Eradication on islands.

Is it effective? Does it deliver conservation gains? Is it worth the cost?

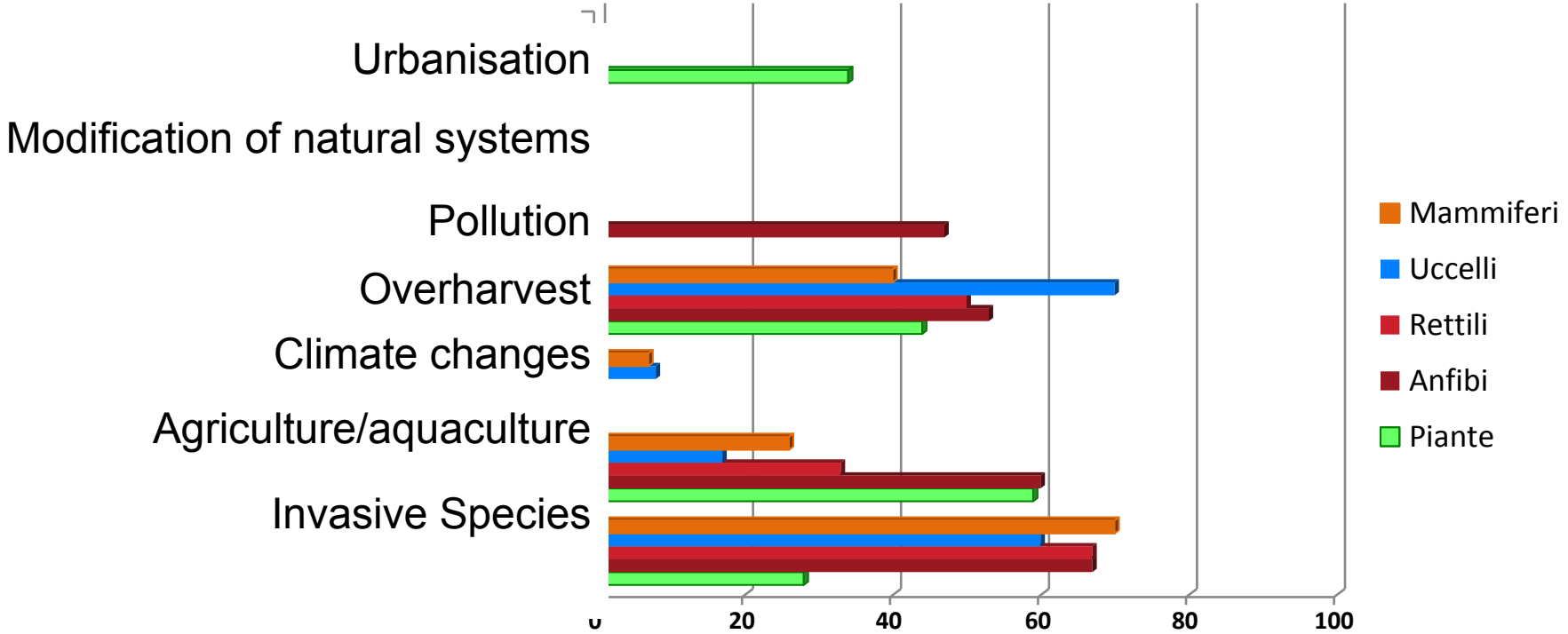
Piero Genovesi

Chair IUCN SSC Invasive Species Specialist Group

Workshop on experiences on control and eradication of invasive alien species on islands
Funchal 1st June 2017

MAJOR DRIVER OF BIODIVERSITY LOSS

Causes of extinctions globally

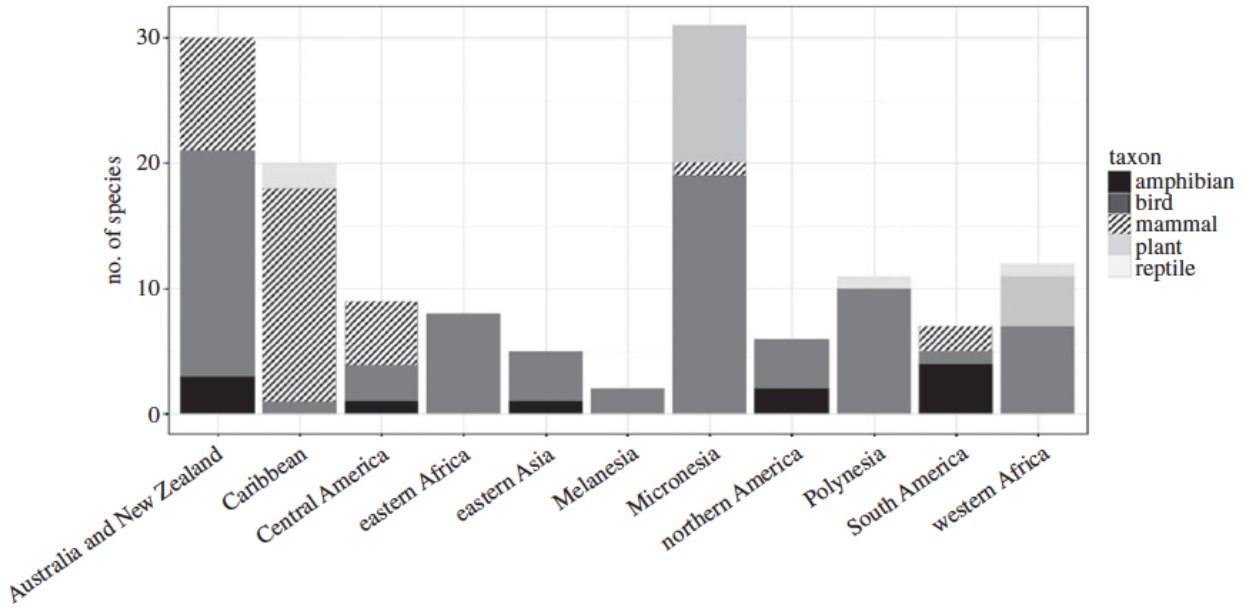


Source: IUCN Red List; N=247

Bellard et al. 2016 Alien species as a driver of recent extinctions. Biol. Lett.

MAJOR DRIVER OF BIODIVERSITY LOSS

Especially on islands



- 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

Bellard et al. 2016 Alien species as a driver of recent extinctions. Biol. Lett.

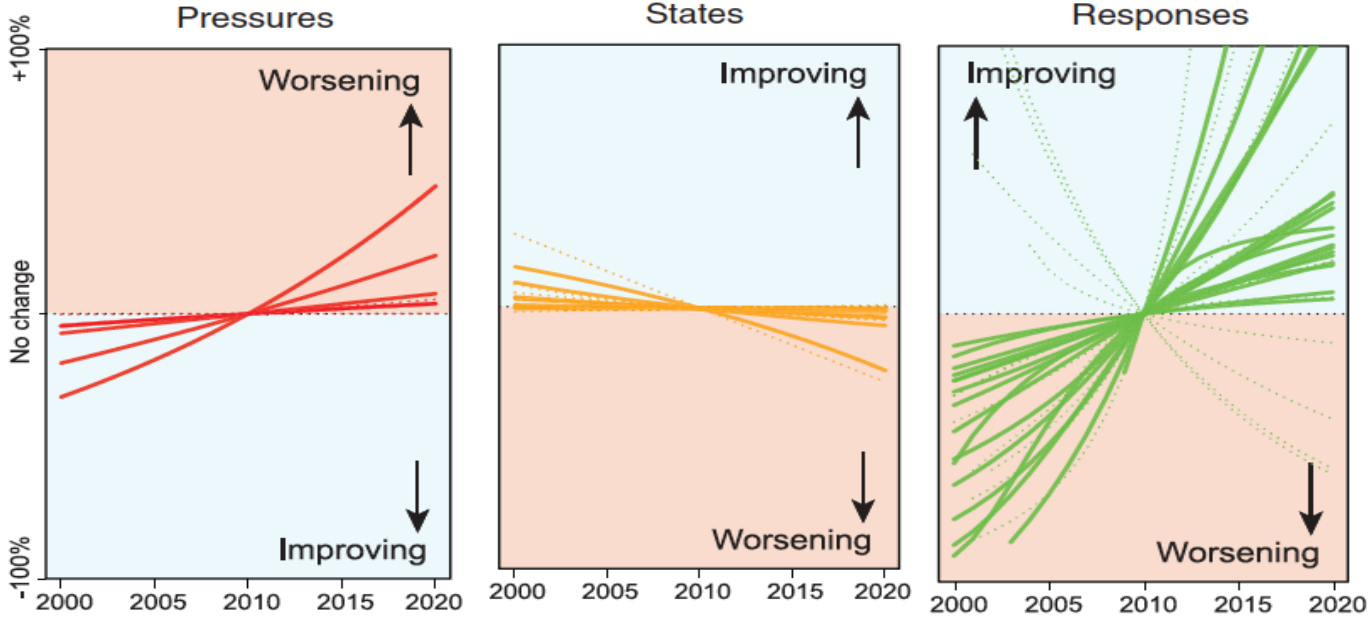
Where are we?

SCIENCE sciencemag.org 10 OCTOBER 2014 • VOL 346 ISSUE 6206

CONSERVATION TARGETS

A mid-term analysis of progress toward international biodiversity targets

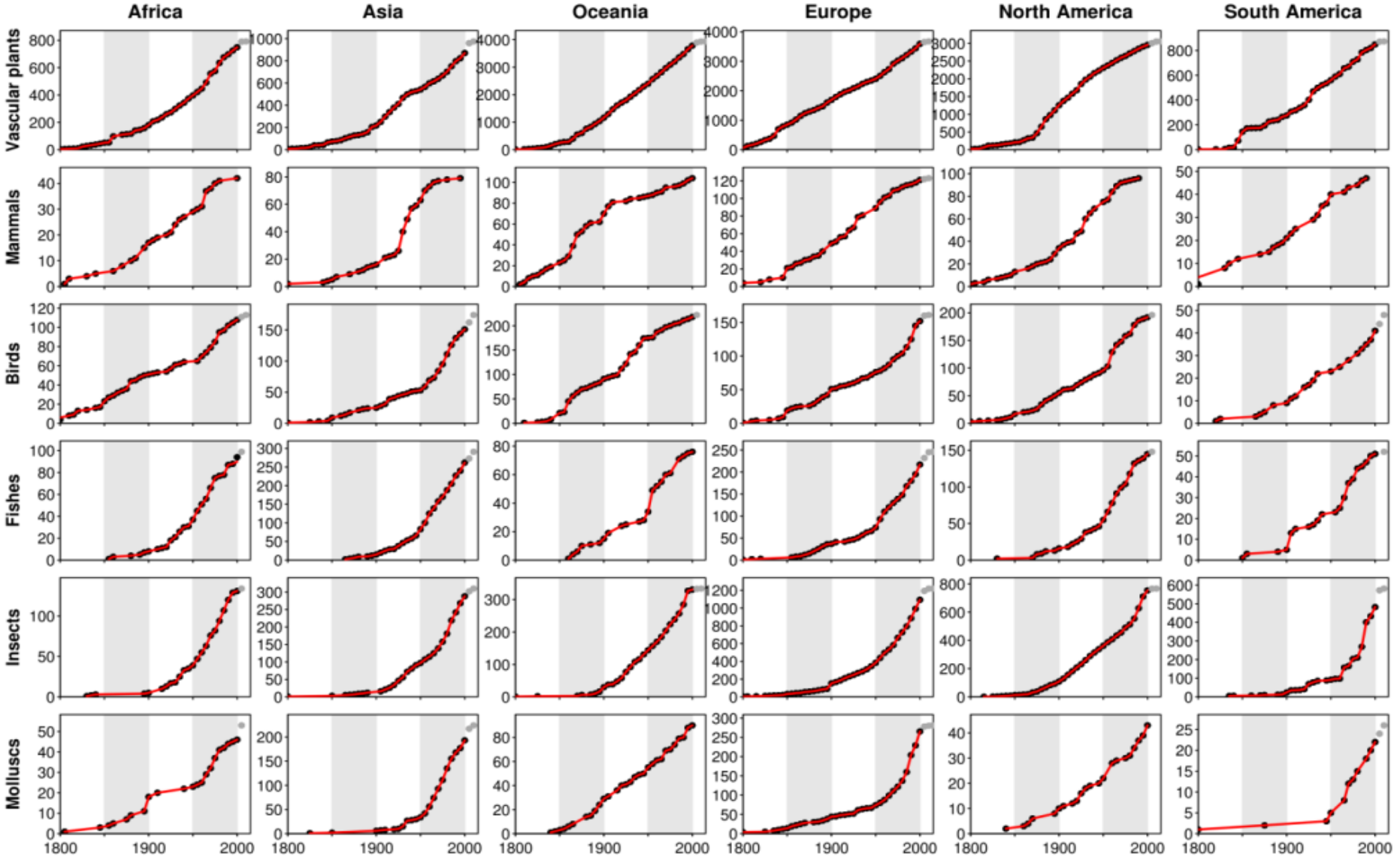
Derek P. Tittensor,[1,2*] Matt Walpole,[1] Samantha L. L. Hill,[1] Daniel G. Boyce,[3,4] Gregory L. Britten,[2] Neil D. Burgess,[1,5] Stuart H. M. Butchart,[6] Paul W. Leadley,[7] Eugenie C. Regan,[1] Rob Alkemade,[8] Roswitha Baumung,[9] Céline Bellard,[7] Lex Bouwman,[8,10] Nadine J. Bowles-Newark,[1] Anna M. Chenery,[1] William W. L. Cheung,[11] Villy Christensen,[11] H. David Cooper,[12] Annabel R. Crowther,[1] Matthew J. R. Dixon,[1] Alessandro Galli,[13] Valérie Gaveau,[14] Richard D. Gregory,[15] Nicolas L. Gutierrez,[16] R. Januchowski-Hartley,[18] Marion Karmann,[19] n,[21] Jonathan Loh,[22] Rik Kutsch Lojenga,[23] David H. W. Morgan,[26] Peter J. Mumby,[27] [2] Shyama N. Pagad,[28] Bradley C. Parks,[29] ,[17] Carlo Rondinini,[30] Luca Santini,[30] dler,[32,33] U. Rashid Sumaila,[11] Louise S.L. Teh,[11] nin Ye[9]

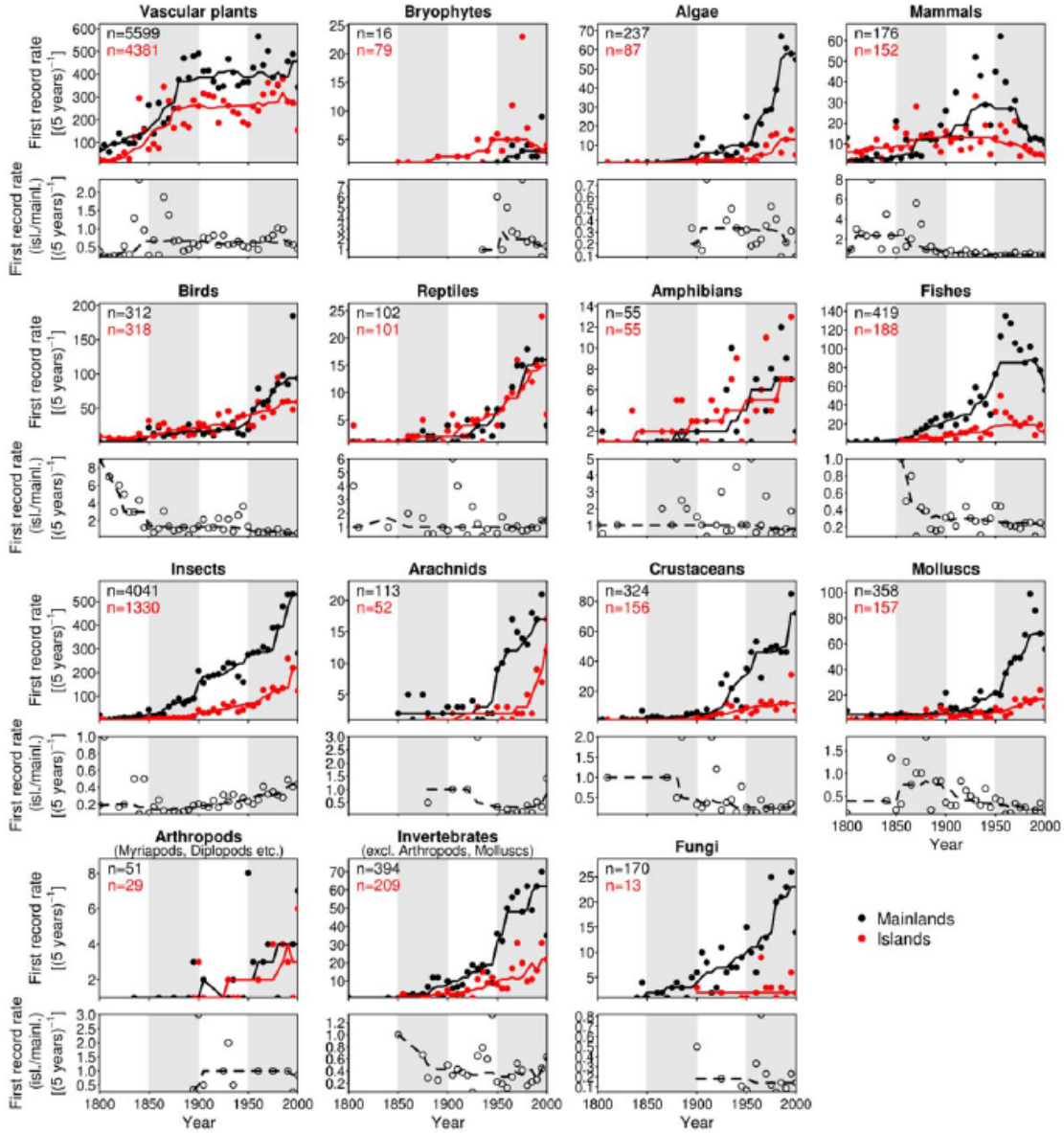


Where are we?

TARGET 9

Invasive alien species identified and prioritized	★★★ T 3	Measures taken in many countries to develop lists of invasive alien species
Pathways identified and prioritized	★★★ T 3	Major pathways are identified, but not efficiently controlled at a global scale
Priority species controlled or eradicated	★☆☆ T 3	Some control and eradication, but data limited
Introduction and establishment of IAS prevented	★★☆ T 2	Some measures in place, but not sufficient to prevent continuing large increase in IAS


Africa
Asia
Oceania
Europe
North America
South America
Vascular plants
Mammals
Birds
Fishes
Insects
Molluscs
1800
1900
2000


Vascular plants
n=5599
n=4381
Bryophytes
n=16
n=79
Algae
n=237
n=87
Mammals
n=176
n=152
Birds
n=312
n=318
Reptiles
n=102
n=101
Amphibians
n=55
n=55
Fishes
n=419
n=188
Insects
n=4041
n=1330
Arachnids
n=113
n=52
Crustaceans
n=324
n=156
Molluscs
n=358
n=157
Arthropods
(Myriapods, Diplopods etc.)
n=51
n=29
Invertebrates
(excl. Arthropods, Molluscs)
n=394
n=209
Fungi
n=170
n=13
First record rate [(5 years)$^{-1}$]
First record rate (isl./mainl.) [(5 years)$^{-1}$]
Year
Mainlands
Islands

POWERFUL CONSERVATION TOOL

Keitt et al. 2010	947
Genovesi & Carnevali in press	124
Abstracts 2010 conference	19
Turning the Tide (IUCN 2002)	10
California weed programme	16
Ant eradications (B. Hoffman pubbl, unpubbl)	13
TOTAL	**1129**

POWERFUL CONSERVATION TOOL

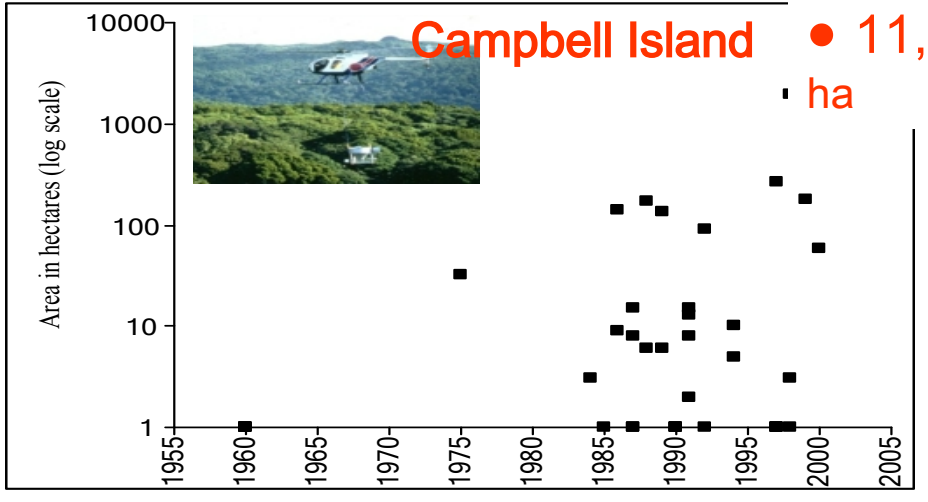
86% successful (n=911; 819 vs. 93)

97.07% on islands (n= 1,129; 1096 vs. 33)

94.6% vertebrates (n= 1,119; 1059 vs. 60)

TECHNICAL ADVANCES

- Larger areas
- Multi-species eradications
- Reduced undesired impacts
- Islands/mainland
- Plants, invertebrates
- More information on positive outcomes



CONCEPTS AND QUESTIONS

Re-evaluating eradication of nuisance species: invasion of the tunicate, *Ciona intestinalis*

Paul K Edwards* and Brian Leung

Eradication is an important concept in the management of biological invasions, but it is rarely considered in practice. This may be because managers commonly work with incomplete data and little or no practical guidance. Past eradication frameworks provide some useful criteria, but do not provide quantitative guidelines. Here, we argue that eradication is not always adequately considered, and we develop a framework for rapid assessment of its feasibility, despite limited data. This quantitative model offers criteria to rapidly assess the potential for eradication and provide estimates of the necessary effort and timing, and of the size of the target area. This framework is applied to a recent tunicate (*Ciona intestinalis*) invasion around Prince Edward Island, Canada, which is causing considerable economic damage to harvesters of blue mussels (*Mytilus edulis*). Our framework suggests that eradication may be feasible and, based on a cost-benefit analysis, could require only a ≥ 16% chance of success to constitute a worthwhile risk.

Front Ecol Environ 2009; 7, doi:10.1890/070218

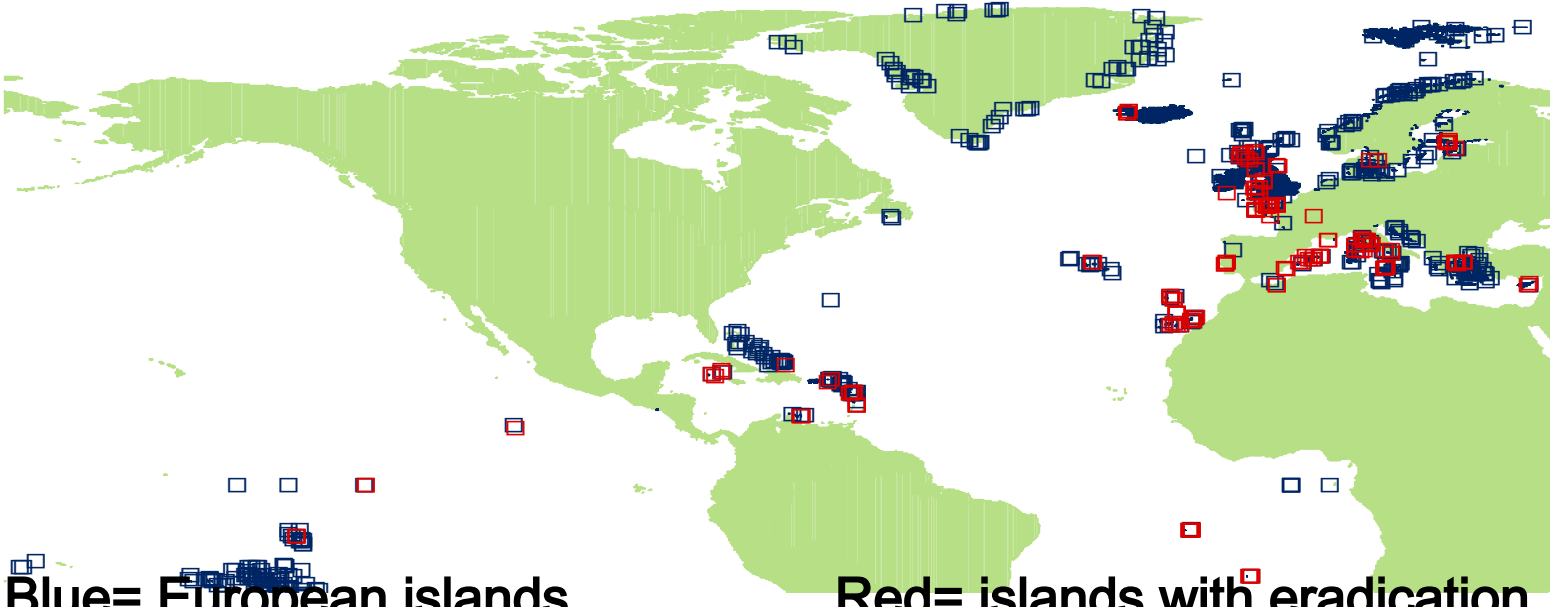
TECHNICAL ADVANCES

Ant eradications

- Invertebrates generally considered not eradicable, with few exception
- Several attempts to eradicate ants from US and Australia not successful, but significantly increased technical basis

EUROPEAN DATA

224 campaigns recorded on 170 islands (belonging to 12 countries).



Blue= European islands

Red= islands with eradication

EUROPEAN DATA

Region	n. eradications
North Atlantic Ocean	50
South Atlantic Ocean	42
Mediterranean sea	45
Macaronesia	12
Caribbean sea	24
Pacific Ocean	35
Indian Ocean	16
Total	*224*

Eradication status	n. eradications
successful	154
unsuccessful	21
uncompleted	5
being confirmed	16
on going	11
unknown	17
Total	*224*

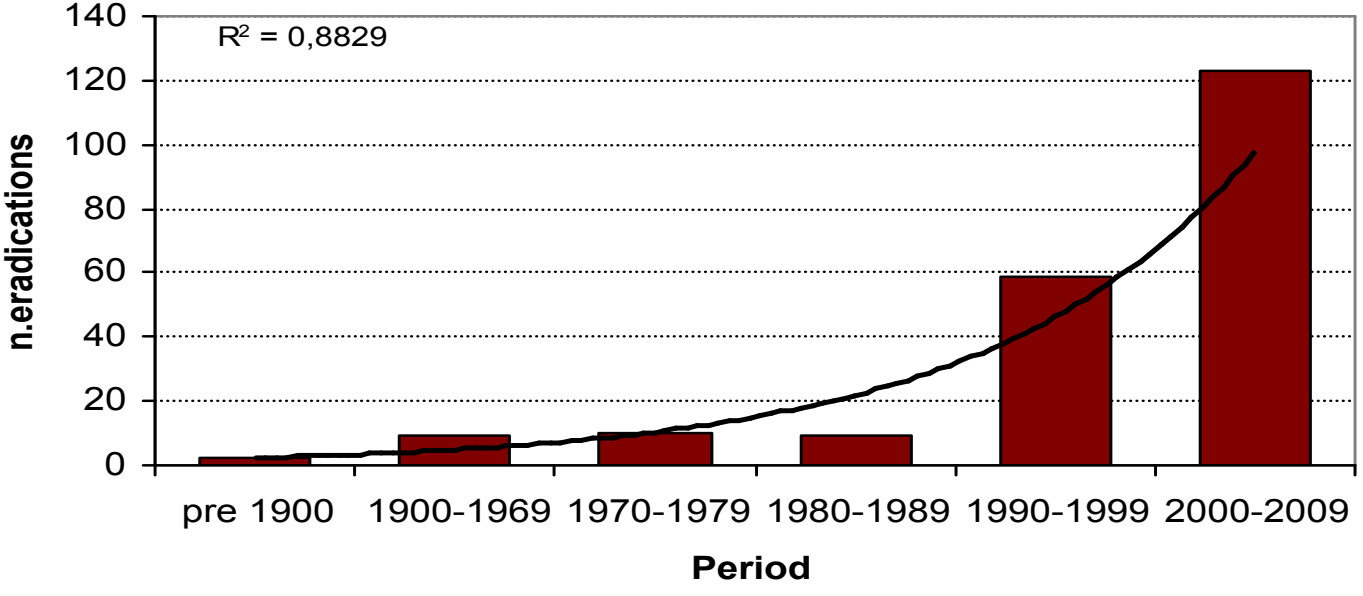
n=180

93% successful

7% unsuccessful

Rapidly increasing

58% of successful eradications in 2000-2009



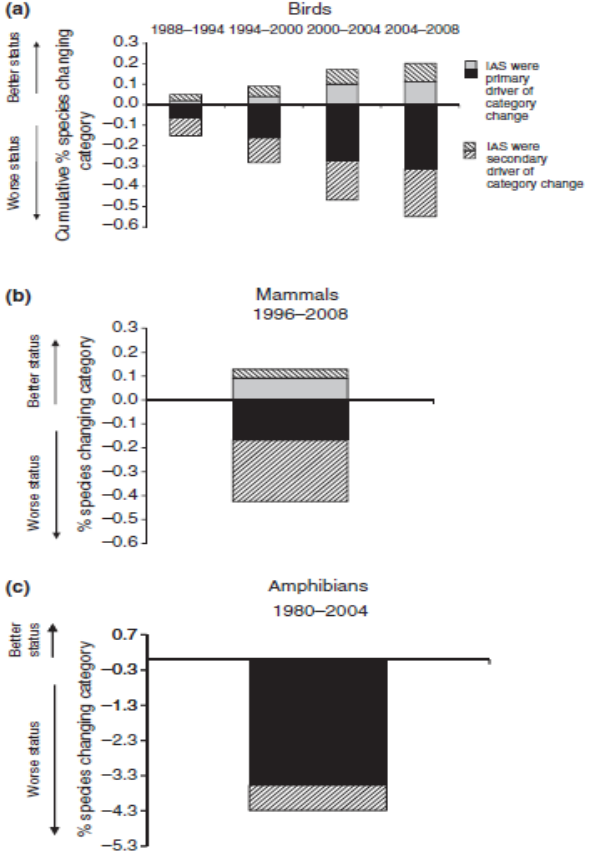
POWERFUL CONSERVATION TOOL

Diversity and Distributions, (Diversity Distrib.) (2010) **16**, 95–108

BIODIVERSITY RESEARCH

Global indicators of biological invasion: species numbers, biodiversity impact and policy responses

Melodie A. McGeoch[1]*, Stuart H. M. Butchart[2], Dian Spear[3], Elrike Marais[3], Elizabeth J. Kleynhans[3], Andy Symes[2], Janice Chanson[4] and Michael Hoffmann[5,6]



Eradication one of the very few examples of effective action to reduce biodiversity loss

- Conservation status of 11 birds, 5 mammals and 1 amphibian improved because of eradication of invasive species

POWERFUL CONSERVATION TOOL

PNAS

Invasive mammal eradication on islands results in substantial conservation gains

Holly P. Jones[a,b,1], Nick D. Holmes[c], Stuart H. M. Butchart[d], Bernie R. Tershy[e], Peter J. Kappes[f], Ilse Corkery[g], Alfonso Aguirre-Muñoz[h], Doug P. Armstrong[i], Elsa Bonnaud[j], Andrew A. Burbidge[k], Karl Campbell[c,l], Franck Courchamp[j], Philip E. Cowan[m], Richard J. Cuthbert[n,o], Steve Ebbert[p], Piero Genovesi[q,r], Gregg R. Howald[c], Bradford S. Keitt[c], Stephen W. Kress[s], Colin M. Miskelly[t], Steffen Oppel[n], Sally Poncet[u], Mark J. Rauzon[v], Gérard Rocamora[w,x], James C. Russell[y,z], Araceli Samaniego-Herrera[h], Philip J. Seddon[aa], Dena R. Spatz[c,e], David R. Towns[bb,cc], and Donald A. Croll[e]

[a]Department of Biological Sciences, Northern Illinois University, DeKalb, IL 60115; [b]Institute for the Study of th Northern Illinois University, DeKalb, IL 60115; [c]Island Conservation, Santa Cruz, CA 95060; [d]BirdLife Internation [e]Ecology & Evolutionary Biology Department, Institute of Marine Sciences, University of California, Santa Cruz, Wildlife Research Unit, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97331; [g]Zo Corcaigh, Ireland; [h]Grupo de Ecología y Conservación de Islas, A.C., Ensenada, C.P. 22800, Baja California, Mexi Natural Resources, Massey University, Palmerston North 4474, New Zealand; [j]Laboratory of Ecology Systematics 91405, France; [k]Private address, Floreat, WA 6014, Australia; [l]School of Geography, Planning and Environment Queensland, St Lucia, QLD 4072, Australia; [m]Landcare Research, Lincoln 7608, New Zealand; [n]Centre for Conse Protection of Birds, Cambridge CB2 3QZ, United Kingdom; [o]Wildlife Conservation Society, Goroka, Eastern Highl National Maritime Wildlife Refuge, US Fish and Wildlife Service, Homer, AK 99603; [q]Institute for Environment

BirdLife INTERNATIONAL | Partnership for nature and people

Our Partnership | Programmes | Regions | Science | Poli

Home > Conservation Silver Bullet?

Conservation Silver Bullet?

Seychelles Magpie-robin benefited from invasive species eradication on its island home image © Simon Stirrup

Island eradications

851 whole islands

IAS eradications (2014)
mostly invasive mammals

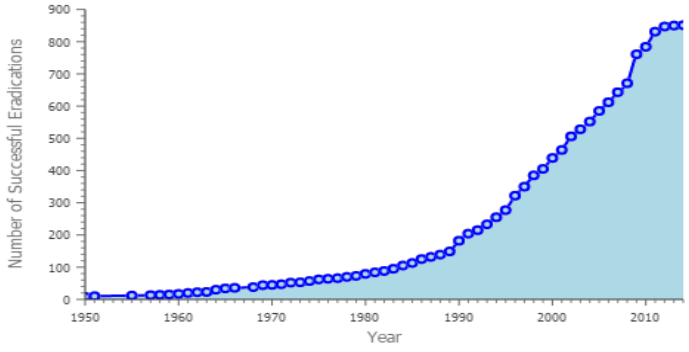
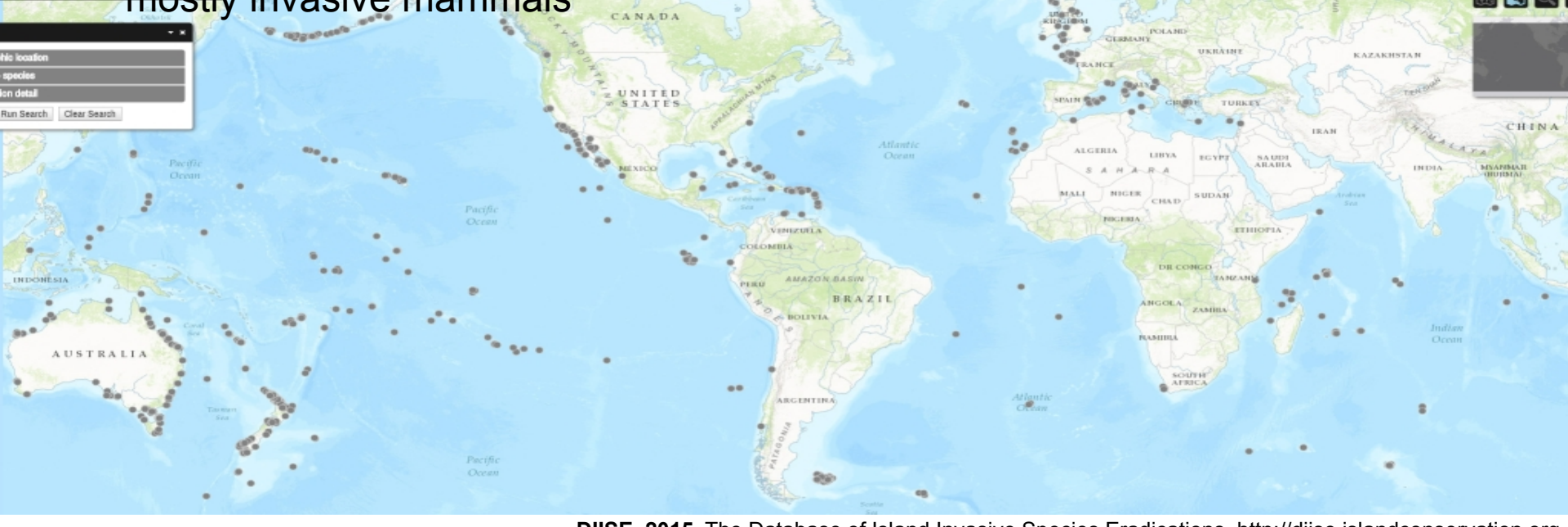


Figure 1. Cumulative number of successful invasive mammal eradication projects by year since 1950. Data are restricted to whole island events, excludes reinvasions, and data quality scored as good or satisfactory only.



DIISE, 2015. The Database of Island Invasive Species Eradications. http://diise.islandconservation.org.

Table 1. Numbers of species with demonstrated benefits from invasive mammal eradications

Animal	Resident population recovery	Unassisted colonization	Unassisted recolonization	Reintroduction	Conservation introduction
Invertebrate	5 (5)	0	0	16 (29)	1 (1)
Landbird	35 (50)	12 (12)	16 (33)	36 (122)	11 (17)
Seabird	41 (73)	22 (28)	50 (89)	9 (12)	0
Mammal	3 (11)	0	1 (1)	7 (7)	4 (5)
Reptile	31 (55)	0	0	22 (44)	2 (2)

Numbers of populations are shown in parentheses.

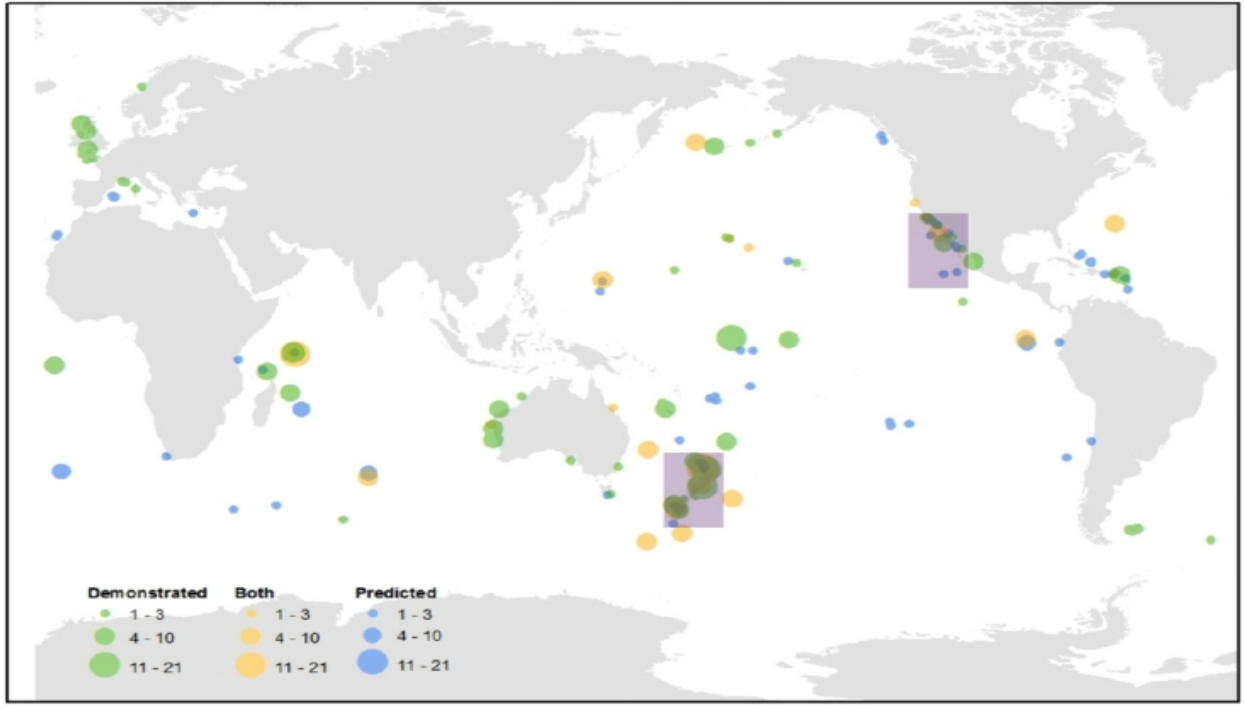
- 596 populations of 236 native species on 181 islands benefitted from eradications

POWERFUL CONSERVATION TOOL

6%

of all highly threatened terrestrial vertebrates have **benefited** from island IAS mammal eradications

Islands with native fauna populations with demonstrated and/or predicted benefits from invasive mammal eradications. Dot size indicates numbers of populations.

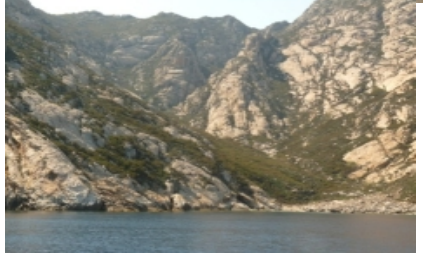


Jones et al. 2016. PNAS

EFFECTS OF ERADICATIONS

Eradication of ship rats from Montecristo Island

- 1080 ha (largest island eradicated from Ship rats; Hermite isl. Australia = 1022 ha)
- Hosts 3-10% of global population of Cory's shearwater (*Puffinus yelkouan*)
- Reproductive success from 0 to 75-95%



EFFECTS OF ERADICATIONS

- The New Zealand storm-petrel, thought extinct for more than 150 years, was recently found breeding on Little Barrier Island following cat and rat eradication

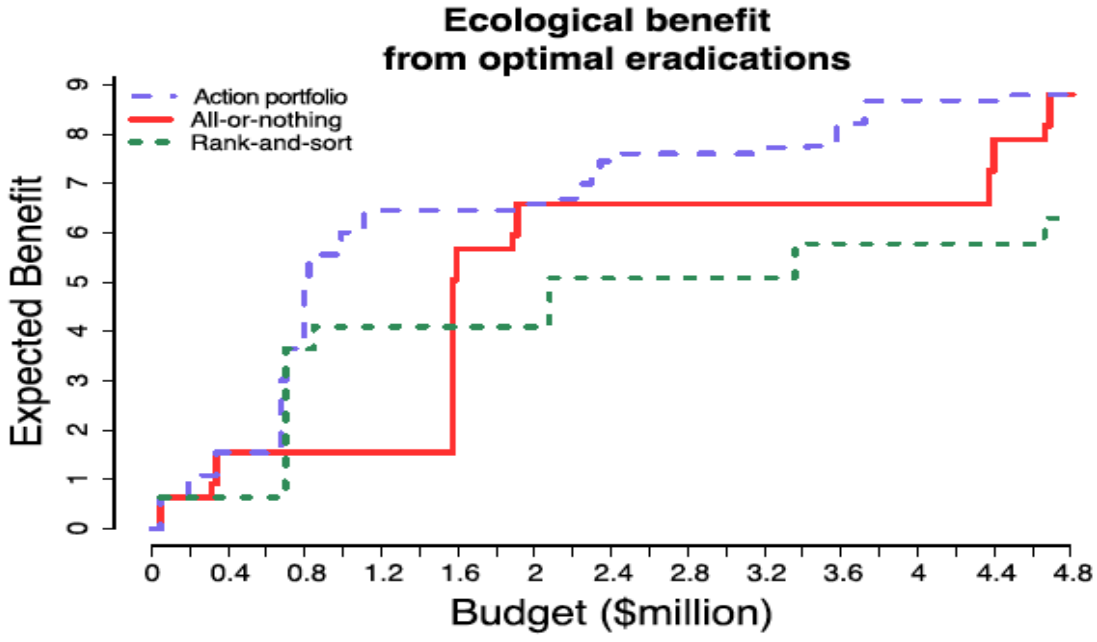
EFFECTS OF ERADICATIONS

- Rat eradication on Great Bird Island, which houses the only population of world's rarest snake, the Critically Endangered Antiguan racer (*Alsophis antiguae*)
- Antiguan Racer population increasing 20-fold on four islands

EFFECTS OF ERADICATIONS

- Following rat eradication on Langara Island in Canada, the population of ancient murrelets (*Synthliboramphus antiquus*) was estimated to double, and Cassin's auklets (*Ptychoramphus aleuticus*) re-colonized the island

EFFECTIVE CONSERVATION ACTION



Helmstedt, K.J. et al., 2015. Journal of Applied Ecology

SCALING UP TO MEET THE CHALLENGE

Island Invasives Conference

10-14 July 2017

at

University of Dundee, Scotland

For further information: www.islandinvasives2017.com

University of Dundee • South Georgia Heritage Trust