention and their effectiveness have to be reported to the Convention in National Reports. Kiribati has submitted the Fourth National report in 2011

Island biodiversity, mountain biodiversity, forest biodiversity, Inland water ecosystems etc. are thematic programmes under the CBD. Protected Areas is a cross-cutting issue within the CBD. Each of these themes has a programme of work, in the case of protected areas known as the

⁷ Convention on Biological Diversity (CBD) < <http://www.cbd.int/>>



Programme of Work on Protected Areas (PoWPA)⁸. Countries are also required to submit action plans related to the PoWPA. Kiribati submitted a PoWPA Action Plan in 2011.

In addition to the CBD, the Government of Kiribati is a signatory to the Convention concerning the Protection of the World Cultural and Natural Heritage - World Heritage Sites⁹. Regionally it is a member of the Secretariat of the Pacific Region Environment Programme (SPREP) and the Secretariat of the Pacific Community (SPC)

Endemic and Threatened Species of Kiribati

The following resources have been used to compile records of endemic and native species of Kiribati that are under risk of extinction (threatened and or endangered) and collate information on their conservation status and threats- they include the IUCN Red List of Threatened Species¹⁰, Kiribati NBSAP and the latest Fourth National Report submitted to the CBD.

IUCN Red List of Threatened Species

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. Species are classified as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) are threatened with the risk of extinction. Other categories include Near Threatened (NT), Lower Risk (Conservation dependant) (LR/cd), Least Concern (LC) and Data Deficient (DD). Species that are Extinct (EX) are also included. The IUCN Red List also provides information on the major threats driving the decline of these species populations.

A query on 'Kiribati' on the IUCN Red List results in an annotated inventory of 784¹¹ species that are known to be native to the country. **The list includes species that have been declared extinct, endemic species, species that have a restricted range that includes some Pacific countries, as well as those with a world-wide distribution.** These species have been conservation assessed using IUCN Red List criteria and categories. In addition to the country inventory, species lists have been provided for Gilbert Islands (42 species), Line Islands (62 species) and Phoenix Islands (88 species). Annotated inventories of all the species listed as

⁸ Programme of Work on Protected Areas (PoWPA) <<http://www.cbd.int/protected/implementation/actionplans/>>

⁹ Convention concerning the Protection of the World Cultural and Natural Heritage - World Heritage Sites <<http://whc.unesco.org/en/conventiontext/>>

¹⁰ IUCN Red List of Threatened Species < <http://www.iucnredlist.org/>>

¹¹ The actual query result is 784 species- this includes *Homo sapiens* which has been excluded in this case



native/endemic to Kiribati (including those in the Gilbert Islands, Line Islands and Phoenix Islands is provided (see **Kiribati-Native-Species Inf -3.1 in Supporting Inf- 3 Excel file**). A majority of the assessed species belong to Animalia (771) - and 13 to Plantae.

A majority of these species occur in the marine biome (722) followed by Terrestrial/Marine (29) and Terrestrial/Freshwater/Marine (10) (see Table 2 for a breakdown of species and biomes). In the marine biome most of the species are found in the shallow marine environment from low waters to depths of 200 mts (600 ft) a zone that is characterized by relatively abundant nutrients and biologic activity because of its proximity to land. Together with the estuarine habitat, it is the most productivity in the sea. This is the zone where corals occur and provide the major food source to fish.

Table 2: Species Biomes- Kiribati

| | |
|-------------------------------|------------|
| Terrestrial | 7 |
| Freshwater | 1 |
| Marine | 722 |
| Terrestrial/Freshwater | 9 |
| Terrestrial/Marine | 29 |
| Terrestrial/Freshwater/Marine | 10 |
| Freshwater/Marine | 5 |
| | 783 |

101 of the 783 species assessed are classed into an IUCN threatened category (11 'Endangered (EN)' and 89 'Vulnerable (VU)'); 120 species are classified as 'Near Threatened (NT)', three species as 'Lower Risk- Conservation Dependant (LR/cd)' and 510 as 'Least Concern (LC)'. 50 species are classified as 'Data Deficient (DD)' (Please see Table 3 for the breakdown in Red List categories).



Table 3: Native species of Kiribati that have been conservation assessed using the IUCN Red List criteria

| IUCN Red List Category | Numbers of species |
|-------------------------------------|--------------------|
| Endangered (EN) | 11 |
| Vulnerable (VU) | 90 |
| Lower Risk (Conservation dependant) | 3 |
| Near Threatened (NT) | 120 |
| Data Deficient (DD) | 50 |
| Least Concern (LC) | 509 |

One species is classified as endemic to Kiribati, this is the Kiritimati Reed Warbler *Bokikokiko* (*Acrocephalus aequinoctialis*). The major threats are habitat degradation and loss and predatory mammals. Three other native Endangered species are impacted by the introduction and spread of invasive species, these are the Rimatara Lorikeet (*Vini kuhlii*), White-throated Storm-petrel (*Nesofregetta fuliginosa*), and the Phoenix Petrel (*Pterodroma alba*). A description of the invasive species threat, management action and conservation outcomes is provided below (Source ISSG Island Biodiversity and Invasive Species Database IBIS).

Kiritimati Reed Warbler Bokikokiko (Acrocephalus aequinoctialis)

The Kiritimati Reed-Warbler is classified as ‘Endangered (EN)’ in the IUCN Red List of Threatened Species. It is endemic to Kiritimati (Christmas Island) and Teraina (Washington) islands in the Northern Line Islands, Kiribati. The population is estimated at 2,500 to 9,999 mature individuals, and numbers are suspected to be declining (BirdLife International, 2012).

The species is found in open areas with dominant *Tournefortia argentea* trees, dense brush and sometimes with introduced coconut palms (*Cocos nucifera*). As a poor flier it spends much of its time foraging close to the ground for insects and small lizards.

The main threats to this endemic species are habitat loss and degradation caused by fires, clearing for coconuts, development and the abundance of introduced weeds such as *Pluchea indica*. Hunting of the birds by children with slingshots may also pose a threat. Introduced mammals present on the islands, and which may potentially be exerting predation pressures on the population, are feral cats (*Felis catus*), and the introduced Black rat (*Rattus rattus*), though spread of the latter has been unusually slow and limited to inhabited areas (BirdLife International, 2012).



A survey and capacity building study was carried out in June 2007 over a 32,700 ha area on Kiritimati with the objective of assisting the recovery of populations of seabirds and *Bokikokiko* (Pierce *et al.*, 2007). Aims of the study in regards to the species included: determining the distribution and habitat preferences of *Bokikokiko*, setting up a baseline study to enable the Wildlife Conservation Unit of Kiribati to monitor trends in population numbers over the years, and aggregating other relevant information such as nest locations or proportions of pairs with juveniles in order to estimate productivity rates (Pierce *et al.*, 2007). Survey methods included recording of percentage plant cover of its habitat, playback of recorded calls and observation of the species' response to these calls. The population was found to be potentially at risk from habitat loss, habitat modification due to the spread of invasive weeds such as *P. indica*, and an increased predation pressure by the Black rat. Annual monitoring is critical to identifying any declines in the population, and in deciding on suitable contingency plans if numbers decrease (Pierce *et al.*, 2007).

Some recommendations for conservation management of *Bokikokiko* populations include: a) identification and mapping of current habitat, b) public awareness campaigns to protect these habitat sites, to identify risks, opportunities and solutions for management through collaboration and workshops with landowners, local communities and the government of Kiribati c) obtaining external advice with regards to biosecurity issues such as controlling the spread of the weed *P. indica* and preventing the arrival of invasive ants, d) surveying and identification of additional areas of suitable potential habitat and using these data for baseline monitoring information, e) annual monitoring of populations from June to July along the best transect lines, f) implementation of rat control, g) testing for the feasibility of emergency translocations of individuals to other islands (Pierce *et al.*, 2007)

Preliminary results of the surveys showed that the population had a wide but patchy distribution across Kiritimati. Numbers were estimated at only several hundred individuals. The most important habitat variables influencing species abundances and distribution were found to be (in order of declining significance): abundance of *te mao* (*Scaevola sericea*), presence of the *ten tanini* vine (*Cassytha filiformis*), and height of *te ren* (*Tournefortia argentea*) (Pierce *et al.*, 2007).

The Phoenix Petrel (Pterodroma alba)

The Phoenix Petrel *Pterodroma alba* is classified as 'Endangered (EN)' in the IUCN Red List of Threatened Species. It breeds exclusively in the central Pacific Ocean, and forms colonies on the Line and Phoenix Islands of Kiribati, the Marquesas Islands in French Polynesia, as well as the Pitcairn Islands (BirdLife International, 2012; Gangloff *et al.*, 2009). Population numbers are estimated at 30,000 mature individuals with the island of Kiritimati (Christmas Island) harbouring the largest colony; in 1982 to 1982, the resident breeding population was believed



to have numbered between 20,000 to 25,000 individuals, though the number has since decreased (BirdLife International, 2012).

Phoenix Petrel are found to nest on low atolls, motus and on predator-free volcanic isles (Gangloff *et al.*, 2009). Egg-laying reaches a peak from November to January, followed by a second peak in April to June (Gangloff *et al.*, 2009). Cephalopods are the prime component of their diet, which is also supplemented by crustaceans and fish (BirdLife International, 2012).

Phoenix Petrel are unable to survive on islands where cats are present, presumably due to excessive predation (BirdLife International, 2012). The arrival of Black rats on Kiritimati has posed a major threat on the species' largest breeding colony, and predation may severely reduce the global population of this species (BirdLife International, 2012). On other atolls in the Pacific, Pacific rats (*Rattus exulans*) may be preying on bird colonies, though it is believed that significant predation rates on the species are usually a consequence of decreased availability of plant foods for the rats (Gangloff *et al.*, 2009). On Hatuta'a Island, which is part of the Marquesas Islands group of French Polynesia, vegetation development was high, suggesting abundant plant foods for Pacific rat, which in turn implies diminished predation pressures on the resident Petrel population (Gangloff *et al.*, 2009).

A cat eradication programme on Kiritimati was largely unsuccessful. There have been plans to attract the species to breed on the cat-free Jarvis Island National Wildlife Refuge, some 200 miles away from Kiritimati, with the aid of acoustic playback recorders. In 1997, Pacific rats were removed from the islands of Oeno and Ducie, Pitcairn where small colonies are present (BirdLife International, 2012).

Conservation measures proposed include conducting population surveys of the Petrel as well as monitoring colonies, particularly in the Phoenix Islands. The risks of rodent introduction and the impacts of island development should be evaluated. Rats and cats should continue to be eliminated from all islands where colonies are present, and the plans to attract individuals to breed on Jarvis Island using acoustic playback recorders should be executed (BirdLife International, 2012).

The White-throated Storm-petrel (Nesofregetta fuliginosa)

The White-throated Storm-petrel (*Nesofregetta fuliginosa*) is classified as 'Endangered (EN)' in the IUCN Red List of Threatened Species. It is native to Kiribati, Chile, Fiji, French Polynesia (BirdLife International 2010).

The current known population is 1,000-1,600 mature individuals. However this is based on surveys from the 1990s and as such the population may actually be lower than this (BirdLife



International 2011). It usually nests in colonies with burrows dug in sand, under vegetation or in rock-crevices (BirdLife International 2011).

A major threat to the White-throated Storm-petrel is predation by rats (*Rattus* spp.) and cats. Predation of eggs and small chicks by the house mouse (*Mus musculus*) is an additional threat (BirdLife International 2011).

Current conservation methods include a cat eradication programme in Kirimati, which was unsuccessful. A total of 23 motu (islets) in Kiribati have been targeted for rat eradication, with more planned for the future. In New Caledonia the Société Calédonienne d'Ornithologie was due to implement a rat eradication program on 18 islets in order to restore suitable breeding area for *N. fuliginosa*. Rabbit and rat eradication was also implemented on McKean and Phoenix Island (Kiribati) in 2008. Future recommendations for management of threats include further eradications of rats and cats from small islets within its breeding range and throughout the Line and Phoenix Islands (BirdLife International 2011).

On Kiritimati, a cat eradication programme has failed to limit predation by feral cats outside villages (M. Rauzon in litt. 1999, E. A. Schreiber in litt. 1999) but, at Jarvis Island National Wildlife Refuge (200 miles from Kiritimati), a colonisation programme has been successful and, in March 2000, three *N. fuliginosa* were observed displaying (Flint and Aycock 2000). A total of 23 motu in the central lagoon area have been targeted for rat eradication, with more eradication on additional motu planned for the future (R. Pierce and D. Brown in litt. 2009). In New Caledonia, the Société Calédonienne d'Ornithologie was due to implement a rat eradication program on 18 islets including the site of the only previously known colony in 2007-2008 to restore suitable breeding conditions for the species (V. Chartendraul in litt. 2007). Rabbit and rat eradication occurred on McKean and Phoenix Island in 2008, though the results have not been confirmed (R. Pierce et al. in litt. 2008, R. Pierce in litt. 2009).

Survey all nesting islets (M. Rauzon in litt. 1999) including those off the main Samoan islands (SPREP 1999). Eradicate rats and cats from key small islets within its breeding range, e.g. Temoe Island (M. Rauzon in litt. 1999, G. Wragg in litt. 1999), and throughout the Line and Phoenix Islands (A. K. Kepler in litt. 2000).

The Rimatara Lorikeet (Vini kuhlii)

The Rimatara Lorikeet (*Vini kuhlii*) is classified as 'Endangered (EN)' in the IUCN Red List of Threatened Species. The species occurs on the islands of Rimatara, in the Tubuai Islands of French Polynesia, Teraina, Tabuaeran, and Kiritimati in the Republic of Kiribati. A recent translocation of the species led to a number of individuals establishing on Atiu in the Cook



Islands. The global population of *V. kuhlii* has been numbered at 2000 mature individuals (BirdLife International, 2012).

The main invasive species threat to lorikeet is nest predation by Black rats. Pacific rats and cats which are present on Kiritimati could be posing further predation pressures on the population (BirdLife International, 2012). The species is also believed to be threatened by the presence of the common myna (*Acridotheres tristis*).

The species is protected in Kiribati and French Polynesia. 27 individuals were translocated to Atiu from Rimatara in May 2007 with the objective of creating a reserve population in the southern Cook Islands (BirdLife International, 2012).

A project targeting the control of the common myna was conducted over a 2695ha area on Atiu, beginning in 2009. In October 2010, a full-scale eradication was implemented with the addition of shooters. Management and eradication procedures are ongoing (CIPIP, 2011; McCormack, pers. comm.).

Kiribati- National Biodiversity Strategy and Action Plan (2006) and latest Kiribati Fourth National Report to the CBD

The Kiribati Biodiversity Strategy and Action Plan (K- NBSAP 2006) provides information on Endangered species of Kiribati. The following tables that are relevant to this review have been reproduced (**see EN-Animalia K-NBSAP Inf 3.2; EN-Plantae K-NBSAP-Inf 3.3; and EN- Marine-sp-K-NBSAP Inf- 3.4 in Supporting Inf- 3 Excel file**)

- Endangered Animalia- K-NBSAP- A list of animal species native to Kiribati and of cultural and conservation value

Note: Annotations including higher taxonomy and species authority, common name in English, organism type, habitat, IUCN Red List status for those species that have been assessed has been included. It was found that there were several errors in species scientific name spellings and taxonomy. Comments have been included in the 'Comments' column. It is hoped that the list will be corrected when the report is reviewed.

- Endangered Plantae- K-NBSAP- A list of plant species of socio-economic and cultural value to the people of Kiribati that are less common



Note: It was found that several of the plant species listed in this table are found to be alien species with a majority of them deemed invasive in Kiribati. Comments have been added to the 'Comments' column and the species have been highlighted in the table

- Endangered Marine Species-K-NBSAP- A list of marine species of socio-economic and cultural value to the people of Kiribati with some information on the threat to these species.

The Kiribati Fourth National Report provides an overview of the biodiversity of Kiribati with current threats. Bird species are stated to be most vulnerable with major causes including degradation and loss of habitat due to extreme weather events, land-use change and the impacts of the spread of invasive alien species- predatory mammals in particular.

The report also describes on-going and planned action related to the management of invasive alien species- including eradication of introduced mammals from priority islands.

SECTION 4

Priority Conservation Areas and Ecosystems of Kiribati

The current Kiribati national target for protected areas (which is inclusive of both marine and terrestrial) is 10% for each of the 3 island groups that make up Kiribati – ie 10% Gilbert Group, 10% Line Group, and 10% the Phoenix group. The Phoenix Islands Protected Area (PIPA) which covers more than 11% of Kiribati's Economic Exclusive Zone (EEZ), exceeds the current 10% national target for Protected Areas.

The World Database on Protected Areas (WDPA)¹² provides the most comprehensive dataset on protected areas worldwide. The WDPA lists 16 'Protected areas' for Kiribati, all 16 in the marine biome. The areas include six Wildlife Sanctuaries, four Closed Areas, and one each of a World Heritage Area (Phoenix Islands Protected Area World Heritage Site), a Marine Reserve, a Bird Reserve, a Conservation Area, a Multiple Use Conservation Area and a Protected Area (Phoenix Islands Protected Area) (see Protected-Areas-WDPA-Inf- 4.1 in Supporting Inf- 4 Excel file).

¹² World Database on Protected Areas –Protected Planet 2013 < <http://www.protectedplanet.net/>>



The K-NBSAP (2006) also lists an inventory of Marine Reserves, Protected Islands and Protected Areas, with no additional data. This inventory has been reproduced (see Protected-Areas-KNBSAP Inf 4.2 in Supporting Inf- 4 Excel file).

Note: While many of the sites are named in both the sources, a confirmation and reconciliation of sites names and values needs to be carried out during the review. The inventories will be revised based on comments received

The major threats to areas of high biodiversity value are over exploitation of marine resources and species- including over-fishing and harvesting for commercial trade; destruction of habitats due to anthropogenic activities; habitat loss and decline in native and endemic species populations due to the spread of invasive alien species. Please refer to the section on native biodiversity for a description of the invasive species threat on key endangered native species.

The Phoenix Island Protected Area (PIPA)

The Phoenix Island Protected Area (PIPA) is centred on the Phoenix Islands in the geographic centre of the Kiribati which are located halfway between Fiji and Hawai'i in the Central Pacific Ocean. The Phoenix Islands contain 8 of Kiribati's 33 islands (Enderbury, Birnie, McKean Island, Rawaki, Orona Island, Kanton Island (Abariringa Is), Manra Island (Sydney Island), and Nikumaroro (Gardner Island)) and constitute 11.34% of Kiribati's Exclusive Economic Zone. PIPA is the largest marine protected area in the world (total area 408,250 km²). The total land area is around 25.51 km². Enderbury Island has an approximate land area of 550 ha, while Birnie is approximately 49 ha in size.

Enderbury Island has the highest diversity of flora of the four PIPA islands targeted for pest eradication and including 15 species of seabirds. Seabird colonies on Enderbury include lesser and greater frigatebirds, three species each of boobies and prospecting shearwaters, and large numbers of red-tailed tropicbirds and sooty terns. Colonies of grey-backed terns and brown noddies are restricted to rat-free lagoon islets. Birnie, the smaller island, has lower habitat diversity and ~ 10 seabird species. Both Enderbury and Birnie have been invaded by the Pacific rat.

Rawaki is a small uninhabited atoll with shallow, brackish lagoon not connected to open sea., it is treeless, and covered with herbs & grasses. Rawaki is a nesting site for migratory seabirds and turtles. Seabirds present include sooty, grey and white terns, frigates, petrels and shearwaters, boobies, migratory plover and curlew. In 2008 Rawaki and the other Phoenix Islands were placed within the Phoenix Islands Protected Area, one of the largest marine protected areas in the world.



Nikumaroro (Gardner Island) is a small, remote, uninhabited atoll with profuse vegetation and a large, central marine lagoon. Nikumaroro has extensive marine and avian ecosystems including coconut palms, thick scrub and *Pisonia* forest. The Pacific rat is present on the island but feral dogs were eradicated in the 1980s.

McKean is a small, uninhabited island ringed by a reef flat and rising to 5 m asl. The centre of the island is depressed with a shallow, hypersaline, guano-laced lagoon. There is no fresh water. The Pacific rat was eradicated from the island in 2008.

Manra Island is uninhabited and surrounded by a hypersaline lagoon without an outlet to the sea. The island has an elevation of 6 m asl. Vegetation comprises coconut palms, scrub forests, herbs and grasses. Pacific rats, black rats and cats are present on the island.

Orona atoll is uninhabited and comprises a narrow ribbon of land surrounding a sizeable lagoon with depths of 15-20 m. The maximum elevation is 9 m. Rats and cats are present on the island.

Kanton Island is the largest, northernmost and as of 2007, the sole inhabited island in the Phoenix Island Group. The island is a narrow ribbon enclosing a 500 ha lagoon. There are no freshwater sources on the island. Pacific rats, black rats, and cats are present on the island. Kanton is frequented by local and international vessels that could potentially introduced alien and invasive species.

Rat eradication was undertaken on Enderbury and Birnie Islands in 2012. Fundraising for rat eradication began in early 2010 with financial support being provided by the Packard Foundation in mid-2010 followed by Critical Ecosystem Partnership Fund (CEPF) and Global Conservation Fund (GCF) in early 2011. The total budget was c.USD 800,000. The Government of Kiribati provided permits for visiting the PIPA, bait importation, bait application, helicopter clearance, collection of physical and biological samples.

Eradication operation – The removal of introduced rats and cats on Enderbury and Birnie were scheduled to be part of a larger operation of introduced mammal removal. The MV Aquila (a single vessel equipped with two helicopters) was to carry bait and other equipment and eradication experts to Palmyra Atoll, Enderbury and Birnie, and then Henderson in the Pitcairns carrying out planned eradication of vertebrate pests¹³. After completing the project on Palmyra, the MV Aquila sailed to Phoenix Islands Protected Area (PIPA) to remove introduced rats on Enderbury and Birnie. Towards the end of July, Birnie and Enderbury were each

¹³ BirdLife International (2012) A 27,000km voyage of conservation has helped safeguard some of the world's most imperiled seabirds. Presented as part of the BirdLife State of the world's birds website. Available from: <<http://www.birdlife.org/datazone/sowb/casestudy/445>>



targeted by two helicopter drops of rodenticide. Working with the Phoenix Island Protected Area Management Committee and Eco-Oceania Pty Ltd, rat eradication was conducted using PestOff 20R baits containing 20 ppm brodifacoum in 2 gm pellets. At each island the first bait application was at c.20 kg/ha and the second around 1 week later was c.10 kg/ha.

The 2011 operations on Enderbury and Birnie were followed up in May 2013 to determine their success, along with the responses of biota. If the eradication campaigns on Enderbury and Birnie are successful they will represent a future cost-effective approach for eradicating pests in the remaining PIPA islands and elsewhere in the central Pacific. The cost per hectare of this operation using helicopters from a boat was about half the cost of the ground operations undertaken at Rawaki and McKean Islands in 2008 (\$1300/ha, c.f. \$2500/ha). Aerial bait application also had greater reliability of coverage and high operator safety levels, e.g. the 2008 operations on Rawaki and McKean Islands required multiple landings through unpredictable surf conditions and more physical handling of bait.

Management priorities with respect to these islands will involve:

- ☞ Securing the gains achieved by rat eradication by implementing and maintaining higher levels of biosecurity in the PIPA. Improved biosecurity may include establishing observers on tourist and research vessels; and plans are in place to achieve the same with foreign fisheries vessels via training of Kiribati observers.
- ☞ Monitoring the responses of biota (especially vegetation, birds, reptiles) to rat eradication and addressing any emerging threats, e.g. weed infestation, and management issues e.g. lures, translocations.

Enderbury Island – Seabird colonies on the island are expected to increase if rat eradication succeeds. Higher breeding success is likely for the prospecting shearwater and blue noddy colonies and grey-backed terns and brown noddies are likely to breed successfully beyond the confines of the lagoon islets.

Birnie Island – Seabird responses to rat eradication on Birnie Island are expected to be similar to that at Enderbury, with rapid increases in tern and noddy numbers and productivity. Petrels and storm-petrels are likely to recolonize the island, but this needs to be monitored as will the response of vegetation and lizard populations to rat eradication.

There are no rats or cats. A colony of feral rabbits was eradicated in 2008 and in 2009 the eradication was confirmed as successful. The biota have responded positively (Pierce & Kerr, 2013).



Rats are the only mammals known to be present on the island as feral dogs were eradicated in the 1980s. Birds include sooty tern, frigate birds, and Red-tailed Tropic Birds. Crabs include Coconut crabs (*Birgus latro*), other hermit crabs (Coenobitidae) and small shore crabs (*Gelasimus* sp.). Key findings from the May 2013 survey are that Pacific rats are still abundant (Pierce & Kerr, 2013). Coconut crabs reached densities of c. 75/ha (Pierce & Kerr, 2013). Rat eradication is planned after eradications have been carried out on Enderbury and Canton Islands (Pierce & Kerr, 2013).

McKean is treeless with 7 species of herbaceous plants and the world's largest population of the lesser frigatebird (*Fregata ariel*) with up to 85,000 birds. The island was declared a bird sanctuary in 1938 and has been a protected area since then. In 2008 it was included in the Phoenix Islands Protected Area.

Birdlife on **Manra Island** is similar to the other Phoenix Islands, with at least 10 species of seabirds (Pierce & Kerr, 2013). Hermit crabs are abundant. The island was declared a bird sanctuary in 1938 and a wildlife sanctuary in 1975. In 2008, it was included together with the other Phoenix Islands into the Phoenix Islands Protected Area.

Orona is covered with coconut palms on the western side of the atoll and scrub forest, herbs and grasses on the rest of the atoll. The fauna of the island comprises hermit crabs and c. 50 species of insects. At least 10 seabird species are present (Pierce & Kerr, 2010). Turtles are known to use the island as a nesting area. The lagoon teems with fish as well as giant clams. Invasive species on Orona were studied in 2006 and 2009, with supplementary work carried out in 2013. Key preliminary findings in 2013 were: (1) Pacific rats were rare, but cats were present on the main motu; (2) Sooty tern numbers have crashed apparently due to cat and rat depredations; (3) Manai (*Cardisoma* sp.) crabs were locally abundant in coconut plantations, reaching densities of c 2.4 m² particularly in estuarine and other pooled areas; and (4) Coconut crabs were present in higher densities than in 2006 (Pierce & Kerr, 2013).

Much of Kanton's land surface is bare coral, sparsely covered with herbs and bunchgrass. Its lagoon teems with 153 known species of marine life, including sharks, tuna, stingrays and eels. Land fauna includes at least 23 bird species, lizards, hermit crabs and turtles. Biosecurity is a key target of PIPA biosecurity and a biosecurity officer to be appointed on Kanton will be pivotal in keeping invasive ants and other invasive species out of PIPA (Pierce & Kerr, 2013). Key findings of a 2013 survey found no invasive ants during Port and village surveys. The Channel island containing Pacific rats and nesting grey-backed terns and brown noddies is a potential experimental site for trialing refinements to Pacific rat eradications (Pierce & Kerr, 2013). Invasive alien species eradications are planned after rat elimination on Enderbury Islands (Pierce & Kerr, 2013) [Source ISSG Island Biodiversity and Invasive Species Database].



Two Secondary Endemic Bird Areas (EBAs)- Gilbert Islands (secondary area) and the Northern Line Islands (secondary area) have been designated in Kiribati. The endemic Bokikokiko occurs in the Northern Line Islands (secondary area), as does the Tuamotu Sandpiper (*Prosobonia cancellata*). An Alliance for Zero Extinction (AZE) site – the island of Teraina has been declared triggered by the threat to the endemic Bokikokiko. Sites that are the last remaining refuge of one or more Endangered or Critically Endangered species are declared AZE sites. They have to meet the three criteria of Endangerment, Irreplacability and Discretness¹⁴

Atolls and Island groups of Kiribati form part of three global Ecoregions a) Central Polynesian tropical moist forests (Northern Line Islands and Southern Line Islands), Eastern Micronesia tropical moist forests (Gilbert Islands) and the Western Polynesian tropical moist forests (Phoenix Islands). The impacts of invasive alien species, extreme weather events, habitat loss and land-use change are recognised as the primary threats to these ecoregions and the threatened native biodiversity they contain (WWF 2013).

Three Key Biodiversity Areas (KBAs) have been identified in Kiribati- Kotabu and Nabini islet, Phoenix Islands, Teirio. KBAs are areas of international importance based on their importance of maintaining species populations.

Programme of Work on Protected Areas (PoWPA) of the CBD

Kiribati has developed an 'Action Plan for Implementing the Convention on Biological Diversity's Programme of Work on Protected Areas' - (PoWPA)¹⁵ in 2011. The PoWPA Action Plan recognises the status, priority and timeline for key actions proposed.

Following is some key information from the Action Plan

Threats to the protected areas as outlined in the PoWPA Action plan are reproduced below

- ☞ Overpopulation and urban-rural drift (from the outer rural islands to the two urban centres in Kiribati – South Tarawa and Kiritimati Island)
- ☞ Predominant 'tragedy of the commons' approach over natural resources and Government owned properties (State lands, public spaces)
- ☞ Destruction associated with urban development and constructions (ie causeways, channels etc) of coral reefs and associated ecological habitat and species

¹⁴ Alliance for Zero Extinction < <http://www.zeroextinction.org/overviewofaze.htm>>

¹⁵ Programme of Work on Protected Areas (PoWPA) Action Plan 2011

<<http://www.cbd.int/protected/implementation/actionplans/country/?country=ki>>



- ☞ Over exploitation of marine and terrestrial species including unregulated exportation of natural resources, particularly marine resources (ie sea cucumber etc)
- ☞ The use and practicing of unsustainable fishing methods – e.g. use of undersized mesh fishing nets; ‘te ororo’, to name a few
- ☞ Loss of traditional enthno-biological knowledge
- ☞ Change of lifestyle into a money-dependent
- ☞ Introduction of new and additional invasive alien species (including agricultural pests and diseases
- ☞ Limited knowledge on the importance of biodiversity conservation and the actions and measures that should be avoided, reduced or strengthened to enhance and sustain biodiversity for the future and its generations.

Four barriers for effective implementation of the Plan were recognised- they include

- ☞ Limited information and knowledge
- ☞ Institutional and financial gaps
- ☞ Limited understanding of the options to involve current customary right users in biodiversity conservation
- ☞ Limited awareness raising and education

Section 5

Invasive alien species management actions and other key biodiversity related projects

A literature review and consulting exercise of key conservation practitioners was undertaken to compile an annotated inventory of invasive species management action carried out on Kiribati. Information was also documented of any other key biodiversity realted projects.

28 projects have been recorded for Kiribati where information was easily available. It is possible that several projects especially those on management of invasive plants could have been missed. It is hoped that the review will provide comments and events that could have been missed.

The projects include a Biodiversity (National) project, three Biodiversity (Regional) projects, eight Biodiversity (National) projects that involved reporting to the CBD (preparation of NBSAP,



National Reports), and 15 Invasive alien species management projects ranging from surveys, to training and capacity building and vertebrate eradication projects (**see Kiribati Projects- Inf 5 in Supporting Inf 5 Excel file**)

Conclusion

The results of this review provide a baseline for biodiversity data and information for Kiribati, and a detailed description of the threat of invasive alien species on native species and natural areas. A review process was undertaken after the preparation of the draft and updates implemented.

Data and information on the distribution of endemic and native species, their conservation status; the extent and distribution of invasive alien species and other threat information are all critical for the prioritization of conservation action. Reliable and current knowledge of the distribution of invasive species, extent of spread and research into the impacts are critical to better management. Information on alien species that have the potential to become invasive, the need for assessing risk before introduction of any alien species and better border control to prevent introductions are other important factors to consider. It is also important to understand which the pathways of spread are so as to prevent the spread of these species from existing infestations. These data and information are necessary for reporting and planning future action.

It is recommended to keep this resource updated by providing all 'new' information to information providers.

A bibliography has been compiled and all source information stored. These will be provided with the final report

