INVASIVE ALIEN SPECIES:
IMPACTS AND MANAGEMENT STRATEGIES AT THE INTERNATIONAL LEVEL

Piero Genovesi
ISPRA
Chair IUCN SSC Invasive Species Specialist Group
MAJOR DRIVER OF BIODIVERSITY LOSS

Causes of extinctions globally

Source: IUCN Red List; N=247

Comprehensively assessed groups
(>150 spp)
Comprehensively assessed groups
(>150 spp)
16.2% of extinctions are driven by invasive alien species ONLY

43% of extinctions are driven by other threats

40.5% of extinctions are driven by invasive alien species + other threats

IUCN Red List v 2016.3
% of threatened species impacted by invasive alien species by habitat:

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Neritic</td>
<td>40.2%</td>
</tr>
<tr>
<td>Marine Intertidal</td>
<td>29.3%</td>
</tr>
<tr>
<td>Desert</td>
<td>21.4%</td>
</tr>
<tr>
<td>Other</td>
<td>21.3%</td>
</tr>
<tr>
<td>Forest</td>
<td>21%</td>
</tr>
<tr>
<td>Marine Coastal/Supratidal</td>
<td>39%</td>
</tr>
<tr>
<td>Shrubland</td>
<td>25.7%</td>
</tr>
<tr>
<td>Grassland</td>
<td>20.8%</td>
</tr>
<tr>
<td>Savanna</td>
<td>16.4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>16.3%</td>
</tr>
<tr>
<td>Marine Oceanic</td>
<td>39%</td>
</tr>
<tr>
<td>Wetlands</td>
<td>25.6%</td>
</tr>
<tr>
<td>Rocky areas</td>
<td>17.9%</td>
</tr>
<tr>
<td>Caves and Subterranean</td>
<td>9.5%</td>
</tr>
</tbody>
</table>

IUCN Red List v 2016.3
% of EX/EW species impacted by invasive alien species by habitat:

- **Caves and Subterranean Habitats**: 100%
- **Desert**: 71.4%
- **Savanna**: 57.9%
- **Marine Coastal/Supratidal**: 53.8%
- **Other**: 50%
- **Shrubland**: 85.5%
- **Rocky areas**: 66.7%
- **Marine Oceanic**: 40%
- **Marine Neritic**: 33.3%
- **Unknown**: 33.3%
- **Forest**: 75.7%
- **Grassland**: 62.9%
- **Marine Intertidal**: 33.3%
- **Wetlands**: 32.1%

IUCN Red List v 2016.3
THREATENING GLOBAL PROTECTED AREAS

Current threats affecting WH sites (number of sites)
• Islands occupy ~5.5% of the globe but contain >15% of terrestrial species, 61% of all recently extinct species, and 37% of all critically endangered species.

Source: IUCN Red List; N=134

IMPACT ON SPECIES

- Aeolian wall lizard, *Podarcis raffonei*
- 5 small populations; latest data suggest that the largest population decreased by 80% in a few years, due to hybridisation with the Sicilian wall lizard,
IMPACT ON ECOSYSTEMS AND LIVELIHOOD

- Beaver introduced in Tierra del Fuego, established in over 7 Mln hectares

- *Prosopis* invading large areas of Africa, limiting access to land

- Water hyacinth impacting access to water and transport, and spreading malaria
AFFECT OUR HEALTH

- More than 100 known cases of invasive species with effects on health
- Pathogens, parasites, vectors of pathogens, producing toxins, allergenic, direct attacks or bites, indirect effects on other invasive species with impact on health, etc.
Tiger mosquito

• transmits 20 pathogens, including Dengue, West Nile, Chikungunia
CAUSE HUGE ECONOMIC LOSSES

Europe

- € Eradication/control
- € Damage to infrastructure
- € Damage to agriculture and forestry
- € Fishing
- € Human health

€ Research, prevention, monitoring, etc

> € 12.5 billions/year; probably > 20b

Economic costs of IAS (billions)

**Economic losses**
- USD $88.64
- AUD $9.83
- EUR €9.6

**Management costs**
- EUR €12.03
- AUD $3.77
- EUR €2.8

Hoffmann & Broadhurst. 2016. Neobiota
Kettunen, Genovesi et al. 2008. IEEP
CAUSE HUGE ECONOMIC LOSSES

• analysis of almost 1,300 known invasive insect pests and pathogens; total potential cost of these species invading each of 124 countries of the world
Threat to agriculture – future invasion cost

Total potential cost to agriculture of IAS globally

Paini et al. 2016. PNAS
Kew. 2017. State of the Worlds Plants
Threat to agriculture – future invasion cost

Total potential cost to agriculture of IAS by country

Paini et al. 2016. PNAS
Threat to agriculture – future invasion cost

Total potential cost of IAS to agriculture as % of GDP

Paini et al. 2016. PNAS
### How well do we understand the impacts of alien species on ecosystem services?

A pan-European, cross-taxon assessment

<table>
<thead>
<tr>
<th>Species Type</th>
<th>Total</th>
<th>Ecological Impacts</th>
<th>Economic Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic marine</td>
<td>1076</td>
<td>134</td>
<td>12.45%</td>
</tr>
<tr>
<td>Aquatic inland</td>
<td>486</td>
<td>139</td>
<td>28.60%</td>
</tr>
<tr>
<td>Birds</td>
<td>172</td>
<td>46</td>
<td>26.74%</td>
</tr>
<tr>
<td>Terrestrial invertebrates</td>
<td>584</td>
<td>126</td>
<td>21.58%</td>
</tr>
<tr>
<td>Terrestrial mammals</td>
<td>112</td>
<td>55</td>
<td>49.11%</td>
</tr>
<tr>
<td>Terrestrial plants</td>
<td>6135</td>
<td>841</td>
<td>13.71%</td>
</tr>
</tbody>
</table>

Impact percentages are calculated as a proportion of the total number of species assessed.
No saturation

- Annual rate of first records worldwide is still increasing, both in mainland and on islands.

How many potential invaders?

- First records in new areas

<table>
<thead>
<tr>
<th>Metric</th>
<th>Birds</th>
<th>Crustaceans</th>
<th>Fishes</th>
<th>Insects</th>
<th>Mammals</th>
<th>Molluscs</th>
<th>Other invertebrates</th>
<th>Vascular plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated candidate species pool</td>
<td>625</td>
<td>1,565</td>
<td>1,354</td>
<td>20,611</td>
<td>499</td>
<td>1,289</td>
<td>3,268</td>
<td>26,048</td>
</tr>
<tr>
<td>No. of alien species in analysis</td>
<td>406</td>
<td>430</td>
<td>478</td>
<td>4,992</td>
<td>248</td>
<td>441</td>
<td>780</td>
<td>7,380</td>
</tr>
<tr>
<td>Percentage of established alien species, %</td>
<td>65</td>
<td>27</td>
<td>35</td>
<td>24</td>
<td>50</td>
<td>34</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>Reported total no. of alien species</td>
<td>971*</td>
<td>425†</td>
<td>944‡</td>
<td>445§</td>
<td>539†‡</td>
<td>13,168*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated true candidate species pool</td>
<td>1,494</td>
<td>1,574</td>
<td>2,697</td>
<td>890</td>
<td>1,585</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated total no. of native species on Earth</td>
<td>10,000</td>
<td>150,000</td>
<td>40,000</td>
<td>5,500</td>
<td>200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of potential alien species among all species worldwide, %</td>
<td>15</td>
<td>1</td>
<td>7</td>
<td>16</td>
<td>1</td>
<td></td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

15% 1% 7% 16% 1% 13%

SYNERGY WITH CLIMATE CHANGE

Increased impacts

- Europe, N America, Oceania
- Some taxonomic groups
EMERGING CHALLENGES

Loss of Arctic sea ice, Movement of commodities, Port development, Tourism and cruise ships, Commercial fishing, Aquaculture, Construction of overland pipelines, Hull fouling …
Pathway trends – shipping arctic passages

- Opening of NW & NE passages
- cutting distance from Europe to Asia by 1/3

Lloyds et al. 2013. Global marine trends 2030
Pathway trends - tourism

between 2010 to 2030
Pathway trends – e-commerce

between 2015 to 2020

Retail e-commerce sales worldwide from 2014 to 2020 (in billion U.S. dollars)

Source:
emarker
© Statista 2016

Additional Information:
Worldwide; eMarketer; 2014 to 2016
CBD guiding principles

- Prevention as the first line of defence
- Early detection rapid response
- Eradication when feasible
- Permanent management when appropriate

Decision VI/23 on Alien Species that threaten ecosystems, habitats and species; COPVI, The Hague, April 2002
Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.
T9 Progress

- On track: 3%
- Insufficient: 48%

Progress of national targets towards the Aichi Targets

RSPB et al. 2016
Correspondence

Zika virus: designate standardized names

A rapid response by the public health and research community to infectious viral diseases depends on the reproducible tracking and analysis of pathogen isolates. A standard strain nomenclature convention for Zika virus sequences is therefore urgently needed. This will ensure that the exchange and interpretation of data in scientific literature is efficient to contain the current outbreak in the tropical Western Hemisphere. Zika virus strain names for isolates associated with the outbreak are arbitrarily designated as RdBl189895. Zik/UF/D12/17 and RdBl/98/15, for example. Such names are largely opaque and inconsistent when it comes to context, although some may include a genus name. This is impractical to include all relevant metadata in the isolate name, but some consistent extension is useful for identifying specific isolates. As the Zika virus expands to other viral fields, we urge the Zika community to adopt a standard nomenclature for isolate names, specifying the virus type (ZIKV), host species (aedes), geographic origin (isolate), unique identification string and year of isolation. The preferred isolate name for RdBl189895, for example, would then be ZIKV/18_aeuesa/Brasil/ RdBl189895/2016. Richard H. Schuermann
drorsch@ucdavis.edu, private, UK

Zika virus: accurate terminology matters

You describe microcephaly as a “serious congenital malformation”, which risks confusing the public and causing needless distress to the families of children with small heads, irrespective of whether these are linked to Zika virus infection (see Nature 536, 74; 2016). In fact, “microcephaly” simply means a small head and is not necessarily associated with intellectual disability, as is often assumed. Microcephaly is a feature of hundreds of different conditions, but can also be seen in otherwise normal individuals (P. Markle et al. J. Med. Genet. 28, 750–753; 1991, S. Ashwal et al. Neurology 73, 887–897; 2009).

This is not mere semantics. Investigations into the proposed link between Zika virus and birth defects (for which there seems to be little evidence at present) will need to include systematic assessment of all the possible causes of microcephaly in children thought to have had exposure to the virus. Careful research is essential (C. G. Victoria et al. Lancet 387, 621–626; 2016).

Edwin P Kirk
Sydney Children’s Hospital, University of New South Wales, and SEALS Laboratory, Randwick, Australia.

Edwin.kirk@health.nsw.gov.au

How to engage social scientists in IPES

We contend that the disciplinary isolation within the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPES) could best be remedied by improving the organization’s communication with researchers from the social sciences and humanities (see A. B. M. Verdooi et al. Nature 538, 160; 2016). We conducted a survey of the groups that were nominated and selected for the second IPES call for experts for deliverables (H) and (V) – namely the regional/subnational assessments of biodiversity and ecosystem services, and of land degradation and restoration – indicating that most people who applied for the assessments had a background in natural sciences (see go.nature.com/2y4wZD7). This suggests that IPES communications about the details and implications of the IPES process itself might not be effectively engaging the social-scientists and humanities communities.

We suggest that IPES calls need to be circulated more widely and avoid language and expressions that are tailored specifically for natural scientists. The calls should recognize differences in the social-scientists and humanities communities and target these more specifically. Katrin Reuter, Malte Timpe
Malte Timpe
Max Planck Institute for Nature History, Leiden University, & Leiden Institute for Evolution and Biodiversity Science, Berlin, Germany.

Carsten Siefkhußel
Hoelderich
Centre for Environmental Research, U. Germany.

malte.timpe@mpi-berlin.mpg.de

Better management of alien species

In our view, the European Union’s recent legislation on invasive alien species will be an effective conservation tool only if the inclusion of new species is supported by the majority of EU member states. Otherwise, it may not be effective in the protection of its biodiversity before the short-term economic interests of member states. Europe is one of the world’s most biologically invaded regions (F. van Klinken et al. Nature 525, 100–103; 2015). The list of invasive alien species targeted for action under the January 2015 EU legislation includes just 37 entries (go.nature.com/2n09G53). Although Europe hosts more than 1,000 such species, most of which meet the criteria for listing (M. Vith et al. Front. Ecol. Env. 8, 135–144; 2010). For example, knotweed (Fallopia japonica) and American mink (Neovison vison) are well characterized species that are responsible for extensive biodiversity losses across the continent.

We are concerned that the restructured new listing cannot keep up to address the scale of biological invasions in Europe. Management must be coordinated at the EU level if both protected and protected species are to be widely applicable, comprehensible and effective.

Jan Pergil Institute of Botany,
The Czech Academy of Sciences, Pruhonice, Czech Republic.

Pier Genovesi
Pier Genovesi Institute for Environmental Protection and Research, Rome, Italy.

Peter Pysek
Institute of Botany, The Czech Academy of Sciences, Pruhonice, and Charles University in Prague, Czech Republic.

jan.pergil@tnt.cz

Class uncorrected errors as misconduct

Peer publication peer review is becoming increasingly popular, but authors need more incentive to self-correct and amend the scientific record (see C. S. Allison et al. Nature 506, 27–28; 2014). We propose that authors to correct their mistakes should be classified as scientific misconduct. This policy has already been implemented by our institute, and we encourage others to consider this approach. The responsibility to correct errors is not limited to the criticized author. Snubbing a critic by not addressing it promptly runs counter to our fundamental ethos as scientists, and threatens to erode society’s trust in the scientific community. Sophien Kamoun, Cyril Zipfel
The Sainsbury Laboratory, Norwich, UK.

sophien.kamoun@ceeleh.org

CONTRIBUTIONS

Correspondence may be sent to correspondence@nature.com with the guidelines at http://go.nature.com/cmemes.
BIOSECURITY POLICIES

New Zealand, the “champion”

- Very stringent biosecurity
- Reduced rate of invasions
- Effective early warning rapid response
- Advanced management for several key IAS
- Worldwide champions in eradication science

Simberloff et al. 2013. TREE
BIOSECURITY CAN REDUCE INVASION RATES


Seebens et al. 2018. Nature Communications
INCREASING N OF BIOSECURITY POLICIES

Norway (outside EU)

• Royal Decree 19 June 2015, entered into force 1 January 2016; regulating import of all species. Ban on import, trade and release/planting of several alien species.
• All imports of live species and release/planting need a permit issued by the environment authorities, unless they are listed on the exemption list.
• Permits only issued after a screening and risk assessment
INCREASING N OF BIOSECURITY POLICIES

Iceland

- General ban of all actions that can cause the spread of non-native organisms within the country.
- The Environment Agency of Iceland has the power to control and/or eradicate IAS.
- List of species that can not be imported to Iceland (or spread within Iceland). The minister can also publish a list of species that can be imported without permission (white list).
Standard categorization of pathways

- Developed by IUCN SSC ISSG within the GIASIP, in collaboration with CEH and CABI, inputs from CBD Secretariat
- Tested with major global databases, mapped toward CBD decisions
- CBD COP decision includes invitation to ISSG to “continue and complete the work on pathway”
ANALYSIS OF PATHWAYS

Crossing Frontiers in Tackling Pathways of Biological Invasions

Journal of Applied Ecology
Assessing patterns in introduction pathways of alien species by linking major invasion data bases

Acridotheres tristis

**System**: Terrestrial

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Phylum</th>
<th>Class</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Animalia</td>
<td>Chordata</td>
<td>Aves</td>
</tr>
<tr>
<td>Family</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Passeriformes</td>
<td>Sturnidae</td>
<td></td>
</tr>
</tbody>
</table>

**COMMON NAME**

house myna (English), common myna (English), Calcutta myna (English), mynah (English), Hirtenmaina (German), German Indischer mynah (English), manu ratao (English, Cook Islands), manu kavamani (English, Cook Islands), manu teve (English, Cook Islands), manu koamani (English, Cook Islands), manu (English, Cook Islands), talking r (English), Martin triste (French), Indian mynah (Enoliah), Indian myna (English)

**SYNONYM**

Acridotheres tristis, (Linnaeus, 1766)

**SIMILAR SPECIES**

Manorina melanocephala, Manorina flavigula

**SUMMARY**

The common myna (Acridotheres tristis), also called the Indian myna, is a highly commensal Passerine that lives in close association with humans. It competes with small mammals and bird for nesting hollows and on some islands, such as Haw. and Fiji, it preys on other birds’ eggs and chicks. It presents a threat to indigenous biota, particularly parrots and other birds in Australia and elsewhere.
Flocks of the common myna are known to damage fruit crops, including grapes, apricots, apples, pears, strawberries, figs and gooseberries. (Heather and Robertson 1997).

Mynas are communal and commensal, they are highly vocal throughout the year, making them a public nuisance. Their droppings are a nuisance (Yap et al. 2000; in Lim Soo Ti Brook and Soh 2003) and public health concern. Mynas form combined populations of up to 160 000 (Lim Soo Ti Brook and Soh 2003) and roost in numbers as great as 5000 (Markula Hannah-Jones & Caufries 2009). They are a residential nuisance as they build nests in spouting and drainpipes (Stoner 1923). Mynas fearlessly steal food off plates which may be a hygiene or general nuisance for restaurants and other shops and scavenge food from people’s houses and gardens. Common mynas pose a human health risk as they carry bird mites such as Ornithonyssus bursa and Dermanyssus gallinae that may infect humans. They can also cause dermatitis, asthma, severe irritation and rashes. Their droppings can spread Psittacosis, Ornithosis, Salmonellosis and arboviruses (Pers. comm. Bill Handke). They may also carry owl flies, biting lice, Oxyspurna thread worm and round worm (Stoner 1923).

Mynas are known to carry avian malaria (Maesam 2001).

The common myna has been implicated in the demise of the lowland populations of the “Vulnerable (VU)” Rarotonga starling (Aplonis pucatana) (BirdLife International 2008b). Mynas are nest site competitors and can displace active breeding pairs of the Endangered (EN) Mauritius parakeet (Ptilinopus ecaudatus). In French Polynesia they are reported to predate on the Critically Endangered (CR) (Todiramphus sanctus).

Please follow this link for more examples of the impacts of common mynas on threatened species.

Red List assessed species 40: CR = 5; EN = 7; VU = 9; NT = 3; LC = 16;

- Acrocephalus caffcr EN
- Acrocephalus rufivirginus VU
- Charadrius sanctithomae
- Copacyna sechellarum EN
- Dacelo novaeguineae LC
- Hemiphaea novaeseelandiae
- Jynx torquilla LC
- Otus palfani CR
- Philesturnus carunculatus NT
- Pomarea mendozae EN
- Pomarea nigra CR
- Ptilinopus ecaudatus CR
- Ptilinopus roretangensis VU
- Sturnella neglecta LC
- Todiramphus sanctus LC
- Zosterops modestus EN
- Acrocephalus nigrettae LC
- Cacatua roseicapilla LC
- Copyschus saularis LC
- Gymnorhina tibicen LC
- Gerygone fuliginosa LC
- Hypsipetes olivaceus VU
- Otus insularis EN
- Pterodromanota brevicaudata LC
- Polytelis swainsoni VU
- Prosthemadera novacocaelandiae LC
- Puffinus pacificus LC
- Todiramphus macleayanus CR
- Trachyphonus vaillantii LC
Zosterops modestus

Scientific Name: Zosterops modestus
Species Authority: Newton, 1867
Common Name(s):
- English: Seychelles Grey White-eye, Seychelles White-eye
- French: Oiseau-fenêtre des seychelles


Assessment Information

Red List Category & Criteria: Vulnerable D1+2 ver 3.1
Year Published: 2016
Date Assessed: 2016-10-01
   * timing: Future * scope: Majority (50-90%) * severity: Unknown -> impact score: Unknown
   → Stresses
   1. Ecosystem stresses -> 1.2. Ecosystem degradation
   2. Species Stresses -> 2.1. Species mortality

   * timing: Past, Likely to Return * scope: Minority (<50%) * severity: No decline -> impact score: Past
   → Stresses
   1. Ecosystem stresses -> 1.1. Ecosystem conversion
   2. Ecosystem stresses -> 1.2. Ecosystem degradation

5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.3. Intentional effects (subsistence/small scale) [harvest]
   * timing: Past, Likely to Return * scope: Minority (<50%) * severity: No decline -> impact score: Past
   → Stresses
   1. Ecosystem stresses -> 1.1. Ecosystem conversion
   2. Ecosystem stresses -> 1.2. Ecosystem degradation

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.3. Trend Unknown/Unrecorded
   * timing: Future * scope: Majority (50-90%) * severity: No decline -> impact score: Low Impact: 3
   → Stresses
   1. Ecosystem stresses -> 1.2. Ecosystem degradation

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases
   → 8.1.1. Unspecified species
   * timing: Ongoing * scope: Majority (50-90%) * severity: Unknown -> impact score: Unknown
   → Stresses
   1. Ecosystem stresses -> 1.2. Ecosystem degradation
   2. Species Stresses -> 2.1. Species mortality

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases
   → 8.1.2. Named species [Ficus madagascariensis]
   * timing: Ongoing * scope: Majority (50-90%) * severity: No decline -> impact score: Low Impact: 5
   → Stresses
   2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases
   → 8.1.2. Named species [Acrithosiphon pismum]
   * timing: Ongoing * scope: Majority (50-90%) * severity: No decline -> impact score: Low Impact: 5
   → Stresses
   2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases
   → 8.1.2. Named species [Psyllids hesperus]
   * timing: Ongoing * scope: Majority (50-90%) * severity: No decline -> impact score: Low Impact: 5
   → Stresses
   2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases
   → 8.1.2. Named species [C. pavonina]
   * timing: Ongoing * scope: Majority (50-90%) * severity: No decline -> impact score: Low Impact: 5
   → Stresses
   2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success
ASSESSING THE IMPACT OF IAS

- IAS 3rd most severe impact on threatened species in Europe
- 1 out of 5 threatened species in Europe directly affected by IAS

Genovesi et al. 2015. Mid-term review EU Biodiversity Strategy
RANKING INVASIVE SPECIES BY THEIR IMPACT

Toward a standard method

- Presented in a paper by Blackburn et al. PLOS 2014
- Detailed guide to application in Hawkins et al. 2015 Div & Distr.

COP XII Decision 17: Invites IUCN ISSG to **complete the work pathways**, and to continue to develop a **system for classifying IAS based on the nature and magnitude of their impacts**
**Rattus rattus**

**Common Name:** Hausratte (German), European house rat (English), bush rat (English), blue rat (English), ship rat (English), roof rat (English), black rat (English)

**Synonym:**
- *Mus rattus*, Linneus, 1758
- *Mus alexandrinus*, Geoffroy, 1803
- *Muscaetus frugivorus*, Ratinesque, 1814
- *Mus novaehollandiae*, Blumer, 1870
- *Rattus norvegicus*

**Summary:**
A native of the Indian sub-continent, the ship rat (*Rattus rattus*) has now spread throughout the world. It is widespread in forest.
COP Decision XIII/13; 17... Also requests the Executive Secretary... (a) To compile information on the potential consequences of invasive alien species on social, economic and cultural values..;
PRIORITISING ACTION

Combining data on the most relevant pathways and on the most harmful IAS can enhance prioritization of action

- Aggregating pathways and invasive species ranks can enhance prioritization of prevention and management actions
ASSESSING PRIORITY REGIONS

IAS and Red List data to define the most vulnerable regions

Spatial distribution of the proportion of IAS-threatened species among other threats.

Bellard, Genovesi, Jeschke 2016. Proc Royal Soc Lon B
ERADICATION: AN EXTREMELY SUCCESSFUL CONSERVATION TOOL

- 825 populations of 329 species on 284 islands documented or predicted to benefit
GLOBAL ERADICATIONS FOR SANITARY PURPOSES

• Two major diseases (smallpox, rinderpest virus) eradicated

• Eradication of two other diseases (polio and dracunculiasis) close to completion
During the 2016 IUCN World Conservation Congress in Honolulu, call for greater action on invasive alien species in order to protect biodiversity and human wellbeing.

“For this aim to be achieved we need to multiply efforts”

Braulio Dias (Exec Sec. CBD) & Piero Genovesi (IUCN ISSG chair) launching the Honolulu Challenge

Commitments toward the Honolulu Challenge.

The UK Government commits to spending £2.75 million on assisting its Overseas Territories to develop comprehensive biosecurity for invasive non-native species as well as making a substantial contribution to the eradication of mice from Gough Island to save the critically endangered Tristan albatross and Gough bunting as well as other threatened species.
THE PREDATOR FREE VISION

Officially endorsed by NZ Government in 2016

• All possums, rats and mustelids to be eradicated from New Zealand by 2050

• The estimated cost is c.$3 billion, including Government and private funding

• Predator Free 2050 Ltd has been established to contribute to funding, support and planning
ORIGINAL PRESS RELEASE  25 JULY, 2016: New Zealand to be Predator Free by 2050

“Prime Minister John Key has today announced the Government has adopted the goal of New Zealand becoming Predator Free by 2050.”

Four interim 2025 goals:

1. Suppress predators on a further 1 million hectares
2. Eradicate predators from at least 20,000 hectares without the use of fences
3. Eradicate predators from island nature reserves
4. Achieve a breakthrough science solution capable of eradicating at least one small mammal predator.
Gene-editing tools, based on technologies (e.g.: CRISPR-Cas9) that are relatively cheap and easy to use.
Gene-editing tools, based on technologies (e.g.: CRISTPR-Cas9) that are relatively cheap and easy to use.
Potential applications of gene drive:
Combating diseases such as malaria, dengue and the Zika virus, which account for more than 17% of all infectious diseases, and cause more than 1 million deaths annually. Malaria alone is estimated to cost African countries USD $12 billion/yr.

GENE DRIVE

Control of invasive alien species for conservation purposes being investigated: invasive mosquitoes in Hawaii, European carp in Australia, removing the toxicity of Cane toads in Australia…

Based on current progress, products ready for field testing may be 5 years out.

Time to consider the important questions of regulation, risk assessment, ethics, and engagement, and to prepare for assessing an actual application.
Thank you!