Report for the Secretariat of the Pacific Regional Environment Programme (SPREP)

Compile and Review Invasive Alien Species Information for the Republic of the Marshall Islands

March 2015

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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 – Report

Introduction

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

Table 1: List of Activities identified by the Government of the Republic of the Marshall Islands 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'

Activity	Deliverable
Attend RISC biannual meeting of Micronesian Chief Executives to provide advice about IAS management and resource needs.	Meeting minutes and communiqué report IAS discussions involving RMI.
Eradication of Chromolaena, Mikania and Merremia from Majuro, Bikini and Kili islands.	Reports about eradication progress
Ant control near coconut crab population on Jaluit	Report about management effectiveness.

RMI has undertaken to develop a National Invasive Alien Species Strategy and Action Plan (NISSAP) in 2015. This desktop study is being implemented to support the development of the NISSAP.

The following areas were identified for this desktop review leading to the development of a comprehensive invasive alien species database for the Republic of the Marshall Islands

- 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 RMI including on-going initiatives

A comprehensive desktop 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 IAS 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 five sections and includes a Bibliography[1]

- Section 1- presents a comprehensive account of alien and invasive species in RMI including any known impacts on native and endemic species and natural areas
- 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 RMI as well as threats to these species
- Section 4- describes the priority conservation areas and ecosystems of RMI as well as threats to the ecological integrity of these sites
- Section 5- describes all invasive species related management action undertaken in RMI 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 RMI Inf 1- Inf 6).

[1] All source information has been submitted in a country source information folder

Key Information Sources

Five main online resources were used for data and information related to IAS; they are the IUCN Invasive Species Specialist Groups Archives and the Global Invasive Species Database (GISD)[2], Pacific Island Ecosystems at Risk (PIER)[3] database, CAB International Invasive Species Compendium (ISC)[4], FishBase[5] and SeaLifeBase[6]. Additional searches were conducted on Biological Abstracts Database, Google Scholar and other reports.

The ISSG holds extensive archives collected over a decade and of IAS information in species folders, country folders and in thematic folders; the archives are enhanced on a daily basis. 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 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 Marshallese, habitat information and most importantly links to risk assessments conducted for the Pacific region. PIER data on the occurrence of alien plants is drawn from all past and recent surveys undertaken by experts in RMI including N, Vander Velde & B. Vander Velde (2009[7], 2010[8]) and Wagner et al 2013[9]

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

[2] Global Invasive Species Database < http://www.issg.org/database/welcome/>
[3] Pacific Islands Ecosystems at Risk < http://www.hear.org/pier >
[4] CAB International Invasive Species Compendium < http://www.cabi.org/isc/default.aspx?site=144&page=4066>
[5] FishBase < http://www.fishbase.org/>
[6] SeaLifeBase < http://www.sealifebase.org/>
[7] Vander Velde, Nancy/Vander Velde, Brian. 2009. Specimens from Likiep, Majuro, Wotje and Arno (unpublished checklist). 4 pp
[8] Vander Velde, Nancy/Vander Velde, Brian. 2010. Survey of Invasive Plant Species and Other Plants of Mili Atoll, Marshall Islands. USDA Forest Resource Management Grant Program. Unpublished report. 6 pp, plus tabulation of plants of Mili Atoll, 23 pp.
[9] Wagner, W. L./ Herbst, D. R./Weitzman, A./Lorence, D.H. 2013. Flora of Micronesia. National Tropical Botanical Garden and the Smithsonian Institution. Online database

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.

The IUCN Red List of Threatened Species[10] was the key resource consulted for information on native and endemic species. The World Database on Protected Areas (WDPA) dataset featured on the Protected Planet Site[11] was used to identify all designated protected areas. Birdlife International's Datazone[12] was consulted for information on native birds and designated Important Bird Areas and Endemic Bird Areas in RMI.

The RMI Clearing House Mechanism[13] resources provided key information on national priorities including datasets on native and endemic species, protected species and those 'deemed of significance'. Additionally, National reports to the Convention on Biological Diversity (CBD) and the National Biodiversity Startegy and Action Plan's (NBSAPS) were key sources of information on national priorities.

[10] IUCN Red List of Threatened Species <http://www.iucnredlist.org/>
[11] Protected Planet <http://www.protectedplanet.net/>
[12] BirdLife International Datazone <http://www.birdlife.org/datazone/>
[13] The Republic of the Marshall Islands Clearing House Mechanism <http://biormi.org/>

SECTION 1

Alien and Invasive Species in RMI

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 invasive plants, mammal predators (rats, feral cats, mongooses, stoats and pigs) and herbivores (rabbits, deer, goats and sheep), 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 that have impacts on native biodiversity and natural areas recorded in RMI and its atolls and islands.

Results of information review

Results of the desktop review indicate that 523 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) have been recorded in RMI. The majority of these are plant species in the terrestrial environment/system. Over 130 species in this inventory are classified as 'invasive' based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as 'invasiveness not specified).

Annotations that have been recorded for each of the species include higher taxonomy, organism types, species preferred habitats, pathways of introduction and spread, risk assessment scores with links and biological status. A list of common names of alien and invasive plant species in Marshallese and English (from PIER-2014) has been provided. Species have been recorded at the country level, as well as at atoll and island level (see RMI Inf-1). The supporting information includes the annotated inventory as well as a alien/invasive species list.

The RMI Biodiversity CHM includes a dataset of 'Pestiferous and potentially pestiferous species' which includes weeds, pests and pathogens of agriculture and known invasive species that impact biodiversity and natural areas (included in RMI-Inf-1). Known alien and invasives species of environmental concern species in the above datasets have been included in the country inventory

***Note**: It is possible that there may be changes in the classification of the biological status of these species related to invasiveness based on feedback received. The lack of a universal standard related to 'invasive species' terminology causes confusion in the assignation of this status*

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 Resource[14])

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

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

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 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 RMI-Inf-1- see 'SPREAD/DISPERSAL' and 'PATHWAYS OF INTRODUCTION' -notes have been reproduced for plant species from PIER (2013) and ISSG (2013)

Inventories of species both native and known invasive species were created for some of the key Pacific Island nations and trading partners of RMI – Federated States of Micronesia, Guam and the Hawaiin Islands (in terms of potential introduction of species through human mediated introductions). Inventories were scanned to identify high risk species (throug risk assessment information for plant species and other evidence of invasiveness) that occurred in neighbouring countries and trading partners and were not known to be present in RMI. An inventory of these 'at risk' species with annotations of their known pathways of introduction and spread was created (see RMI-Inf-2).

Note: *This exercise of identification of species that may be of potential risk to RMI was merely one of matching lists of species. No research was conducted to evaluate the potential risk based on climate matching etc.*

SECTION 3

RMI and its biodiversity

The Republic of the Marshall Islands are located in the North Pacific Ocean about halfway between Hawaii and Australia. The islands comprise two Archipelagic Island chairs (Ralik Chain and Ratak Chain) consisting of five islands and 29 Atolls. These Atolls and islands cover 180 sq kms of land 11,600 kms of lagoon water and 370 kms of coastline[15].

RMI is a Party to the Convention on Biological Diversity (CBD) and the Cartagena Protocol on Biosafety[16]. RMI's commitments to the CBD are the basis of all priorities related to the conservation of biological diversity. The Government of RMI signed and ratified the Convention in 1992 and became a Party to it in 1993. The principle instrument for implementing the CBD at the national level is the National Biodiversity Strategy and Action Plan (NBSAP). RMI National Biodiversity Strategy and Action Plan (NBSAP) was developed in 2000. Measures taken for the implementation of the Convention and their effectiveness have to be reported to the Convention in National Reports. A First and Second National Report were submitted in 1997 and 2001 respectively[17].

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 Programme of Work on Protected Areas (PoWPA)[18]. Countries are also required to submit action plans related to the PoWPA. RMI is yet to submit a PoWPA Action Plan.

In addition to the CBD, RMI is a signatory to the Convention concerning the Protection of the World Cultural and Natural Heritage - World Hertitage Sites[19], the Convention on Wetlands of International Importance (Ramsar)[20], United Nations Framework Convention on Climate Change (UNFCCC)[21], and the United Nations Convention on the Law of the Sea (UNCLOS)[22]. Regionally

[15] State of Conservation in Oceania 2014. Republic of Marshall Islands Draft Country Assessment
[16] Convention on Biological Diversity (CBD) < http://www.cbd.int/>
[17] National Reports and NBSAPS- RMI (CBD) < https://www.cbd.int/reports/search/?country=mh>
[18] Programme of Work on Protected Areas (PoWPA) <http://www.cbd.int/protected/implementation/actionplans/>
[19] Convention concerning the Protection of the World Cultural and Natural Heritage - World Hertitage Sites < http://whc.unesco.org/en/conventiontext/>
[20] Ramsar Convention < http://www.ramsar.org/>
[21] United Nations Framework Convention on Climate Change (UNFCCC) <http://unfccc.int/2860.php>
[22] United Nations Convention on the Law of the Sea (UNCLOS <http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm>

RMI is a member of the Secretariat of the Pacific Region Environment Programme (SPREP)[23] and the Secretariat of the Pacific Community (SPC)[24]

Endemic and Threatened Species of RMI

Two key sources of information have been used to compile and collate records of endemic and native species of RMI that are under risk of extinction (threatened and or endangered)- they are the IUCN Red List of Threatened Species™[25], and the RMI Biodiversity Clearing House Mechanism –CHM's RMI Natural Resources Database.

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 'Marshall Islands' on the IUCN Red List results in an annotated inventory of 948[26] 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. A majority of the assessed species belong to Animalia (929) - and 19 to Plantae.

A majority of these species occur in the marine biome (843) followed by terrestrial species (19) and freshwater (3) (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.

[23] Secretariat of the Pacific Region Environment Programme SPREP < http://www.sprep.org/ >
[24] Secretariat of the Pacific Community SPC < http://www.spc.int/>
[25] IUCN Red List of Threatened Species < http://www.iucnredlist.org/>
[26] The actual query result is 949 species- this includes *Homo sapiens* which has been excluded in this case

Table 2: Threatened Species Biomes- RMI

Environment/system	Number of species
Terrestrial	19
Freshwater	3
Marine	844
Terrestrial/Freshwater	13
Terrestrial/Marine	43
Terrestrial/Freshwater/Marine	20
Freshwater/Marine	7

95 of the 949 species assessed are classed into an IUCN threatened category category (8 ' Endangered (EN)' and 87 'Vulnerable (VU)') (see Table 3 for the breakdown in Red List categories).

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

IUCN Red List Category	Numbers of species
Endangered (EN)	**8**
Vulnerable (VU)	**87**
Lower Risk (Conservation dependant)	3
Near Threatened (NT)	122
Data Deficient (DD)	59
Least Concern (LC)	670

The inventory on conservation assessed native, endemic threatened species includes annotations on higher taxonomy, common names and synonyms, organism type, environment/system, year assessed and status of population, and if the species is included in any of the appendices of the CITES (Convention on International Trade in Endanagered Species of Wild Fauna and Flora)[27] and the Convention on the Conservation of Migratory Species of Wild Animals (CMS)[28] in which the species occurs (see RMI-Inf-3).

[27] CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) <http://www.cites.org/>
[28] Convention on the Conservation of Migratory Species of Wild Animals (CMS) <http://www.cms.int/>

Exploitation through overfishing and biological resource use are the worst threat impacting threatened species in RMI- most of which occur in the marine biome including fish (ray-finned and cartilegenous), echinoderms, marine mammals and reptiles. This is followed by the threat of human disturbance, the spread of invasive species and the impacts of a changing climate (flooding and dsevere weather events).

Notes on key species

The Micronesia Imperial Pigeon (*Ducula oceanica*) including subspecies have been recorded in RMI. The main threat to this species in all its range is biological resource use and loss of habitat. A Species Recovery programme was launched in Majuro Atoll.

One species is classified as endemic to RMI, this is the girdled wrasse (*Cirrhilabrus balteatus*) classified as 'Data Deficient (DD)' in the IUCN Red List. Pressures on its population causing any decline are unknown. This species is known to be used in the Aquarium trade.

The Micronesia Forest Skink *Emoia boettgeri* is classified as 'Endangered (EN)' in the IUCN Red List of Threatened Species. It is endemic to the Caroline and the Marshall Islands in eastern Micronesia. In the Carolines, the species occurs on Pohnpei, on the Sapwuahfik Atoll and the Mortlock Islands. In the Marshall Islands, the species occurs in Ine, Dodo and Autore Islands. *E. boettgeri* is a ground-dweller, and is found most frequently in the open interior of the forest (Allison and Austin, 2010). On the Marshall Islands, the three subpopulations of *E. boettgeri* are potentially threatened by the high human population density. Invasive species such as rats *Rattus* spp.) are also a threat to *E. boettgeri* (Allison and Austin, 2010). No conservation management action targeted to protect *E. boettgeri* has been implemented. Extensive research and monitoring of the species' population, habitat status and threats is recommended (Allison and Austin, 2010).

RMI Natural Resources Database

THE RMI Biodiversity CHM's – RMI Natural Resources Database provides annotated lists of native plants and animals, species endemic to RMI only, and those endemic to Micronesia and RMI alien and protected species. The database also features an annotated inventory of pestiferous and potentially pestiferous species'

724 plant species have been recorded in this resource, of these 342 are known to be native to RMI; three endemic to RMI only and five species are known to be endemic to both Micronesia and RMI. The 342 native plants include 86 vascular plants, and 256 non-vascular plant species.

Close to 6000 animal species have been recorded in this resource, of these 1182 are listed as native. They include 46 species that are known to be endemic to RMI only and 76 endemic to both Micronesia and RMI.

The following datasets have been compiled from the RMI CHM RMI Natural Resources Database

1. Native Vascular Plants of RMI

86 Native vascular plants of RMI are listed in this dataset; they include the Micronesian endemic grass *Lepturopetium marshallense* and the RMI endemic grass *Lepturus gasparricensis* (records highlighted in supporting Inf)

2. Plants of RMI

Close to 500 species are listed in the Plants of RMI dataset. They include both native including prehistorically introduced (122) as well as introduced alien species (352) and several whose origin is unknown.

3. Snails of RMI

23 species of 'native' Molluscs (snails and slugs) are recorded in this dataset. They include the introduced invasive Giant African Snail *Achatina fulica*

4. Arachnids and Myriapods of RMI

51 species of native Arachnids and Myriapods have been recorded in this dataset, they include six endemic species and two introduced.

5. Insects of RMI

Over 500 native insect species are listed in this dataset inluding five introduced insects

6. Fish of RMI

1060 native fish species that occur in the freshwater, brackish and marine biome are listed in this dataset. They also include the introduced mosquito fish *Gambusia* spp. and molly's *Poecilia* spp.

7. Reptiles and Amphibians of RMI

One amphibian the introduced Cane toad *Rhinella marina (=Bufo marinus),* five endangered marine turtles, 18 species of gecko's and skinks (including the Micronesian endemic *Emoia arnoensis*, RMI endemic *Emoia boettgeri* and two introduced gecko species), one lizard species the monitor *Varanus indica* and two introduced snakes the Brown tree snake and the Brhaminy blind snake

8. Birds of RMI

103 bird species including 11 introduced birds are listed in this dataset. Several of these birds have been assessed in the IUCN Red List and the classifications have been included.

9. Mammals of RMI

28 marine mammals, several of them classified as 'Endangered' are included in this dataset. Nine terrestrial mammals all of which have been introduced both prehistorically and recently are included

All the above datasets have been recorded in RMI-Inf-4

10. Pestiferous and potentially Pestiferous species of RMI.

The Pestiferous and potentially pestiferous dataset lists introduced and known invasive and pest species of RMI; included are weeds, pests and pathogens of agriculture and known invasive species that impact biodiversity and natural areas. All introduced species in the above datasets have been included in the consolidated Introduced and alien species inventory (see RMI-Inf-1)

The following four annotated datasets list protected and endemic species of RMI and Micronesia have been included in RMI-Inf-3

11. Protected Species of RMI
12. Endemic species of RMI
13. Endemic species and subspecies of RMI and Micronesia
14. Species deemed worthy of Conservation in RMI

A majority of these listed species have not been conservation assesed using the IUCN Red List criteria (an annotation on the status has been indicated for those that have been assessed). There is very limited information available on the current population status of and threats to these species

SECTION 4

Priority Conservation Areas and Ecosystems of RMI

Protected areas are the cornerstone of biodiversity conservation, these designated areas of high biodiversity value host significant numbers of threatened native biodiversity and their habitats. Improving the efficacy of invasive alien species management within the boundaries of protected areas and other areas of high biodiversity value is critical in the conservation of species and natural areas

The World Database on Protected Areas (WDPA)[29] provides the most comprehensive dataset on protected areas worldwide. The WDPA lists five 'Protected areas' for RMI. The areas include two Ramsar Designated Sites- Jaluit Atoll Conservation Area and Namdrik Atoll, Bikar Atoll designated as a Mo (a traditional no-take area), and the Jaluit Atoll Conservation Area established to conserve trochus and giant clams from over-exploitation (see RMI-Inf-5).

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

Additionally one Endemic Bird Area (EBA) and 10 Important Bird Areas (IBA) have been designated by BirdLIfe International. Conservation International (CI) has designated Key Biodiversity Areas (KBAs) in the three Biodiversity Hotspots of Oceania (Polynesia-Micronesia, East Melanesian Islands and New Caledonia) elaborated in the Critical Ecosystem Partnership Funds Ecosystem Profiles[30]. Seven KBAs are recognised in RMI- Bokak Atoll, Jaluit Atoll Conservation Area, Kabin Meto (North-western atolls), Mili Atoll Nature Conservancy, Northern Ratak (Eastern chain), Southern Railik (Western chain), Southern Ratak (Eastern chain) (see RMI-Inf-5)

The major threats to areas of high biodiversity value are over exploitation of marine resources and species- including over-fishing and harvesting for commrcial 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.

[29] World Database on Protected Areas –Protected Planet 2013 < http://www.protectedplanet.net/>
[30] Critical Ecosystems Partnership Fund (CEPF) Ecosystem Profiles <http://www.cepf.net/where_we_work/regions/asia_pacific/polynesia_micronesia/Pages/default.aspx>

Notes on key sites

Jaluit Atoll Conservation Area

Jaluit Atoll comprises 91 islets, the entire atoll is a designated Ramsar site. On account of limited terrestrial systems, terrestrial biodiversity is limited, but the atoll hosts aggregated populations of nesting seabirds and nesting turtles. From the Ramsar Sites datasheet "*Jaluit has very healthy marine ecosystems with corresponding populations of reef fish and associated invertebrates. This includes Coconut crabs (Birgus latro) and mangrove crabs (Scylla serrata), trochus,*

(Trochus niloticus) a marine snail, sea cucumbers, aw die variety of reef fish, sharks, blacklip pearl oyster (Pinctada margaritifera) and four species giant clam (Tridacna gigas, T. maxima, T. squamosa and Hippopus hippopus)". Threats to this site include, overexploitation and biological resource use (fishing, hunting and harvesting), land use change and expansion of residential and commercial activities and the spread of invasive alien species. Jaluit Atoll is also designated as a Key Biodiversity Area (KBA)

Namdrik Atoll

The large coral atoll of Namdrik consist of two islands Madmad and Namdrik. It supports mangrove ecosystems and breeding populations of the Critically Endangered (CR) Hawksbill Turtle (*Eretmochelys imbricata*) and the Endangered (EN) Green Turtle (*Chelonia mydas*), as well as the EN Humphead Wrasse (*Cheilinus undulatus*). The Atoll is the wintering ground of the Vulnerable Bristle-thighed Curlew (*Numenius tahitiensis*). From the Ramsar Sites datasheet "*a number of important endemic species have recently been recorded, such as the Tree-hole Mosquito (Aedes marshallensis Range: Marshalls, Kiribati, Caroline Atolls, Kosrae), and the endemic Crane Fly (Limonia beardsleyi or Limonia beardsley Range: Namu, Kili, Namdrik) and Land Snail (Assiminea nitida marshallensis Range: Marshalls)*" Potential threats to this site include, overexploitation and biological resource use (fishing, hunting and harvesting), land use change and expansion of residential and commercial activities and the spread of invasive alien species.

Marshall Islands- Endemic Bird Area (EBA)

The whole of the Marshall Islands is recognised as an EBA. The trigger species for this designation is the Near Threatened Micronesian Imperial-pigeon (*Ducula oceanica*). It includes the 10 designated IBAs sites that include complete Atolls and their extended marine areas- Bokak Atoll, Bokak Atoll Marine, Bikar Atoll, Bikar Atoll Marine, Enewetak Atoll, Enewetak Marine, Take Atoll, Take Atoll Marine, Mili Atoll and the Northeast islets, Majuro Atoll. These designated IBA's host aggregations of nesting and breeding seabirds such as the (LC) Sooty Tern (*Onychoprion fuscatus*), the NT Micronesian Imperial-pigeon -Ducula oceanica (sub-species ratakensis) and endemic plant species such as the endemic grass Lepturopetium marshallense

and Lepturus gasspariensis. The Atolls also provide nesting sites to the EN Green Turtle (*Chelonia mydas*)

Notes have been provided for each of the designated areas (see RMI-Inf-5)

Section 5

Invasive alien species management actions and other key biodiversity related activities

A literature review and consulting exercise of key conservation practitioners was undertaken to compile an annotated inventory of invasive species and biodiversity related management action carried out on RMI.

18 activities have been recorded for RMI 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 inventory includes 13 National level activites including development of NBSAPS, Strategic plans and involment in the Regional Micronesia Biosecuity Plan (MBP). Five types of activities related to IAS management were recorded including vegetation surveys, planned and ongoing 'eradication' and management of priority invasive alien plant species, awareness raising, capacity building and training (see RMI Inf-6)

Conclusion

The results of this review provide a baseline for biodiversity data and information for RMI, and a detailed description of the threat of invasive alien species on native species and natural areas. An internal 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.

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