


# Priceless or Worthless?







**“This book does not merely tell us which species are most endangered, it shows us how we can save them. It challenges us to commit to safeguarding our priceless natural heritage for future generations”**

**His Royal Highness The Duke of Cambridge**

Cover image of a juvenile *Eleutherodactylus thorectes*  
© Robin Moore

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Published by: Zoological Society of London, Regent's Park, London NW1 4RY  
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Hardback ISBN: 978-0-900881-65-7  
Paperback ISBN: 978-0-900881-66-4  
Online ISBN: 978-0-900881-67-1

Baillie, J.E.M. & Butcher, E. R. (2012) *Priceless or Worthless? The world's most threatened species*. Zoological Society of London, United Kingdom.

Design: Kevin Hawkes [www.22creative.co.uk](http://www.22creative.co.uk)  
Print: [witherbysonline.co.uk](http://witherbysonline.co.uk)



# Priceless or Worthless?

## The world's most threatened species

by Jonathan E M Baillie and Ellen R Butcher

Nominations provided and text reviewed  
by members of the IUCN Species Survival Commission Specialist Groups  
and Red List Authorities



# Acknowledgements

We give gracious thanks to the global network of scientists who comprise the IUCN Species Survival Commission Specialist Groups

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Palm Specialist Group  
Seagrass Red List Authority  
Southern African Plant Specialist Group  
Temperate South American Plant Specialist Group

We would also like to give particular thanks to the following individuals and organisations who generously gave their time and expertise to review sections of, and to provide suggestions for, this book:

Adam Kerezszy  
Adam Matthews  
Adam Sweidan  
Alan Whitfield  
Alastair Robinson  
Aljos Farjon  
Allannah Weston  
Anders Rhodin  
Annabelle Cuttelod  
Anthony Rylands  
Arlo Brady  
Ather Rafi  
Axel Hochkirch  
B.A. Daniel  
Barbara Taylor  
Barney Long  
Battal Ciplak  
Baz Hughes  
Ben Collen  
Bert Orr  
Bibhab Kumar Talukdar  
Bush Heritage Australia  
Byron Wilson  
Charles Clarke  
Chavalit Vidthayanon  
Christian Randrianantoandro  
Christine Rose-Smyth  
Christoph Schwitzer  
Claude Gascon  
Colin Maycock  
Craig Hilton-Taylor  
Craig Turner  
Darren Yeo Chong Jinn  
David Burslem  
David Gill  
David Harries  
David Long  
David Mallon

David Minter  
Dominique Burgauer  
Donald McFarlane  
Douglas Gibbs  
Elizabeth Boakes  
Frank Glaw  
Frank Hawkins  
Franz Seidenschwarz  
Fred Katterman  
Galen Rathbun  
Georgina Mace  
Giuseppe Notarbartolo di Sciara  
Gordon Reid  
Héctor Hernández Macias  
Henk Beentje  
Ilse Storch  
Isaac Malugu  
Itambo Malombe  
James Burton  
James Collins  
James Kalema  
James Kushlan  
Jessica Sweidan  
James Thornton  
James Wren  
Jean-Christophe Vié  
John Donaldson  
John Dransfield  
John Himes  
John G Robinson  
Jonathan Eames  
Jonathan Ogwen  
Jörg Freyhof  
Jörn Köhler  
Justin Gerlach  
Karen B Strier  
Katalin Csatadi  
Kingsley Dixon  
Laura Owens  
Lina Eugenia Daza Rojas  
Lize von Staden  
Lorenzo Rojas-Bracho  
Luana Lucena  
Luigi Boitani  
Marie Bruegmann  
Mariella Superina

Mary Seddon  
Matthew Grainger  
Matti Hämäläinen  
Mervyn Lotter  
Micheal Neutens  
Michael Fay  
Mike Maunder  
Neil Burgess  
Neil Cumberlidge  
Nicholas Kinyau  
Nicholas Dulvy  
Nigel Collar  
Nigel Maxted  
Onildo Marini-Filho  
Paul Cowley  
Paul Donald  
Paul Racey  
Paul Williams  
Paul Wilkin  
Peter Cranswick  
Peter Garson  
Peter Ng Kee Lin  
Peter Paul van Dijk  
Peter Rand  
Peter Thomas  
Philippe Chardonnet  
Quentin Luke  
Raj Amin  
Ralph Armond  
Randall Reeves  
Reagan Villanueva  
Rebecca Lee  
Rich Storton  
Richard Jenkins  
Richard Lansdown  
Richard Young  
Robert Cantley  
Robbin Thorp  
Robin Moore  
Rodrigo Medellin  
Ron Kopas  
Royal Forest and Bird Protection Society  
Roy Gereau  
Rudy Pothin  
Russell Mittermeier  
Samuel Turvey

Sandy Luk  
Sanjay Molur  
Sara Oldfield  
Scott Black  
Sir David Attenborough  
Stefan Wiswedel  
Stewart McPherson  
Stuart Butchart  
Tandora Grant  
Tim Bauer  
Tim Flach  
Tim Gerrodette  
Tomas Hallingbäck  
Usama Ghazali  
Vimoksalehi Lukoschek  
Vincent Florens  
Vincent Kalkman  
Viola Clausnitzer  
Will Duckworth  
Willem-Joost de Gier  
William Baker  
William Perrin  
William Robichaud  
Yvonne Sadovy

Special thanks to Client Earth for their assistance in formulating this concept and for providing valuable contributions to the book.

Additional thanks to all those who provided the images featured throughout this publication.

Finally, sincere thanks to Rachel Roberts and Emma Edwards for providing feedback on the text, and to Simon Stuart and Mike Hoffman for assisting with the selection of the top 100 species.

Please accept our apologies for any accidental omissions.



*“Conservation began with a focus on species, especially those in danger of extinction, and a major species focus needs to continue as a central element in all efforts to ensure the long-term viability of our living planet”*

*Dr Russell A Mittermeier  
President, Conservation International*

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# Foreword

Written by: Dr Simon Stuart, Chair of the IUCN Species Survival Commission



**Simon Stuart**



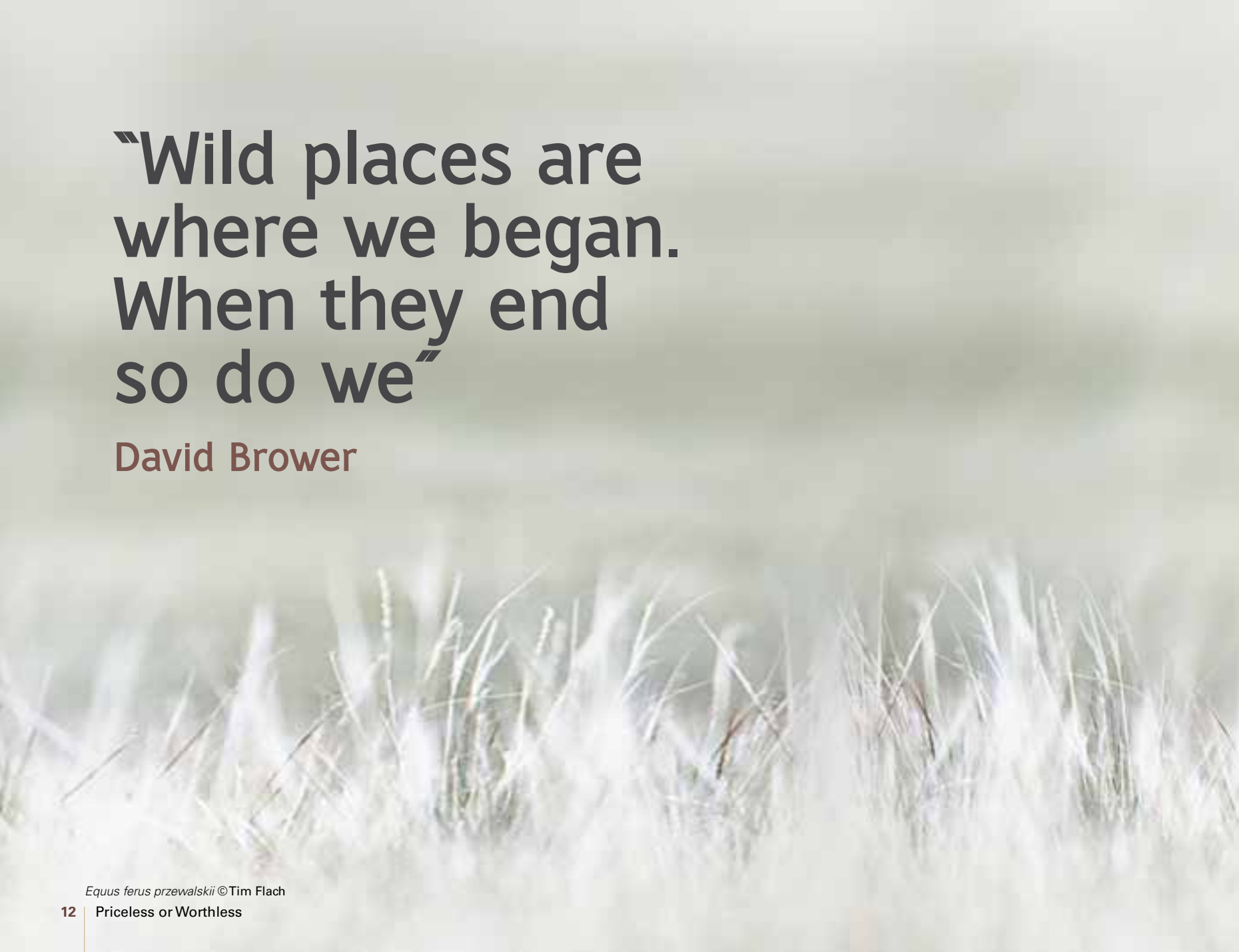
The IUCN Species Survival Commission (SSC) is a science-based network of more than 8,000 volunteer experts from almost every country of the world. SSC members include experts on plants, fungi, birds, mammals, fish, amphibians, reptiles, and invertebrates, and are deployed in over 100 Specialist Groups. It is these experts who have nominated the species featured in this book to draw attention to those which, without urgent conservation intervention, might no longer be with us in the near future.

The SSC vision is of a just world that values and conserves nature through positive action to reduce the loss of diversity of life on earth. This diversity includes the huge variety of species highlighted in the book: the aptly named Suicide palm, a colossus tree that dies shortly after flowering, and the iconic Red River giant softshell turtle, tightly woven into Vietnamese mythology. Teetering on the edge of extinction, these species and many others urgently need strong, global collaboration to survive.

'Priceless or Worthless' identifies the threats that these 100 species face, but it also identifies how they can be addressed. In addition, to remind us that all is not lost and that conservation has tangible benefits, the book highlights the successful efforts which have rescued species from the brink of extinction. We should be greatly encouraged that, worldwide, there are people with the determination and dedication to prevent species being lost. By learning from our mistakes, sharing our skills and knowledge and placing value on the life around us, we can help to ensure that, as custodians of our environment, we save species rather than accelerate their loss.

Launched in time for the world's largest gathering of conservationists (the IUCN World Conservation Congress), 'Priceless or Worthless' challenges us to confront our moral and ethical beliefs about the value of nature. The future of many species is going to depend on reconciling the needs of people and nature, and ensuring economic development and conservation do not undermine each other. If society believes that all species have a right to exist on the planet, then why are 100 of the most threatened species on the planet receiving so little funding or attention? At a time when thousands of species are truly on the edge of extinction, it is time to ask society to take a stand – to declare that the 100 species in this book, and millions of others like them, have the right to exist on this planet. This then needs to be followed with appropriate conservation action, innovation, community participation, policies, legislation and enforcement. If we ignore the question, and fail to take action, we shall be inadvertently accepting the ethical position that human-caused mass extinction is acceptable. This book signals a wake-up call and challenges us all to take the necessary action on behalf of our fellow species as a matter of urgency.





“Wild places are  
where we began.  
When they end  
so do we”

David Brower





## Chapter 1

# The value of extinction



“Nowadays we know the price of everything, and the value of nothing”

Oscar Wilde

# Priceless or worthless; you decide.

Written by: Professor Jonathan Baillie, Director of Conservation Programmes, Zoological Society of London



Jonathan Baillie

The future existence of the 100 species in this book lies squarely in our hands. Do these species have a right to exist, or do we have the right to drive them to extinction?

For the first time the IUCN SSC network of 8,000 scientists have identified 100 of the most threatened animals, plants and fungi. The declines of most of these species have been caused by humans and in almost all cases their extinction can be avoided and the decline reversed. Thus, their future existence lies squarely in our hands. Whether they disappear forever or remain on the planet simply depends on whether we as a society believe they are worth protecting. In this book we ask you to consider whether the 100 most threatened species are priceless or worthless. Do they have the right to exist or do we have the right to drive them to extinction?

The book starts by introducing 100 species from 48 different countries that will be the next to go if conservation action is not taken immediately. Twenty-five of the 100 are highlighted to demonstrate the diversity of life that is about to be lost. We introduce the reader to the unique traits and characteristics of each species – essentially the wonder and natural beauty of each creature, plant and fungi. We then highlight examples of species that have been brought back from the brink of extinction such as Przewalski's horse or the Chatham Island's black robin, demonstrating that averting extinction is possible.

Although a few species on the list provide economic benefits to people, such as the sale of the Giant yellow croaker's swim bladder (worth over seven times the price of gold in 2001) for use in traditional medicine, the majority do little for society other than represent cultural or existence values. If the 100 species on this list were to disappear tomorrow there would be little impact on the global economy, jobs or security. This is in fact the case for millions of species on the planet, where their value to humanity is unknown or tangential at best.

With the threats to biodiversity rapidly escalating, and growing numbers of species on the doorstep of extinction, society is at a point in history where a decision needs to be made. Do these species have the right to exist? A decision not to tolerate human-caused extinction would of course be entirely value based – but so is the alternative of allowing extinction to occur. We need to decide where we stand on this moral and ethical issue and implement and enforce national and international laws accordingly. So – it is up to us. The future of these species depends on our values, are they priceless or worthless?



*“Every living species represents one unique pathway to success, developed over millions of years. What we lose with each passing species can never be replaced”  
Professor Georgina Mace, CBE, FRS*

# Game changing

For the value of these 100 species to be recognised in our political, legal, social and economic systems, changes will need to be made. Here four leading figures from the policy, legal, funding and communications arenas give their personal opinions on what would need to be done.

**Disclaimer:**  
The views expressed in this section are the opinions of the individual authors themselves, and as such do not necessarily reflect those of the authors of this book, the Zoological Society of London, IUCN or other participating organizations.

## Marketing and Communications

The truth is I don't know if it is possible to save the 100 species listed in this book. That's a punchy start, but it's just me being honest. It may be too late and it may require too much effort. That's a sweeping value judgement that us humans will make, based on an analysis of four basic points that we have embedded in our psyche:

- Do I know anything about this, is it on my radar?
- What's the rational argument (economically speaking) for doing something?
- What's the emotional argument for doing something?
- Can I actually do anything anyway?

If we, as conservationists, want to give saving these species a shot then the first stage is to consider our answers to these questions. It is in answering these questions that communications and marketing has a significant role to play.

We may not be able to craft a convincing argument in all instances, but we will be able to flush out the most convincing angles. The first question is often the hardest; it is also the most important. As conservationists we frequently assume that everyone else should have the same degree of care and passion about the natural world that we have. This is not the case. Nature is not prominent in the media; increasingly we are divorced from

nature in our day to day lives, surrounded by tarmac, concrete and glass. Caring about nature is increasingly not natural.

In order for people to be moved to action they firstly need to be aware of the issue (no mean feat in a world where we are bombarded by messages about soap, sport and smartphones, 24/7). Then we need a powerful rational and/or an emotional argument - you only need a powerful response to one of them to get some traction. Then finally, when you have established interest you have to be sure not to fall at the final hurdle by neglecting to provide a call to action, something that your audience can do themselves to help. Get all that in place, or even part of it, and you are well on the way to saving species and getting nature back on the agenda.

**Dr Arlo Brady**  
*Managing Director  
freud Communications*



## Policy

Politics is driven by [moral] values and economics. The influence that each has on public policy varies according to both national context and the individuals involved. Although their respective importance is determined by their context, the combination of the [moral] values and economics defines and determines the public policies on which a political party will fight an election.

The conservation movement faces competition for politicians' time, interest and commitment. How it addresses these driving forces will be the key factor determining its relevance to, and impact on, politicians and the key decisions that they will make in the coming years.

For most of its history the conservation movement has largely advanced moral and ethical (values-based) arguments for protecting nature, rather than promoting a more utilitarian, ecosystem-service based approach. This balance is now changing, with focus turning towards functional arguments. Commitment to a more utilitarian approach may be at the expense of some of the world's most endangered species. However, it would be politically naïve to use this as a reason completely to reject it, when it demonstrates the material benefits some components of biodiversity provide to people.

There is now a real political opportunity for the conservation movement to continue to maintain the moral and ethical arguments that are the foundation of its legitimacy, while at the same time highlighting the economic benefits that biodiversity provides. The Natural Capital approach provides a framework to do exactly this – to recognise simultaneously both the intrinsic and utilitarian values of nature. It encourages governments to measure and monitor species and ecosystems and calls on society to decide how these should be valued. They can then be protected through legislation and viewed as a national asset, with degradation showing up as a loss on the national balance sheet. This does not undermine or displace the long-standing cultural or ethical values people may have in and for nature, but provides another politically relevant reason for decisions to be made that support conservation.

**Adam CT Matthews**  
*Secretary General*  
*Globe International*





## Legal

What would have to change about the law to protect the threatened species celebrated in this book? The main problem is that there is simply no enforceable law globally that protects threatened species in their habitats. We have the Convention on Biological Diversity, under which action plans and protected areas are created, but it is not legally binding. We have the Convention on International Trade in Endangered Species which is legally binding, but only covers species threatened by trade. We have the IUCN Red List prepared by the International Union for Conservation of Nature (IUCN), which is a key tool in identifying species at risk of extinction. But it has no effect in law. Many countries also have National Red Lists, but few are linked with any legal obligations. What we need to do to protect the species in this book and a host of other threatened species is create a system of law that tracks species at risk and creates real enforceable protections.

What might this look like? We could start with the Convention on Biological Diversity and give it some real teeth. Here's how. Placing a species on a National Red List would trigger the requirement to produce a biodiversity action plan for the most threatened species. These plans would differ from the current ones in that they would be binding. They would come with targets, timetables and a pathway to the desired outcome. There would also be sanctions attached for not complying with the plan. Crucially, technical help and funds must also be made available for the countries that will be doing the conservation work needed to help threatened species to thrive. The critical issue is whether we can generate the understanding to create the political will to make the legal regime work.

**James Thornton**  
*CEO*  
*ClientEarth*



## Funding

There are few universal causes that require massive mobilization from all sectors of society. Preserving the diversity of life on Earth is one of them.

Governments have repeatedly recognized the need to do so, but this is no longer an option; we must do it. Thousands of enthusiastic people are trying to do miracles around the globe, often anonymously and with very limited support. Most of the time it is to preserve one species or one natural site. This publication features some of their successes. These committed conservationists and conservation groups stand ready to do more but unfortunately, we cannot rely indefinitely on the contributions of volunteers, nor the passion of a few committed individuals, to undertake such a mammoth task. They need money.

Billions of dollars are being invested to carry out research on other planets. The landing of the robot Curiosity on Mars with the objective of finding tracks of new forms of life is the most recent example. At the same time, the diversity of life, on which our very existence depends, is disappearing fast. If equal amounts of money and ingenuity were invested to protect the natural resources of our world, our future on Earth would be secured. Then species such as those featured in this publication would not disappear.


Wildlife generates interest and arouses our passion which is demonstrated by the huge popularity of zoos or botanical gardens visited worldwide. Species have the power to communicate; their conservation is portrayed through wonderful photos, amazing stories and dedicated, driven individuals working with local communities. We have first and foremost an ethical obligation to conserve wild species. Our materialistic world, however, tends to restrict its attention to what is useful to human kind, has an immediate monetary value and considers the rest as obstacles. For this utilitarian view of nature, we are not short of powerful reasons to conserve the diversity of species that we have inherited. Wild animals, plants and fungi are excellent indicators of environmental change, contribute significantly to ecosystem services. Conserving species also helps to tackle complex environmental problems. Species are also of great value to companies which depend on their use for business or for promotion and for brand logos. What is the gain for species from their extensively valuable and free contribution to the world economy?

It is time to scale up funding efforts and call upon the governments to increase their contribution towards a better understanding and monitoring of biodiversity, as well as conservation action on the ground, directly, through multilateral bodies such as the Global Environment Facility or dedicated species conservation funds. However this responsibility cannot be left solely to governments. SOS – Save Our Species, is a global partnership initiated by leading conservation organizations aimed at mobilizing new sources of funding for threatened species, their habitats and the people depending on them. By joining SOS, governments, foundations, companies, wealthy individuals can join forces and ensure that species featured in this book prosper again. [www.SaveOurSpecies.org](http://www.SaveOurSpecies.org)

**Dr Jean-Christophe Vié**  
*Deputy Director  
Global Species  
Programme Director  
SOS - Save Our  
Species IUCN*







**“There’s no better  
designer than nature”**

Alexander McQueen





## Chapter 2

# Species at a tipping point



The species featured here represent the 100 most critically endangered species in the world. If we don't rapidly increase the amount of conservation attention that they receive they may soon be lost forever.







# *Astrochelys yniphora*

## Ploughshare tortoise, Angonoka

Text reviewed by the Tortoise and Freshwater Turtle Specialist Group

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**Population size:**  
**440 - 770 individuals**

**Range:**  
**12km<sup>2</sup> in Baly Bay region,  
northwestern Madagascar**

**Primary threats:**  
**Illegal collection for international  
pet trade**

**Action required:**  
**Enforcement of legal protection  
and protected area management**

---

Often referred to as the most endangered tortoise in the world, the ploughshare tortoise (*Astrochelys yniphora*) is named after the plough-like projection that protrudes between its front legs. Having narrowly survived hunting pressure and habitat destruction by fire in the past, this species' good looks may be its ultimate downfall as illegal collection for the international pet trade is likely to push it to extinction in the wild in the near future.

Baly Bay, the location of the single remaining metapopulation of the ploughshare tortoise, was gazetted as a national park in 1997 by the Malagasy government to protect the remaining fragments of the species' habitat. Another layer of security for this attractive reptile is accorded by its listing in CITES Appendix I, outlawing its international trade. However, poor enforcement undermines these legal protections, with illegal trade and collection escalating in recent years. In 1996, 73 individuals were stolen from the Durrell Wildlife Conservation Trust's offsite captive breeding facility, while in May 2009 four tortoises were stolen from their onsite quarantine facility, where they were being monitored prior to their planned release into the wild. Many wild animals have been poached off national park lands and appeared in the illegal pet trade, especially in Southeast Asia and China. Relying only on the current levels of legal protection to save this species has an extremely poor chance of success.

The illegal trade of ploughshare tortoises is undermining the otherwise laudable attempts of local conservationists and organizations to protect this species. There have been concerted efforts to stop illegal collection with the presence of the Madagascar National Parks Authority in the town of Saolala, close to the species' habitat, and the establishment of a small network of village para-rangers. These para-rangers monitor for possible smugglers and outbreaks of fire.

### **What needs to be done?**

Expansion of the current network of para-rangers, along with an increase in the level of protection provided by government authorities, would go a considerable way toward ensuring the survival of ploughshare tortoises in the wild. These efforts need to be coupled with ongoing monitoring of the species' presence in the illegal global pet trade, along with effective repatriation of confiscated animals. Unless these measures are implemented rapidly, human desire to own one of these fascinating creatures will rob future generations of the opportunity to ever see them in the wild.

# *Atelopus balios*

## Rio Pescado stubfoot toad

Text reviewed by the Amphibian Specialist Group

Population size:

**Unknown**

Range:

**Azuay, Cañar and Guayas provinces,  
south-western Ecuador**

Threats:

**Chytridiomycosis and habitat  
destruction due to logging and  
agricultural expansion**

Action required:

**Protection of last remaining habitat**

Drawing its name from the Greek word for dappled or spotted, 'balios', the beautiful Rio Pescado stubfoot toad (*Atelopus balios*) is clinging to existence in a fragment of habitat in the Pacific lowlands of south-western Ecuador. Unseen since 1995, the rediscovery of this species in 2010 was one of few high points in the 'Search for Lost Frogs'. Launched in August 2010 by the IUCN SSC Amphibian Specialist Group and Conservation International, with support from Global Wildlife Conservation, this campaign resulted in expeditions by 26 researchers in 21 countries. Sadly only four of the high priority 'lost amphibians' were found, only one of which featured in the 'top ten'. This was the Rio Pescado stubfoot toad.

Only a tip-off from the local community led researchers to find a single adult toad by a river during their search in 2010. This discovery partially allayed fears that the species had already succumbed to chytridiomycosis. However, the spot where it was found was not under any form of protection. As habitat degradation and loss due to agriculture, logging and pollution also severely threaten the survival of this species, protection of the last remaining fragments of the toad's habitat is needed without delay.

Also known as harlequin toads, the rediscovery of this species was a rare moment of celebration in an otherwise sobering search for 'lost' amphibians. However, amphibian lovers should draw hope from the fact that they now have a rare opportunity to rescue a member of a group that has been hit particularly hard by amphibian declines.

### **What needs to be done?**

The immediate protection of this species' habitat in the Pacific lowlands of south-western Ecuador, coupled with further intensive searches for other individuals that could be used for captive breeding, may yet save the Rio Pescado stubfoot toad. Ecuadorians must take rapid, decisive action if this beautiful piece of their natural heritage is to be saved.







# *Brachyteles hypoxanthus*

## Northern Muriqui, Woolly Spider Monkey

Text contributed by Karen B. Strier, Primate Specialist Group

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**Population size:**  
**< 1,000 individuals**

**Range:**  
**Atlantic forest, south-eastern Brazil**

**Primary threats:**  
**Habitat loss and fragmentation  
due to large-scale deforestation  
and selective logging**

**Action required:**  
**Habitat protection and  
commitment of resources to  
support the implementation  
of the national action plan**

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The long-limbed northern muriqui (*Brachyteles hypoxanthus*), or woolly spider monkey, is found exclusively in the Atlantic forest of south-eastern Brazil. This peaceful primate is quite peculiar as, instead of fighting to monopolize fertile females, males wait patiently for their turn to copulate. It is not unusual for an ovulating female to mate with multiple males in close succession. These low levels of aggression give females the opportunity to choose their own mates without the risk of violence that other female primates may face. Revelations about the northern muriqui's egalitarian social relationships and promiscuous sex lives have captured attention both in Brazil and internationally, leading to the proposal for it to be a flagship species for the upcoming (2016) Olympic Games in Brazil.

Large-scale deforestation in the past and selective logging has reduced the northern muriqui's unique ecosystem to a fraction of its original extent, and hunting pressures have taken their toll on local populations. Today, fewer than 1,000 northern muriquis are known to survive, distributed among about a dozen private and government owned forests in the states of Minas Gerais, Espírito Santos and Bahia. Habitat fragmentation has isolated these populations from one another and most of the remaining populations are now alarmingly small.

To address these threats, current conservation tactics are aimed at the preservation and expansion of remaining habitats and at the protection and management of existing populations. This often requires delicately balancing research, ecotourism, and environmental education programs, with both the well-being of the animals and environmental impact concerns.

### **What needs to be done?**

With the formation of an advisory committee of experts and the recent completion of a national action plan for the muriquis (O Plano de Ação Nacional para a Conservação dos Muriquis), the Brazilian government has taken impressive steps in demonstrating its commitment to the development of informed conservation policies for its endangered and critically endangered species. The success of these policies now depends upon the appropriate allocation of global resources for conservation initiatives.

# *Bradypus pygmaeus*

## Pygmy three-toed sloth

Text reviewed by the Anteater, Sloth and Armadillo Specialist Group

### Population size:

**< 500 individuals**

### Range:

**Approximately 1.3km<sup>2</sup> – 1.5km<sup>2</sup> on Isla Escudo de Veraguas, Panama**

### Threats:

**Habitat loss due to illegal logging of mangrove forests for firewood and construction and hunting of the sloths**

### Action required:

**Enforcement of protection of the Isla Escudo de Veraguas nature sanctuary and raising awareness**

Less than half the size of its mainland cousin – the brown-throated sloth (*Bradypus variegatus*) – the pygmy three-toed sloth (*Bradypus pygmaeus*) lives almost exclusively in the red mangrove forests which cover between 1.3km<sup>2</sup> to 1.5km<sup>2</sup> of the Isla Escudo de Veraguas, off the Caribbean coast of Panama. This small sloth has blotchy, pale grey-brown fur with a slight greenish tinge. This green hue is actually a cunning camouflage created by a coat of algae, helping the sloths to blend in with their habitat.

Although the island is uninhabited, seasonal visitors pose an increasing threat with reports of fishermen and lobster divers opportunistically hunting the sloths. There is also evidence of clearance of their mangrove habitat for use as firewood and in local construction, endangering the survival of this tiny creature. Anecdotal observations from researchers visiting the island have estimated the population of the pygmy three-toed sloths to be around 200 individuals. The small size of the population and the limited extent of their habitat increase the species vulnerability to unexpected environmental events, and reduce their ability to withstand continued and increasing anthropogenic pressure.

Isla Escudo de Veraguas is already gazetted as a protected nature sanctuary. However, enforcement of this status is currently nonexistent, leading to the exploitation of both the sloths and their habitat. Though there is currently some evidence of local indigenous governance, this needs better coordination and enforcement, via engagement of all the stakeholders.

The pygmy three-toed sloth is a quintessential charismatic species. The willingness of humanity to save such species is well documented and if this little sloth could be elevated to flagship status in the minds of Panamanians and the global community, it could become a valuable ambassador for the conservation of the mangrove ecosystem on which it depends.

### What needs to be done?

As the primary threat to this species is of human origin, transforming the current perception of the species is of paramount importance. Local awareness programmes could improve its profile of and, when coupled with increased law enforcement to protect the nature sanctuary, could help to reduce the myriad of pressures that these little sloths face. Furthermore, the use of the pygmy three-toed sloth as a flagship species for both its mangrove habitat and Panama could increase its value to the Panamanian people and their government.











# Calumma tarzan

## Tarzan's chameleon

Text reviewed by the Chameleon Specialist Group

Population size:

**Unknown**

Range:

**< 10km<sup>2</sup> in Anosibe An'Ala region,  
eastern Madagascar**

Primary threats:

**Habitat destruction for agriculture**

Action required:

**Support for nascent community  
conservation initiatives and  
protection of habitat**

Named in the hope that it would be a clarion 'Tarzan' call for conservation, the arresting Tarzan's chameleon (*Calumma tarzan*) was discovered in a small, and shrinking, patch of rain forest close to the village formerly known as Tarzanville (now Ambodimeloka) in eastern Madagascar. Madagascar has rich chameleon diversity with numerous strikingly beautiful species occurring throughout its remaining forests. The bright green and yellow Tarzan's chameleon is a spectacular species, with the yellow stripes that males display when agitated being particularly eye-catching.

Sadly, habitat destruction as a result of slash-and-burn agriculture is threatening the survival of this recently discovered species. Currently only known from three small rainforest fragments, covering an area less than 10km<sup>2</sup>, the species faces an uncertain future.

Thankfully there are some legal restrictions in place and forest clearance, enforced by local community associations, is prohibited in two of the small fragments in which the species is found. However, during a recent visit to Ampotaka Forest, a provisional protected area, researchers found evidence of forest clearance for the creation of trails for logging. Community conservation efforts, including the establishment of new protected areas, are underway in two of the sites where this species occurs. These tiny patches of rainforest harbour a variety of endemic plants and animals, and their value to the local economy and environment is well understood locally. Communities that use these forests are strongly supportive of conservation efforts that focus on sustainable use.

The preservation of tiny fragments of forest, while seemingly less important for the conservation of larger animals such as lemurs, play a critical role in plant, amphibian and reptile conservation on Madagascar. In light of the current rapid rates of habitat degradation and destruction, the protection of these refugia is of utmost importance. While the situation may seem dire, prior experience shows us that the 'Tarzan' calls of species such as this charismatic chameleon can inspire communities to overcome seemingly insurmountable obstacles to preserve their heritage.

### **What needs to be done?**

Local community organisations require support, as well as the promotion of economic activities that don't require forest clearance, to effectively manage the remaining fragments of forest. One such activity could be the development of a basic infrastructure for ecotourism as a partial alternative to destructive agricultural practices. Eco-tourism that rests on the survival of Tarzan's chameleon, coupled with the provision of better education and health services, could provide the impetus needed for locals to protect this valuable habitat.

# *Coleura seychellensis*

## Seychelles sheath-tailed bat

Text reviewed by the Bat Specialist Group

### Population size:

**< 100 mature individuals**

### Range:

**Two small caves on Silhouette and Mahé, Seychelles**

### Threats:

**Habitat degradation and predation by invasive species**

### Action required:

**Removal of invasive vegetation and control of introduced predators, coupled with legal protection of habitat and roosting sites**

A member of an ancient family, the tiny Seychelles sheath-tailed bat (*Coleura seychellensis*) owes its name to the membrane stretched between its hind legs. The bat's aerial acrobatics are facilitated by the presence of this membrane - by shifting its hind legs the bat can adjust the length of the membrane, enabling it to rapidly duck and dive whilst in flight. Sadly, this winged aerialist is now flying ever closer to the edge of existence and may soon be lost for good.

Already extinct on the islands of La Digue and Praslin, this captivating species is now clinging to life in several caves on the islands of Silhouette and Mahé. However, even these caves are no longer safe havens as the world's most endangered bat is beset from all sides. The most significant declines of this species were probably driven by lowland forest clearance and the extensive use of horticultural pesticides in the late 1800s and early 1900s. Now however, the proliferation of invasive species, such as the Kudzu vine (*Pueraria phaseoloides*), seems to be the primary factor imperilling the species' survival due to damage to forest habitat and the entrances to roosts. Human disturbance to the bat's roosts in well lit boulder caves, coupled with predation by voracious feral cats, rats, and introduced barn owls may seal the fate of this aerial acrobat.

### What needs to be done?

Aggressive control of invasive vegetation and predators, drawing from international experience in the eradication of these threats, could assist this little bat's recovery. These activities should be coupled with the restoration of the bats' lowland forest home which should increase the bats' invertebrate prey and augment the currently limited habitat available to the species. Finally, legal protection of habitat and roosting sites, combined with the initiatives mentioned above, could secure the persistence of this species into the future.



*Aggressive control of invasive vegetation and predators, drawing from international experience in the eradication of these threats, could assist this little bats recovery.*







# *Cyclura collei*

## Jamaican iguana, Jamaican rock iguana

Text reviewed by the Iguana Specialist Group

### Population size:

**Unknown**

### Range:

**< 10km<sup>2</sup> in Hellshire Hills, Jamaica**

### Primary threats:

**Predation by introduced species and habitat destruction**

### Action required:

**Translocation to predator-free islands and control of deforestation**

Believed to be extinct for much of the last century following its disappearance from the Goat Islands, two small islands off the Jamaican coast, the Jamaican iguana (*Cyclura collei*) was re-discovered on the mainland in 1970. Hanging on in a remote section of the harsh Hellshire Hills, this large lizard seems determined to fight on. When cornered the species will strike out with its front claws, and there are reports of it putting out the eye of hunter's dogs when attacked.

Once common on the southern coast of Jamaica, the introduction of invasive predators (particularly the Indian mongoose in 1872) coupled with changing land-use patterns and human population growth, have driven the rapid decline of this species. In the absence of reintroductions from a head-starting programme run from Hope Zoo in Kingston, and extensive predator control managed by the University of the West Indies, the species would probably have vanished entirely from its refuge in the Hellshire Hills. As it is, they persist only within a 10km<sup>2</sup> core zone that is protected from predators by a series of traps.

The iguana's forest habitat is protected under the Forest Act of 1996, but a lack of enforcement has meant that the area continues to be exploited for wood used in charcoal production. If this destruction is not controlled within the near future, there is a real risk that forest users will enter the remaining iguana habitat and destroy it, wiping out the species within it. The Hellshire Hills is also

within the Portland Bight Protected Area, which was declared in 1999, and should provide further legal weight to stop current levels of abuse. These legal instruments could also be used to limit the expansion of development projects into the area that would open up the forest to further exploitation.

### What needs to be done?

The reintroduction of the Jamaican iguana to the offshore Goat Island cays, which also fall within the Portland Bight Protected Area, should proceed without delay. The establishment of a dry forest biodiversity reserve on these islands, and the eradication of predators, would provide the iguanas with a safe haven and is critical in ensuring the species long-term survival. The head-starting programme, which has released over 174 iguanas back into the wild since 1996, could then be used to boost populations in these sanctuaries. The establishment of populations on these offshore islands would provide a lifeline for the iguanas and secure their future.

# *Dendrophylax fawcettii*

## Cayman Islands ghost orchid

Text reviewed by the Orchid Specialist Group

Population size:

**Unknown**

Range:

**< 1km<sup>2</sup> Ironwood Forest, George Town, Grand Cayman**

Threats:

**Habitat destruction due to infrastructure development**

Action required:

**Development of legislation that will facilitate the protection of the Ironwood Forests**

Known only from Grand Cayman Island, the ethereal ghost orchid (*Dendrophylax fawcettii*) grows on the trunks of trees and bare rocky limestone karst pinnacles. A leafless, spider-like network of roots for most of the year, delicate pale cream flowers bloom between April and June, decorating the moist forest adjoining the wetlands. Sadly, this beautiful orchid faces an uncertain future. The Ironwood Forest, the last remaining fragment of old-growth forest in George Town, is bounded on all sides by the urban development of the nation's capital. The forest extends to just 46 acres; of this, while the ghost orchids are confined to an area of only six acres.

Development of the west side of Grand Cayman has been voracious in recent years. In 2008, government plans to construct a bypass through the forest, and through the portion occupied by the orchids, provoked outcry from both the public and the owners of the privately-held Ironwood Forest land. The forest won a stay of execution thanks to the campaign by the protestors and the bypass plans were shelved. However, this temporary reprieve will be insufficient to ensure the long-term survival of the enchanting ghost orchid as the Ironwood Forest continues to remain without any formal protection. The successful protection of the forest would also preserve (among numerous other native species) four additional Cayman Islands endemics of cultural as well as natural significance (Ironwood: *Chionanthus caymanensis*, Thatch palm: *Coccothrinax proctorii*, the Banana orchid: *Myrmecophila thomsoniana* (Cayman's National

Flower), and *Hohenbergia caymanensis*). The latter, a giant bromeliad nick-named "Old George", is known naturally only from this area.

### **What needs to be done?**

The Cayman Islands currently lack the comprehensive conservation legislation necessary to establish national protected areas, and only five per cent is under the protection of the National Trust for the Cayman Islands. With appropriate legislation, protection of the Ironwood Forest would be possible, either by purchase or through establishing management agreements with the private landowners. This would benefit the landowners by enabling them to maintain their land in its natural state, as they have done for generations. All that is required to enable this is the political will.









# *Dioscorea strydomiana*

## Wild yam

Text reviewed by the South African Plant Specialist Group

Population size:  
**200 individuals**

Range:  
**Oshoek area, Mpumalanga,  
South Africa**

Primary threats:  
**Collection for medicinal use**

Action required:  
**Develop strategy for sustainable  
use and establish ex-situ populations**

Touted as a cure for cancer in South African traditional medicines, the recently discovered wild yam (*Dioscorea strydomiana*) holds the unenviable title of the most threatened yam in the world. While claims of its healing properties are currently unsubstantiated, related species are rich in elements which formed the original basis of steroidal drugs and the contraceptive pill.

Unfortunately, the plants purported curative attributes may be the cause of its destruction. Excessive levels of collection for medicinal use are currently the primary threat to this slow-growing species. In fact, the most recent survey of the wild yam population found over 89 per cent of the plants had harvesting scars. Collectors remove large parts of the tuber, which protrudes from the ground, often leading to the death of the plant. If the species continues to be exploited at the current rate, its persistence in the wild is highly unlikely. In addition, burning, mining, cattle farming and firewood collection are threatening the surrounding area, adding to the pressure on this valuable species.

As the primary threat to the wild yam is unsustainable levels of collection, developing solutions that will alleviate this are essential. Concerned parties, including the Mpumalanga Tourism and Parks Authority, the South African National Biodiversity Institute and the Mpumalanga Plant Specialist Group, are currently collaborating to address this. These groups will also need to develop conservation programmes in conjunction with the community that has primary custodianship over the wild yam if they are to have any chance of success.

### **What needs to be done?**

Possible solutions could include substituting other similar species in medicinal products or developing systems for harvesting the seeds and selling plants post-cultivation. The development of a successful cultivation project in particular could provide a lifeline for the species, alleviating pressure on the wild population. Ex-situ cultivation projects have been started, but after eight years no plants have reached reproductive maturity. Although cultivation and the stockpiling of seed may provide an emergency parachute of sorts for the species, they alone can't be relied on to save the wild yam. This makes immediate protection of the species in the wild of paramount importance.



# *Eurynorhynchus pygmeus*

## Spoon-billed sandpiper

Text contributed by Rebecca Lee and reviewed by the Threatened Waterfowl Specialist Group

**Population size:**  
**< 100 breeding pairs**

**Range:**  
**Breeds in Russia, migrates along the East Asian-Australasian Flyway to wintering grounds in Bangladesh and Myanmar.**

**Primary threats:**  
**Trapping on wintering grounds and land reclamation.**

**Actions required:**  
**Maintenance of critical intertidal staging posts and reducing trapping on wintering grounds.**

The spoon-billed sandpiper (*Eurynorhynchus pygmeus*) is a weird and wonderful bird, having a uniquely shaped bill that resembles a flattened spoon. It is also a species in deep trouble and is today considered to be one of the most endangered birds on the planet. With the global population estimated at less than 100 breeding pairs, and an annual rate of decline of 26 per cent over the last decade, the species could be extinct within the next ten years. On leaving its breeding grounds in the coastal tundra in far north-eastern Russia, the spoon-billed sandpiper undertakes an epic 8,000km migration along the East Asian–Australasian Flyway to winter in southern and Southeast Asia.

The most acute cause of the species' very rapid recent decline is believed to be trapping and hunting, primarily on the wintering grounds including the Bay of Martaban in Myanmar and Sonadia Island off the Bangladesh coast. This small wader has also undoubtedly been affected by the loss of intertidal habitats along its migratory route, particularly in the Yellow Sea. This problem also affects many other birds and local communities who depend on the region's coastal natural resources. The precipitous decline of waterbirds along this flyway has been described as the gravest bird extinction crisis on Earth.

Many organisations across the conservation community have united to attempt to save the spoon-billed sandpiper and preliminary results are positive. In Myanmar, efforts to reduce trapping by providing local communities with livelihood alternatives have shown success, and two arduous expeditions to far north eastern Russia have resulted in a captive population of spoon-billed sandpipers, as well as birds being released on the breeding grounds after being hatched and reared in captivity, which has helped to alleviate the high mortality rate of chicks in the wild.

### **What needs to be done?**

A flagship species for the East Asian–Australasian Flyway, the spoon-billed sandpiper's fate, and that of the millions of other waterbirds that migrate along the same flyway, hangs on the preservation of key staging sites. In addition to the long-term measures needed to protect these sites, activities such as conservation breeding and a reduction in winter trapping pressure are essential.

It will not be easy to save the spoon-billed sandpiper – time is short, funds are limited and the logistical problems are considerable. Success is by no means guaranteed, but with a huge collaborative effort on habitat protection, reduction of trapping and conservation breeding, there is still hope for this remarkable bird.









# *Heteromirafa sidamoensis*

## Liben lark

Text reviewed by the Bird Red List Authority

### Population size:

**90 - 256 individuals**

### Range:

**< 35km<sup>2</sup> in the Liben Plains,  
southern Ethiopia**

### Threats:

**Habitat loss and degradation due  
to agricultural expansion, over-  
grazing and fire suppression**

### Action required:

**Restoration of grasslands, including  
establishing sustainable land  
management practices, clearing  
scrub and reinstating fire regime**

Perfectly camouflaged amongst the sunburnt Ethiopian grassland, the cryptic Liben lark (*Heteromirafa sidamoensis*) resides solely in the open, tall grass habitat of the Liben Plains. Sadly this enigmatic species looks as though it could become mainland Africa's first recorded bird extinction. Between 2007 and 2009 the number of Liben larks dropped by 40 per cent with the population now numbering between 90 and 256 individuals. Unless current trends of habitat loss are reversed, there seems little hope for the species survival.

While as insidious and disastrous for the biodiversity they contain, the degradation of rangelands globally attracts far less attention than the destruction of tropical forests. It is this destruction of rangelands that is pushing the Liben lark to the edge. The loss of habitat in this area has been driven by crop planting, overgrazing and scrub encroachment, a result of both excessive grazing and fire suppression. Modelling suggests that apart from a small, politically insecure area near Somalia, there is no other suitable habitat for the species anywhere in the Horn of Africa. This makes the protection of remaining patches in the Liben Plains critically important.

As well as threatening the Liben lark, the decline in pasture quality is impacting the livelihoods of the local Borana pastoralists. Deteriorating pasture quality has transformed the homelands of the Borana from some of the most productive in Africa to a landscape overrun with famine and ethnic hostilities. Regeneration of these once productive areas is urgently required.

### What needs to be done?

As the Liben lark avoids woody vegetation, very short grass, and bare ground, regeneration of the open, tall grass habitat on which it depends will be pivotal to any recovery programme. The establishment of cattle enclosures could facilitate this. In addition, implementing sustainable management practices, including clearing scrub and abolishing fire suppression policies, is necessary to ensure the species long-term survival. By reinvigorating traditional land and water management strategies and increasing the appeal and sustainability of pastoralism, both the livelihoods of the local people and their biodiversity may yet be saved.

# *Johora singaporensis*

## Singapore freshwater crab

Text reviewed by the Freshwater Crab and Crayfish Specialist Group

### Population size:

**Unknown**

### Range:

**Bukit Timah Nature Reserve and streamlet near Bukit Batok, Singapore**

### Primary threats:

**Habitat degradation – reduction in water quality and quantity**

### Actions required:

**Protection of remaining habitat and establishment of ex-situ populations**

Hiding under rocks and dank leaf litter in just two or three streams in central Singapore can be found the Singapore freshwater crab, *Johora singaporensis*. One of only three endemic freshwater crabs in this highly developed island city state, for over half a century it had been assumed to be a population of the Malaysian species *Johora johorensis*. However, morphological and genetic studies have since confirmed it to be a distinct species, and it was formally named in 1986 – underlining the need to conduct careful analysis of taxonomy when developing conservation strategies. This tiny (up to 30 mm in size), mainly nocturnal creature feeds on detritus and worms found in the stream bed.

Until recently the Singapore freshwater crab was assumed to be relatively well protected with one of its two populations occurring in a stream drainage within the country's oldest and best protected national park, Bukit Timah Nature Reserve. However, studies in 2008 surprisingly found that it had completely disappeared from this particular stream within the reserve. Acid rain was suspected to be one of the culprits as the water in this stream had become too acidic for the crabs to persist. Most recently, however, follow-up surveys revealed the presence of a hitherto unknown population in another part of the reserve but in a different drainage, which fortunately does not appear to be experiencing similar problems of stream acidification.

The survival of this freshwater species now hinges on this stream in the reserve and a small drainage canal near Bukit Batok within five kilometres of this stronghold. Worryingly, the latter site remains unprotected, and lowering of the water-table that sustains the stream, pesticide use, and urban development could all result in the loss of this species from it altogether. However, the National Parks Board of Singapore is working with other government agencies in an urgent bid to prevent impacts to this unprotected site and help to prevent the impending extinction of one of the country's iconic species.

### What needs to be done?

Protection of the crabs' habitat and the surrounding stream systems offers the only chance to ensure the long-term survival of this species in the wild. In addition to in-situ conservation by protecting the species' habitat, the establishment of an ex-situ population is being explored; as this could provide some insurance in the short term against the sudden disappearance of the Singapore freshwater crab. Without the rapid implementation of these measures, the loss of this species seems almost inevitable.







# *Lophura edwardsi*

## Edwards's pheasant

Text reviewed by the Galliforme Specialist Group and the World Pheasant Association

### Population size:

**Unknown**

### Range:

**Quang Binh, Quang Tri and Thua Thien-Hue, Viet Nam**

### Threats:

**Hunting and habitat loss**

### Action required:

**Effective law enforcement, habitat restoration and development of a captive breeding programme**

Since proper records began 400 years ago, no pheasant species has been lost from the wild in Asia. It now looks as though Edwards's pheasant (*Lophura edwardsi*) from central Viet Nam may succumb to this fate, leaving its shimmering blue and black plumage and bright red wattles to adorn only display cases and zoo exhibits.

Rediscovered in 1996 after a 70-year gap in records, there have been no confirmed sightings of this species in the wild since 2000 despite intensive surveys in previously known areas. Deforestation has left the species' historical range almost completely devoid of the original tree cover. The spraying of herbicide during the Viet Nam war, and logging and clearance for agriculture have driven this loss which has left only fragments standing. In addition, indiscriminate hunting practices have pushed Edwards's pheasant to what may be a point of no return.

Previous experience with highly threatened bird species gives us reason to hope that this seemingly desperate situation could be reversed. Intensive surveys may yet uncover small remnant populations, and attempts to find these survivors should be continued. Critically though, the key to the survival of this striking species in the wild lies in effective law enforcement, coupled with awareness raising within local communities. Although current hunting practices do not specifically target Edwards's pheasants, the random nature of the activity still results in bird deaths.

### What needs to be done?

Complete cessation of hunting is necessary in any protected areas found to hold Edwards's pheasant, as will increased control of hunting in the surrounding habitat. In addition, habitat restoration and management will need to be incorporated into a comprehensive conservation plan that includes the full establishment of protected areas in the known range. Phong Dien and Dakrong have already been classified as nature reserves, but their status needs to be confirmed without delay.

Fortunately, there are a large number of individuals held in captivity around the globe, although the genetic purity of this population is uncertain and requires investigation. If this captive population is deemed suitable for a breeding programme, then this could be considered as part of a long-term management strategy to save the species. Habitat restoration and management, coupled with conservation breeding and reintroduction within the historical range of the Edwards's pheasant, could provide a much-needed reprieve for this enigmatic bird.

# *Nepenthes attenboroughii*

## Attenborough's pitcher plant

Text reviewed by members of the Carnivorous Plant Specialist Group

Population size:

**Unknown**

Range:

**< 1km<sup>2</sup> on either side of the summit of Mount Victoria, Palawan, Philippines**

Primary threats:

**Poaching**

Actions required:

**Creation of a protected area and enforcement of current legal protection**

Named after one of the world's most famous broadcasters and naturalists, Sir David Attenborough, Attenborough's pitcher plant (*Nepenthes attenboroughii*) is one of the world's largest, with traps reaching up to 30cm in height. This spectacular, colourful species was discovered by science in 2007 and three colonies have since been found on the uppermost slopes of the Mount Victoria Massif.

The location of Attenborough's pitcher plant is currently relatively inaccessible, meaning that habitat degradation and destruction do not yet pose a major threat. Instead, the primary risk is that of over-collection by locals and visitors. The monetary and curiosity value of this species is high, particularly in Asian markets and if unregulated, could drive this fascinating and iconic plant towards extinction. Elsewhere in the Philippines, the locals have noted the interest of foreigners in rare plants and may occasionally respond by collecting plants from the wild and selling them at roadside stalls. As the profile of this species continues to rise, this practice may escalate in Palawan, especially in the absence of an enforced protected status. Another potential threat to Attenborough's pitcher plant relates to mining expansion. Though operations are currently suspended at the nickel mine at the base of Mount Victoria, the soils in the area are rich in heavy metals and have been prospected for future mining operations. Such expansion would result in habitat destruction and open up the area, facilitating poaching.

Had Attenborough's pitcher plant been discovered any later, attempts to protect the plant and its species-rich habitat may have been too late. Fortunately, governments, scientists and the local inhabitants have been given an early opportunity to safeguard this remarkable pitcher plant and Palawan's unique biological heritage for the benefit of future generations.

### **What needs to be done?**

Attenborough's pitcher plant currently has little monetary value, apart from that gained through its collection and sale - a practice that is ultimately futile since harvested plants are unlikely to survive. An education programme focusing on developing responsible eco-tourism, coupled with better enforcement of existing laws prohibiting wild collection of the species, could ensure the plant's continued existence. Designation of the species' habitat as a protected area under Philippine law would also assist in ensuring its long-term survival, as would escalating cultivation efforts with the aim of reducing demand for wild-collected plants while potentially facilitating future reintroductions.







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*"This project is clearly a most valuable initiative, focussing attention as it does on species that are particularly endangered. I was greatly flattered when a pitcher plant with perhaps the biggest pitchers yet discovered was given my name, but aware too that such a potential record-breaker could attract the attention of unscrupulous collectors. So it is good to know that the Zoological Society of London and IUCN SSC have decided to include it among the species to be given special attention"*

**Sir David Attenborough**  
OM, CH, CVO, CBE, FRS, FZS, FSA





# Neurergus kaiseri

## Luristan newt

Text reviewed by the Amphibian Specialist Group

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### Population size:

**< 1,000 mature individuals**

### Range:

**< 10km<sup>2</sup> Zagros Mountains,  
Lorestan, Iran**

### Primary threats:

**Illegal collection for pet trade**

### Action required:

**Enforcement of protection**

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Restricted to only three fast-flowing streams in the southern Zagros mountains of Lorestan in Iran, the stunning Luristan newt (*Neurergus kaiseri*) was described relatively recently in 1952. Spending the winter hibernating in arid shrub land under stones, the species then returns to spring-fed streams to breed. The males of the species perform an intricate courtship dance prior to mating, but after expending all that effort the pair don't even touch. Instead the male deposits a sperm packet for the female to retrieve.

Cloaked in black, white and flashes of bright orange, this handsome amphibian has experienced a dramatic decline in its population over the last ten years with numbers now estimated to be less than 1,000 mature individuals. A significant threat to the survival of the Luristan newt is the growing demand from the international pet trade. Prized for their distinctive colouring, a warning of their toxic skin secretions, some individuals have been spotted for sale in markets in Tehran. Wood collection, together with the effects of severe droughts in the region, is severely limiting the suitable habitat available for the species. Finally, damming of the streams in which the species lives, and the spread of non-native cyprinid species that predate on larvae and eggs, may be the final nail in the coffin for the species.

The Luristan newt is protected by Iranian national legislation and was listed on CITES Appendix I in 2010. This listing renders all trade in the species illegal, unless in exceptional circumstances which require a licence. However, enforcement of this legislation is currently insufficient and needs to be strengthened to respond to increasing international demand.

### What needs to be done?

Monitoring movement of the species both locally and internationally should be an important component of any management plan, in order to map the illegal trade flows. In addition, the expansion of the Zagros Oak Forest to include the range of the Luristan newt would provide a strong legal framework for tackling current levels of habitat destruction. Finally, a habitat restoration project should be initiated to connect the remaining fragments and to ensure that genetic isolation of the remaining populations does not further threaten the chances of survival for this colourful amphibian.



# Phocoena sinus

## Vaquita

Text contributed by the Cetacean Specialist Group

### Population size:

**< 200 individuals and declining**

### Range:

**core area of approximately 2,500km<sup>2</sup> in Northern Gulf of California, Mexico**

### Primary threats:

**Incidental capture in gillnets**

### Actions required:

**Ban on use of gillnets throughout the species' range**

During the last decades of the twentieth century, the population of baijis, China's endemic Yangtze River dolphins, declined from several hundred to nothing. Sadly, the global attention and political will needed to save this charismatic species was too little and arrived too late. The world's smallest porpoise, a beautiful desert species known as vaquita (*Phocoena sinus*), is now facing a similar fate.

The only immediate threat to the vaquita's existence is accidental drowning in gillnets deployed by artisanal fishermen. This makes saving the species as simple as removing these nets from its small range. However, doing that presents an economic and socially complex problem as fishing is one of the primary sources of income in the region. The government of Mexico has taken important steps to reduce fishing effort in the upper Gulf, and has banned gillnets and other fishing gear from central parts of the vaquita's range. However, models indicate that the current levels of protection have only slowed, not stopped, this species decline. Winning the race to alter human behavior in time to save this desert porpoise will require a complex mixture of governmental will, genuine economic alternatives for local people (including access to alternative fishing gear), and the funds for implementing and enforcing some difficult changes to the status quo.

Creation of the Upper Gulf of California and Colorado River Delta Biosphere Reserve in 1993 and the Vaquita Refuge in 2005 gave cause for optimism that protection for this species was on its way, but these initiatives proved far from adequate. Initial implementation of the 2008 'Action Plan to Protect the Vaquita' was designed to reduce fishing pressure through a voluntary buy-out programme and there was a strong effort to enforce the refuge boundaries. Today, however, fishing effort, although reduced, is still higher than in the early 1990s and while fishing is banned in the Refuge, both gillnetting and trawling continue to occur there.

### What needs to be done?

Gillnets will need to be removed from the vaquita's entire range within the next few years. Alternative 'vaquita-safe' shrimp gear has been developed, but its adoption by local fishermen awaits governmental approval, training in its use, and initiatives to support gear replacement. Alternative gear for catching finfish still needs to be developed. Only with the wide-scale adoption of 'vaquita-safe' fishing methods will it be possible to ensure the species' survival. International support of gear-switching efforts and a mandatory timetable for gillnet phase-out will be critically important.



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*The government of Mexico has taken important steps to reduce fishing effort in the upper Gulf, and has banned gillnets and other fishing gear from central parts of the vaquita's range.*





# *Prolemur simus*

## Greater bamboo lemur

Text reviewed by the Primate Specialist Group

### Population size:

**100-160 individuals**

### Range:

**Southeastern and southcentral rainforests of Madagascar**

### Primary threats:

**Habitat destruction due to slash-and-burn agriculture, mining and illegal logging**

### Action required:

**Habitat protection and reforestation in the Ivato and Karlanaga regions**

Possessing powerful jaws that can crack through the tough bamboo that makes up the majority of its diet, the greater bamboo lemur (*Prolemur simus*) has returned from supposed extinction once before. Discovered in 1870, the species was believed extinct for almost fifty years before being rediscovered in 1972. Since that date there has been a near constant struggle to protect the species' last remaining strongholds.

The greater bamboo lemur was once widespread throughout Madagascar but now survives in only about 1 - 4 per cent of its historical range. In fact, it may have the smallest population size of any lemur in Madagascar, and hence the world. The major threat to this species is habitat destruction as a result of slash-and-burn agriculture, mining and illegal logging.

The establishment of the Ranomafana National Park in 1991 and the Andringitra National Park in 1999 provided legal protection for large chunks of the greater bamboo lemur's habitat, throwing a lifeline to populations in this area. However, there may also be additional groups that are clinging to existence in the Ivato and Karlanaga regions, where their home range is completely unprotected and severely threatened by slash-and-burn agriculture. Without immediate protection the habitat and populations in these areas may be lost, significantly undermining the genetic viability of the species.

Encouragingly, positive collaboration between national and international non-governmental organisations and local communities provides hope that this species will continue to chew through stocks of bamboo well into the future.

### What needs to be done?

Protection of suitable habitat in the Ivato and Karlanaga regions should be implemented immediately. In addition, to reduce the impact of continuing destruction outside reserve areas, the development of a reforestation programme to create corridors between the forest fragments needs urgent consideration. This would also facilitate movement, and therefore the transfer of genes, between populations. If the survival of the greater bamboo lemur is to be ensured, as well as that of many other Malagasy species, community education and the development of more sustainable agricultural practices, which drives large amounts of habitat destruction, will be of paramount importance.

# *Pseudoryx nghetinhensis*

## Saola

Text contributed by Barney Long and reviewed by the Asian Wild Cattle Specialist Group

### Population size:

**Unknown**

### Range:

**Annamite mountains, on the Viet Nam - PDR Laos border**

### Threats:

**Hunting and habitat destruction**

### Action required:

**Increase enforcement efforts and habitat protection**

The saola (*Pseudoryx nghetinhensis*) is such a distinctive species that no general English descriptor, such as cat or dog, can be applied to it. It is simply a saola – a relative of cows and goats – and its name represents the only Lao word in the English language. Despite its recent and remarkable discovery in 1992, this modern day unicorn remains under immediate threat of extinction. Residing in the dense rainforests that cloak the steep Annamite Mountains along the Viet Nam-Laos PDR border the saola has yet to be seen in the wild by a scientist.

Intensive hunting in the species habitat is the greatest threat to the saola's survival, with ubiquitous and uncontrolled snaring to supply the illegal trade in wildlife products being the principle driver. Although hunters are not targeting saola, their incidental capture results in a similar outcome. The failure to address this, due to a lack of control of hunting in both Viet Nam and Laos PDR, is driving the declines in populations of numerous threatened species. The lack of enforcement of national laws that govern the sale and trafficking of wildlife products only adds to the difficult situation. Finally, habitat loss and fragmentation, driven by agricultural expansion, infrastructure development and extractive industries is increasing the extreme pressures currently facing saola populations. Though researchers are unable to provide any confident estimates of numbers, they are aware that the species has only been found in less than 15 patches of forest.

To have any hope of stemming the unsustainable loss of species throughout Asia national and international groups must collaborate to stem the illegal wildlife trade. Preventing the sale of illegally caught wildlife in restaurants across the area would help to save species, but demand in other sectors will also need to be addressed. Finally, reducing the rate of forest loss in the saola's habitat and improving protected area management will be critical. The situation seems dismal, but if local, national and international support can be mustered there is still hope that the saola can be saved.

### **What needs to be done?**

A reduction in snaring effort in the areas where saola are thought to still survive will be an essential conservation measure for this species and could be achieved with an increase in both the number of rangers and their operational budgets. A pilot programme in Thua-Thien Hien Saola Reserve in Viet Nam was extremely successful with 12,000 snares removed in the first year it was implemented. Financial and operational support from the international community is urgently needed to expand this programme to other areas in which the saola may still roam.





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*To have any hope of stemming the loss of species throughout Asia national and international groups must work together to stem the illegal wildlife trade.*



© W Robichaud/ Ban Vangban village/ WCS/ IUCN



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# Rafetus swinhoei

## Red River giant softshell turtle

Text reviewed by the Freshwater Turtle and Tortoise Specialist Group

### Population size:

**4 individuals**

### Range:

**Hoan Kiem Lake and Dong Mo Lake, Viet Nam, and Suzhou Zoo, China**

### Primary threats:

**Hunting for consumption and habitat destruction and degradation as a result of wetland destruction and pollution**

### Actions required:

**Education and awareness programmes, and captive breeding**

The enormous Red River giant softshell turtle (*Rafetus swinhoei*) can reach up to 120kg in weight, with a shell over 100cm long. The species plays a significant role in the cultural history of the area. In fact, the turtle in Hoan Kiem Lake is fabled to be the legendary Kim Qui, or Golden Turtle God, and has appeared at notable points in Vietnamese history. Unfortunately this cultural icon may soon be lost forever as hunting and habitat destruction have devastated populations. Previously found throughout the Red River of Yunnan, China and Vietnam, the known global population now consists of four individuals.

An intensive conservation breeding programme at Suzhou Zoo with an old male and the last known female has been running since 2008. Unfortunately, despite multiple attempts, none of the clutches of eggs laid by the female have produced hatchlings, and in 2011 were all found to be infertile. Attempts continue and efforts may be made to pair the female with a younger Vietnamese male discovered in 2007 in Dong Mo Lake.

As well as continuing conservation breeding efforts, scientists have made several missions to Yunnan in recent years to assess reports of possible sightings of the species by the forestry bureaus and others in the area. Although awareness levels of the species and its significance was encouragingly high, there were no confirmed recent sightings. The forestry bureaus in the area were continuing to monitor markets in order to rescue any individuals that might

be on sale there. However, as officials focus their hunt on gigantic specimens (large adults), younger individuals may be slipping through under the assumption that they are a more common species.

### What needs to be done?

The creation of a clear identification kit for officials that distinguishes between all size classes of softshell turtle species in the area would be invaluable. If these were then distributed throughout the area other individuals could possibly be rescued and included in captive breeding programmes. In addition, options to include the turtle in Dong Mo Lake in the breeding programme should continue to be explored.

Finally, comprehensive surveys and awareness campaigns across the region need to be continued. The value of these was demonstrated in 2010, when Dong Mo Lake broke its dam and a turtle was caught downriver. In the absence of an awareness campaign this individual would have found his way onto a dinner table, rather than being rescued and released back into its wetland home.



# Rhinoceros sondaicus

## Javan rhino

Text reviewed by the Asian Rhino Specialist Group

**Population size:**  
**< 100 individuals**

**Range:**  
**Ujung Kulon National Park,  
Java, Indonesia**

**Threats:**  
**Hunting for traditional medicine  
and small population size**

**Action required:**  
**Enforcement of protection laws  
and possible establishment of  
a captive breeding programme**

Formerly found throughout south-east Asia, as far afield as Bangladesh and southern China through to peninsular Malaysia and the islands of Sumatra and Java in Indonesia, the Javan rhino (*Rhinoceros sondaicus*) is now the rarest of all the living rhinoceros species. Like many rhinos, their horns are prized in traditional medicine and can fetch up to \$30,000 (US) on the black market.

This charismatic species is battling to survive, with only a small population of between 40 - 60 individuals remaining in Ujung Kulon National Park in Java. Until recently a population hung on in the Cat Tien National Park in Viet Nam. However the last individual was poached from the protected area in early 2010, the value of its horn in traditional medicine is overshadowing any intrinsic value that the species has.

A principal form of legal protection for the species is its listing on CITES Appendix I, and since 1975 this has made the trade of individuals or any component parts illegal. However, the often under-resourced nation states that hold CITES Appendix I species require increased levels of international support to enforce this legislation and protect what is of global value.

Rhinos are one of the world's most recognisable species, filling children's story books and providing inspiration for generations. Losing one of their species due to the human desire to consume ever more resources would be inexcusable.

### **What needs to be done?**

As the primary threat to the survival of the Javan rhino is hunting, then the success of rescue efforts will hinge on understanding the motivations for these activities and effectively addressing them. Ramping up patrolling efforts and the enforcement of protection laws in the area will also be of critical importance to save this species. Due to the small population size, disease is also a significant threat and needs to be continually monitored. In addition, habitat management, to enhance its suitability for the Javan rhino, should continue.

With the loss of the final population in Viet Nam, there is an urgent need to review the feasibility of a conservation breeding programme and the potential for reintroductions and translocations. Any translocation or reintroduction would carry substantial risk, but as the sole remaining population of this rhino exists in a geographically limited area of Java, not implementing these ambitious conservation measures may no longer be an option.









# *Risioconemis seidenschwarzi*

## Cebu frill-wing

Text contributed by Reagan Joseph Villanueva and reviewed by the Dragonfly Specialist Group

### Population size:

**Unknown**

### Range:

**< 1km<sup>2</sup> in a rivulet beside the Kawasan River, Cebu, Philippines**

### Primary threats:

**Habitat degradation and destruction**

### Actions required:

**Designation of area as 'Critical Habitat' – restricting human access to the area**

Discovered in 1999, the Cebu frill-wing (*Risioconemis seidenschwarzi*) is a beautiful black damselfly with unusual blue eyes and is found only on the island of Cebu, in the Philippines. Two years after its discovery a local farmer moved onto the only site from which the species was known, destroying the original vegetation. With its forested habitat lost, the population of Cebu frill-wings began to decline rapidly. After the farmer was found washing his pesticide sprayer in the frill-wing's only known habitat, thus poisoning the water, the species seemed to be lost forever. Extensive efforts to locate the species and to raise awareness of its plight came to no avail.

Fortunately, in 2009, a small population was discovered at a spring located by Kawasan Falls, near the source of the Kawasan River. This population is confined to a narrow area measuring less than 30m<sup>2</sup> and may itself have only narrowly escaped destruction. According to locals, the site was nearly destroyed in 1990 by the construction of a house. In a strange twist of fate, the delicate frill-wings were saved only by the deportation of the owner, leaving nature to reclaim the abandoned property and return it to its former state.

The fate of this distinctive, blue-eyed damselfly (and *Protosticta plicata*, another endangered damselfly) depends largely on encouraging various stakeholders to protect the habitat around the Kawasan Falls. There is a high risk of this site being destroyed, with the lower section having already been developed with concrete paving and ornamental plantings. Clearance of vegetation above the waterfalls has also been noted. As the area is not currently protected, there are no legal restrictions to prevent landowners modifying the area further.

### What needs to be done?

The presence of the two threatened odonata species, four other island-endemics and a number of other Philippine endemics, should accord the Kawasan Falls 'Critical Habitat' status. This would restrict human access to the area and remove the threat of habitat modification. It would also reduce the risk of the site being poisoned, which wiped out the previous population. Careful management of the designation process will be of paramount importance, to avoid negative reactions from the current landowners which could have disastrous consequences for the Cebu frill-wing.



# Scaturiginichthys vermeilipinnis

## Red-finned Blue-eye

Text contributed by Adam Kerezszy, Freshwater Fish Specialist Group

### Population size:

**2,000 - 4,000 individuals**

### Range:

**Eggbaston Station, central western Queensland, Australia**

### Threats:

**Predation by introduced species**

### Action required:

**Control of the invasive species *Gambusia holbrooki*, and reintroduction of *S.vermeilipinnis***

The red-finned blue-eye (*Scaturiginichthys vermeilipinnis*) is a tiny fish which has an extremely restricted range in an isolated group of artesian springs on Eggbaston, a former sheep and cattle station in central western Queensland, Australia. First discovered in 1990, the existence of a beautifully-coloured member of the blue-eye family in such an unlikely environment was exciting to everyone.

However, from the onset of its discovery there was recognition of an impending disaster: the presence of the fish *Gambusia holbrooki*. Introduced as a biological control for mosquitoes, feral populations of gambusia are associated with catastrophic declines in indigenous fish populations, and this is certainly the case in the spring complex at Eggbaston where the species predate on red-finned blue-eyes.

During the 1990s, staff from the state fisheries agency in Queensland worked to get red-finned blue-eye listed as an endangered species. These efforts were successful and it is now listed as endangered under Australian and Queensland legislation. Unfortunately, conservation breeding efforts failed so the best hope for this fish now rests on conservation efforts in its arid homeland.

In 2008, Eggbaston was purchased by Bush Heritage Australia and a project commenced to attempt to control gambusia and save the red-finned blue-eye. An audit of all springs in March 2009 revealed only four springs with the fish, and

total numbers were estimated at between 2,000 and 4,000 individuals. In contrast, the gambusia population had exploded and they were present in their millions in thirty springs. It is thought that gambusia invaded the springs following extensive flooding of the region, and there is a high risk that the species could colonise the final strongholds of the red-finned blue-eye. The situation is a little better in 2012, but is still precarious. Rotenone – a substance used to kill fishes - has been trialled at Eggbaston. It successfully eliminates gambusia and, when applied correctly, doesn't damage populations of non-target taxa. Red-finned blue-eyes have also been successfully relocated to three springs which were free of gambusia, opening up the possibility for future successful reintroductions. Work is currently underway to trial methods of preventing future gambusia colonisation, barricading springs using a range of materials.

### What needs to be done?

The red-finned blue-eye has survived in an extremely harsh aquatic environment, but unfortunately this little fish's impressive adaptability is nothing in the face of a gambusia invasion. Although much progress has been made in protecting the red-finned blue-eye, there is still a long way to go. Rescue currently hinges on red-finned blue eye reintroductions and prevention of further gambusia colonisations. While this is possible, the species requires dedicated funding and support to ensure its long-term recovery. Without this, the extinction of this unique species remains likely.



*The species was previously found in six estuaries in the Eastern Cape Province, but is believed to have disappeared from five. Its situation was so dire that it was feared extinct in 1994.*





# Syngnathus watermeyeri

## Estuarine pipefish

Text reviewed by the Seahorse, Pipefish and Stickleback Red List Authority

### Population size:

**Unknown**

### Range:

**Kariega Estuary to East Kleinemonde Estuary, Eastern Cape Province, South Africa**

### Threats:

**Construction of dams altering river flows and flood events into estuaries**

### Action required:

**Establishment of a freshwater 'reserve', pollution control and implementation of water use allocations**

A relative of the seahorse and sea dragon, the estuarine pipefish (*Syngnathus watermeyeri*), like all species in its family, has flipped reproductive roles with the male being the one that gets pregnant. Females deposit eggs into the male's brood pouch after mating, where the male then carries them to term – between 12 and 14 days. Unfortunately this diverting species and its quirks may soon be lost due to continued declines of habitat quality and food resources in its estuarine home.

The estuarine pipefish relies on pulses of river water that both nourish its food supply and maintain habitable saline levels. The construction of dams and other barriers along waterways, and the direct abstraction of water from rivers, in the Eastern Cape Province have reduced the frequency and intensity of these flows – resulting in a decline in food availability for the larval stages of development. The species was previously found in six estuaries in this area, but is believed to have disappeared from five. Its situation was so dire that it was feared extinct in 1994, before a new population was discovered in East Kleinemonde Estuary. Sadly this population was wiped out by a flood in 1998, which resulted in the loss of submerged aquatic grass beds on which this species depends.

Fortunately, a population of estuarine pipefish returned to the Kariega Estuary after an absence of four decades. This re-emergence was probably linked to a period of heavy rain in the area, which resulted in the Kariega River flowing once again and giving rise to optimal levels of salinity and nutrients in the estuary. Ensuring that this quirky little species improves its currently shaky grip on life will require careful management of the water flows into the estuary.

### What needs to be done?

The establishment of a freshwater 'reserve', which could help to ensure regular pulses of freshwater into the system, coupled with habitat conservation and pollution control are the main measures needed to protect this species. Management of these freshwater flows, that supply both food and living space for the species, should be achieved without too much difficulty since allocations for water use have been agreed for other estuaries in the area. Now all that is required is for them to be implemented, and then effectively managed, on the Kariega and Bushman's rivers. Appropriate land-use management and ecological water allocations could avoid potentially catastrophic outcomes for this species in the future.

# Tahina spectabilis

## Suicide Palm, Dimaka

Text reviewed by the Palm Specialist Group

### Population size:

**90 individuals**

### Range:

**Analalava district, north-western Madagascar**

### Threats:

**Habitat loss due to fires, logging and agricultural developments**

### Action required:

**Establishment of a protected area and development of a management plan**

Large enough to be seen in satellite imagery, the suicide palm (*Tahina spectabilis*) can grow a trunk up to 18m tall which is topped by a crown of leaves over five metres in diameter. This enormous palm remained undetected until 2007, when it was first discovered at the foot of a tiny limestone outcrop in Madagascar's seasonal west. Once mature, the suicide palm extends a 4 - 5m high inflorescence which is covered in a multitude of small yellow flowers. This impressive reproductive effort is so taxing that, true to its common name, the palm dies a few months after flowering and fruiting. Described in 2008, the palm's generic name, *Tahina*, is based on the Malagasy for 'blessed'.

Habitat loss, as with so many of Madagascar's endemic species, is the most serious threat to this species. Its small population size and its restricted range, makes the suicide palm particularly vulnerable. Even small-scale modifications to the surrounding area may have a devastating impact while unforeseen events, such as a cyclone or wildfire, could result in the species' swift extinction in the wild. Establishing new populations of the species is, therefore, of critical importance.

Seed has been harvested from wild specimens through collaboration between the Madagascar National Seed Bank (Silo Nationale des Graines Forestières), the Royal Botanic Gardens, Kew, and a commercial seed distributor. These seeds were then distributed to botanic gardens and private palm enthusiasts around the world to ensure a

well distributed collection. The financial proceeds from this enterprise were returned to the local population, who used the revenue to build fire breaks around the site and construct fences to keep cattle out. An additional benefit included refurbishment of the local school, demonstrating the advantages of conserving the site and the species to the surrounding community.

### What needs to be done?

Although ex-situ conservation efforts have provided the suicide palm with a level of security, an ongoing sustainable management plan now needs to be developed. This could include the establishment of a protected area, enrichment planting and ongoing monitoring, as well as the maintenance of current conservation measures. These efforts will be instrumental in sustaining the species for the long term in the wild. Encouragingly, progress so far indicates that an increase in resources and effort really could help this species defy its 'suicide' moniker and pull itself back from the brink of extinction.









# Telmatobufo bullocki

## Bullock's false toad

Text reviewed by the Amphibian Specialist Group

### Population size:

**Unknown**

### Range:

**< 500km<sup>2</sup>, Nahuelbuta, Arauco Province, Chile**

### Primary threats:

**Habitat destruction as a result of construction of a hydro-electricity scheme**

### Actions required:

**Halting development of the hydro-electricity scheme and protecting habitat**

The mottled greyish-brown Bullock's false toad (*Telmatobufo bullocki*) was discovered in 1952 but, being extremely rare, there have only been three recorded sightings since 1992. Found hiding under logs in temperate southern beech forests of Nahuelbuta, this tiny frog is considered one of the most evolutionarily distinct amphibians in the world. Its family, the Calyptocephalellidae, split off from other amphibians around 130 million years ago. This means that the toad's relatives were developing separately from other amphibians when dinosaurs were still roaming the planet.

Sadly, this curious creature is now facing a fight for its life due to ever-increasing demands for energy. Its sole known breeding population, discovered in 2011 in the Nahuelbuta forests in Chile, is threatened by plans to establish a hydro-electric project. Adult Bullock's false toads spend the majority of their time on land, as evidenced by analysis of their stomach contents, whilst the tadpoles seem to be adapted to swimming in fast-flowing streams. Alteration of these habitats could be disastrous for this species. The construction of this hydro-electric scheme would irrevocably alter this amphibian's home and probably wipe out the only known breeding population, pushing this little toad closer to extinction. An additional threat to this species is the expansion of pine and eucalyptus plantations; the resulting deforestation and habitat modification destroying the habitat of the Bullock's false toad.

The hydro-electricity project, and the continuing habitat destruction from agricultural expansion, also threatens the 17 other amphibians (including five endemic species) that inhabit the Nahuelbuta forests. This devastating loss must be prevented, and the treacherous position these species are currently in necessitates quick and decisive action.

### What needs to be done?

If the hydro-electricity development goes ahead, the known wild populations of this species will almost certainly be wiped out. Therefore, the Chilean national government must decide whether increasing energy supplies is worth the cost of a species extinction.

Expansion of the existing Parque Nacional Nahuelbuta, and enforcement of the protection it provides, would help alleviate the pressure on the Bullock's false toad from pine and wood collection. Planting buffer strips along the toad's breeding streams would also improve habitat quality by reducing the levels of siltation – a by-product of tree removal. Finally, the establishment of an ex-situ population, to act as an insurance policy of sorts for the species, should be explored without delay.





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### *Abies beshanzuensis*

Baishan fir

Population size: 5 mature individuals  
Range: Baishanzu Mountain, Zhejiang, China  
Primary threats: Agricultural expansion and fire  
Actions required: Ex-situ conservation and re-introduction, and establishment of a protected area



© Andre Freitas

### *Actinote zikani*

Population size: Unknown  
Range: Near Sao Paulo, Atlantic forest, Brazil  
Primary threats: Habitat degradation due to pressure from human populations  
Action required: Protection of habitat and *Mikania obsoleta* (host plant)



© Vimoksalehi Lukoschek

### *Aipysurus foliosquama*

Leaf scaled sea-snake

Population size: Unknown  
Range: Ashmore Reef and Hibernia Reef, Timor Sea  
Primary threats: Unknown - likely degradation of coral reef habitat  
Action required: Evaluate reasons for population decline and formulate appropriate management plans



© Viola Clausnitzer

### *Amanipodagrion gilliesi*

Amani flatwing

Population size: < 500 individuals  
Range: 10km<sup>2</sup>, Amani-Sigi Forest, Usamabara Mountains, Tanzania  
Primary threats: Habitat degradation due to increasing population pressure and water pollution  
Action required: Habitat protection



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### *Antilophia bokermanni*

Araripe manakin

Population size: 779 individuals  
Range: 28km<sup>2</sup>, Chapado do Araripe, South Ceará, Brazil  
Primary threats: Habitat destruction due to expansion of agriculture and recreational facilities and water diversion  
Actions required: Formal protection of remaining habitat and protection of springs and streams



© Justin Gerlach

### *Antisolabis seychellensis*

Population size: Unknown  
Range: 5km<sup>2</sup>, Morne Blanc, Mahé island, Seychelles  
Primary threats: Invasive species and climate change  
Action required: Habitat management to prevent further invasion by introduced plants



© Barbara Nicca

### *Aphanius transgrediens*

Aci Göl toothcarp

Population size: few hundred pairs  
Range: small springs, south-eastern shore of former Lake Aci, Turkey  
Primary threats: Competition and predation by Gambusia and road construction  
Action required: Raise awareness in national conservation groups and governments, monitor and conserve current springs, develop action plan for lost springs and maintain captive populations



© Rudy Potthin

### *Aproteles bulmerae*

Bulmer's fruit bat

Population size: approximately 150 individuals  
Range: <10km<sup>2</sup>, Luplupwintern Cave, Western Province, Papua New Guinea  
Primary threats: Hunting and cave disturbance  
Action required: Protection of Luplupwintern cave and enforced prohibition of hunting





*Ardea insignis*  
White bellied heron

Population size: 70 - 400 individuals  
Range: 56,300km<sup>2</sup> in Bhutan, North East India and Myanmar  
Primary threats: Habitat destruction and degradation due to hydropower development  
Actions required: Develop captive rearing and release program, eliminate adverse uses of riverine habitat, and mitigate effects of hydroelectric development



*Ardeotis nigriceps*  
Great indian bustard

Population size: 50 - 249 mature individuals  
Range: 570,000km<sup>2</sup> in Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Madhya, India  
Primary threats: Habitat loss and modification due to agricultural development  
Action required: Establishment of protected areas and community reserves, and realignment of Indira Gandhi Nahar Canal Project



*Aythya innotata*  
Madagascar pochard

Population size: approx 20 mature individuals  
Range: 1km<sup>2</sup> volcanic lakes north of Bealanana, Madagascar  
Primary threats: Habitat degradation due to slash-and-burn agriculture, hunting, and fishing / introduced fish  
Action required: Formal protection of current breeding site, habitat restoration, and development of release programme for captive-bred individuals



*Azurina eupalma*  
Galapagos damsel fish

Population size: Unknown  
Range: Unknown  
Primary threats: Climate Change - oceanographic changes associated with the 1982 / 1983 El Nino are presumed to be responsible for the apparent disappearance of this species from the Galapagos  
Action required: Surveys to identify if the species still exists in Los Lobos Islands



*Bahaba taipingensis*  
Giant yellow croaker

Population size: Unknown  
Range: Chinese coast from Yangtze River, China to Hong Kong  
Primary threats: Over-fishing, primarily due to value of swim-bladder for traditional medicine - cost per kilogram exceeded that of gold in 2001  
Actions required: Establishment of appropriate protection in Hong Kong and enforcement of legal protection in China



*Batagur baska*  
Common batagur, Four-toed terrapin

Population size: Unknown  
Range: Bangladesh, Cambodia, India, Indonesia and Malaysia  
Primary threats: Illegal export and trade from Indonesia to China  
Action required: Enforcement of CITES Appendix I restrictions and control of illegal trade



*Bazzania bhutanica*

Population size: Individuals unknown, two populations  
Range: <10km<sup>2</sup> in Budini and Lafeti Khola, Bhutan  
Primary threats: Habitat degradation and destruction due to forest clearance, overgrazing and development  
Action required: Protection of area to prevent future development damaging remaining habitat



*Beatragus hunteri*  
Hirola

Population size: <1,000 individuals  
Range: South-east Kenya and possibly south-west Somalia  
Primary threats: Habitat loss and degradation, competition with livestock, poaching  
Action required: Establishment of protected areas and community conservancies, increase in level of management and protection of wild population



© Brendan White / USFWS

*Bombus franklini*  
Franklin's bumblebee

Population size: Unknown  
Range: Oregon and California, United States of America  
Primary threats: Disease from commercially bred bumblebees and habitat destruction and degradation  
Actions required: Protection of habitat containing nectar and pollen sources



© Richard Lansdown

*Callitriche pulchra*

Population size: Unknown  
Range: 2m x 1m pool on Gavdos, Greece  
Primary threats: Exploitation of the species' habitat by stock, and modification of the pool by local people  
Action required: Provide alternative water sources for stock, involve local people in the protection of the pool and document remaining water bodies on Gavdos



© Luciano Candisani/ www.lucianocandisani.com

*Cavia intermedia*  
Santa Catarina's guinea pig

Population size: 40-60 individuals  
Range: 0.04km<sup>2</sup> on Moleques do Sul Island, Santa Catarina, Brazil  
Primary threats: Habitat disturbance and possible hunting; small population effects  
Action required: Protected area enforcement and regulation of access to the island



© Neila Curtin

*Cercopithecus roloway*  
Roloway guenon

Population size: Unknown  
Range: Cote d'Ivoire  
Primary threats: Hunting for consumption as bushmeat and habitat loss  
Action required: Protection of habitat from logging and conversion to agricultural land



© David Harries

*Cryptomyces maximus*  
Willow blister

Population size: Unknown  
Range: Pembrokeshire, United Kingdom  
Primary threats: Limited availability of habitat  
Actions required: Continue protection of current populations and habitat regeneration projects



© Lázaro Guevara

*Cryptotis nelsoni*  
Nelson's small-eared shrew

Population size: Unknown  
Range: <100km<sup>2</sup>, Volcán San Martín Tuxtla, Veracruz, Mexico  
Primary threats: Habitat loss due to logging, cattle grazing, fire and agriculture  
Action required: Surveys to map species range; improved protected area management



© Save the Rhino International

*Dicerorhinus sumatrensis*  
Sumatran rhino

Population size: <250 mature individuals  
Range: Sabah, Sarawak and Peninsular Malaysia, Kalimantan and Sumatra, Indonesia  
Primary threats: Hunting for horn - used in traditional medicine  
Action required: Expansion and reinforcement of anti-poaching programmes and continuation of captive breeding efforts



© Eric van der Vliet

*Diomedea amsterdamensis*  
Amsterdam albatross

Population size: 100 mature individuals  
Range: Breeds on Plateau des Tourbières, Amsterdam Island, Indian Ocean.  
Primary threats: Disease and incidental by-catch in long-line fishing operations  
Action required: Prevention of the spread of disease and promotion of best-practice measures in all fisheries within the species range

IMAGE NOT  
YET AVAILABLE

### *Diospyros katendei*

Population size: 20 individuals, one population  
Range: Kasyoha-Kitomi Forest Reserve, Uganda  
Primary threats: High pressure from communities for agricultural activity, illegal tree felling, habitat degradation due to alluvial gold digging and small population  
Actions required: Enforcement of legal protection of area, field surveys for further search and ex-situ conservation in arboreta / botanic gardens

---



### *Dipterocarpus lamellatus*

Population size: 12 individuals  
Range: Siangau Forest Reserve, Sabah, Malaysia  
Primary threats: Habitat loss and degradation due to logging of lowland forest and creation of industrial plantations  
Action required: Restoration of Sianggau Forest Reserve and re-introduction of species to previous range

---



### *Discoglossus nigriventer* Hula painted frog

Population size: Unknown  
Range: <2km<sup>2</sup> in Hula Valley, Israel  
Primary threats: Predation by birds and range restriction due to habitat destruction  
Action required: Restoration of habitat

---



### *Dombeya mauritania*

Population size: Unknown  
Range: Mauritius  
Primary threats: Habitat degradation and destruction due to encroachment by alien invasive plant species and cannabis cultivation  
Action required: Control of invasive plant species, habitat protection and re-introduction of propagated individuals

---



### *Elaeocarpus bojeri*

Population size: <10 individuals  
Range: Grand Bassin, Mauritius  
Primary threats: Habitat degradation  
Actions required: Unknown - trees are currently being closely monitored to determine level of threat and how these should be addressed

---



### *Eleutherodactylus glandulifer* La Hotte glanded frog

Population size: Unknown  
Range: Massif de la Hotte, Haiti  
Primary threats: Habitat destruction due to charcoal production and slash-and-burn agriculture  
Action required: Habitat protection

---



### *Eleutherodactylus thorcetes* Macaya breast-spot frog

Population size: Unknown  
Range: Formon and Macaya peaks, Masif de la Hotte, Haiti  
Primary threats: Habitat destruction due to charcoal production and slash-and-burn agriculture  
Action required: Protection of habitat

---



### *Eriosyce chilensis* Chilenito

Population size: <500 individuals  
Range: Pta Molles and Pichidungui, Chile  
Primary threats: Collection of flowering individuals  
Action required: Protection of plants through construction of a fence and signage alerting people to threatened status

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*Erythrina schliebenii*

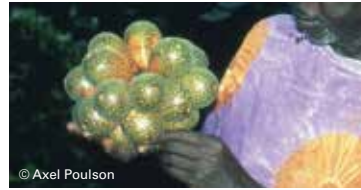
Coral tree

Population size: < 50 individuals  
 Range: Namatimbili-Ngarama Forest, Tanzania  
 Primary threats: Limited habitat and small population size increasing vulnerability to stochastic events  
 Actions required: Complete establishment of Forest Reserves and continue propagation efforts, ex-situ conservation



*Euphorbia tanaensis*

Population size: 4 mature individuals  
 Range: Witu Forest Reserve, Kenya  
 Primary threats: Illegal logging and habitat degradation due to agricultural expansion and infrastructure development  
 Action required: Enforcement of legal protection in the Witu Forest Reserve, which has diminished due to civil insecurity



*Ficus katendei*

Population size: < 50 mature individuals  
 Range: Kasyoha-Kitomi Forest Reserve, Ishasha River, Uganda  
 Primary threats: Agricultural activity, illegal tree felling and habitat degradation due to alluvial gold digging  
 Action required: ex-situ conservation in arboreta / botanic gardens; enforcement of protection to contain encroachment and habitat degradation; community development programmes in areas adjacent to the reserve



*Geronticus eremita*

Northern bald ibis

Population size: 200 – 249 mature individuals  
 Range: Breeds in Morocco, Turkey and Syria. Syrian population winters in central Ethiopia  
 Primary threats: Habitat degradation and destruction, and hunting  
 Action required: Protection of key breeding and roosting sites



*Gigasiphon macrosiphon*

Population size: 33 mature individuals  
 Range: Kaya Muhaka, Gongoni and Mrima Forest Reserves, Kenya, Amani Nature Reserve, West Kilombero Scarp Forest Reserve, and Kihansi Gorge, Tanzania  
 Primary threats: Timber extraction and habitat degradation due to agricultural encroachment and development, seed predation by wild pigs  
 Actions required: Enforcement of protection in reserves and establishment of management plan to mitigate effects of water loss from hydroelectricity developments



*Gocea ohridana*

Population size: Unknown  
 Range: <10km<sup>2</sup>, Lake Ohrid, Macedonia  
 Primary threats: Habitat degradation due to increasing pollution levels, off-take of water and sedimentation events  
 Action required: Implement transboundary agreements to improve habitat management



*Heleophryne rosei*

Table mountain ghost frog

Population size: Unknown  
 Range: < 9km<sup>2</sup>, Table Mountain, Western Cape Province, South Africa  
 Primary threats: Habitat degradation due to invasive plants and water abstraction  
 Action required: Protection of habitat, continued implementation of management plans and integration of activities between sites



*Hemicycla paeteliana*

Population: Unknown  
 Range: < 8km<sup>2</sup>, Jandia peninsula, Fuerteventura, Canary Islands  
 Primary threats: Habitat destruction due to overgrazing and trampling by goats and tourists  
 Action required: Conservation of habitat and control of goats, and limiting recreational access to area by tourists



*Hibiscadelphus woodii*

Population size: Unknown  
 Range: Kalalau Valley, Hawaii  
 Primary threats: Habitat degradation due to feral ungulates and invasive introduced plant species  
 Actions required: Survey the extremely steep terrain for additional individuals  
 Control of invasive species in the remaining suitable habitat so that species can be reintroduced if more individuals are located



*Hucho perryi*  
 Sakhalin taimen

Population size: Unknown  
 Range: 233,498km<sup>2</sup>, Russian far east and northern Japan  
 Primary threats: Overfishing (sport fishing and commercial bycatch) and habitat loss from damming, agriculture and other land use practices  
 Action required: Expansion of conservation protection in rivers in Russia and Japan and enforcement of fishing regulations



*Lathyrus belinensis*  
 Belin vetchling

Population size: < 1,000  
 Range: < 2km<sup>2</sup>, outskirts of Belin village, Antalya, Turkey  
 Primary threats: Habitat destruction due to urbanisation, over-grazing, conifer planting and road widening  
 Action required: Habitat protection, control of grazing, halt conifer planting and periodic sampling for ex-situ seed conservation



*Leiopelma archeyi*  
 Archey's frog

Population size: Unknown  
 Range: Coromandel peninsula and Whareorino Forest, New Zealand  
 Primary threats: Chytridiomycosis and predation by invasive species  
 Action required: Continuation of current conservation efforts



*Lithobates sevosus*  
 Dusky gopher frog

Population size: 60-100 individuals  
 Range: < 10km<sup>2</sup> in Harrison County, Mississippi, USA  
 Primary threats: Fungal disease and habitat limitation due to climate change and land-use changes  
 Actions required: Protection of habitat and management of population to prevent spread of disease



*Magnolia wolfii*

Population size: < 5 individuals  
 Range: Risaralda, Columbia  
 Primary threats: Isolation of species and low regeneration rates  
 Action required: Protection of remaining population and exploration of potential for ex-situ conservation

Image © Dr. Jan Wolf, University of Amsterdam Institute for Biodiversity and Ecosystem Dynamics, Dorian Ruiz Penagos, Universidad Tecnológica de Pereira, Colombia, Grupo de Investigación Jardín Botánico



*Margaritifera marocana*

Population size: < 250 individuals  
 Range: Oued Denna, Oued Abid and Oued Beth, Morocco  
 Primary threats: Habitat degradation and disturbance due to pollution and development  
 Action required: Habitat protection to mitigate effects of construction of hydroelectricity schemes and agricultural abstraction



*Moominia willii*

Population size: <500 individuals  
 Range: 0.02km<sup>2</sup> Silhouette Island, Seychelles  
 Primary threats: Invasive species and climate change  
 Action required: Protection of habitat and control of invasive species



### *Natalus primus*

Cuban greater funnel eared bat

Population size: <100 individuals  
Range: Cueva La Barca, Isle of Pines, Cuba  
Primary threats: Habitat loss and human disturbance  
Actions required: Protection of Cueva La Barca and its surrounds



### *Nomascus hainanus*

Hainan gibbon

Population size: <20 individuals  
Range: 10km<sup>2</sup>, Hainan Island, China  
Primary threats: Hunting  
Action required: Gun confiscation in the area of the Bawangling population and habitat protection



### *Oreocnemis phoenix*

Mulanje red damsel

Population size: Unknown  
Range: <10km<sup>2</sup> Mulanje Plateau, Malawi  
Primary threats: Habitat destruction and degradation due to drainage, agricultural expansion and exploitation of forest  
Action required: Enforcement of habitat protection



### *Pangasius sanitwongsei*

Pangasid catfish

Population size: Unknown  
Range: Chao Phraya and Mekong basins in Cambodia, China, Lao PDR, Thailand and Viet Nam  
Primary threats: Overfishing and collection for aquarium trade  
Action required: Protection from overfishing and collection



### *Parides burchellanus*

Population size: <100 individuals  
Range: Cerrado, Brazil  
Primary threats: Habitat degradation due to pressure from human populations and range restriction  
Actions required: Protection of gallery forest habitat



### *Picea neveitchii*

Population size: Unknown  
Range: Qinling Range, China  
Primary threats: Forest destruction  
Action required: Ex-situ conservation and re-introduction; establishment of protected areas



### *Pinus squamata*

Qiaojia pine

Population size: <25 mature individuals remaining  
Range: Qiaojia, Yunnan, China  
Primary threats: Limited distribution and small population size  
Action required: Ex-situ conservation and re-introduction; establishment of protected areas



### *Poecilotheria metallica*

Gooty tarantula, metallic tarantula, peacock parachute spider, peacock tarantula, Salepurgu

Population size: Unknown  
Range: Nandyal and Giddalur, Andhra Pradesh, India  
Primary threats: Habitat loss and degradation as a result of deforestation, firewood collection and civil unrest  
Action required: Habitat protection, awareness at community level, inclusion in the national Wildlife Protection Act and national and international trade legislation





© Tom Ghestemntje

## *Pomarea whitneyi*

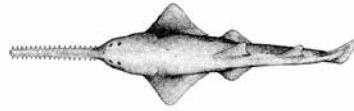
### Fatuhiva monarch

Population size: 50 individuals

Range: Fatu Hiva, Marquesas Islands, French Polynesia

Primary threats: Predation by introduced species - *Rattus rattus* and feral cats

Actions required: Increase control of introduced species and consider translocation, either to another island or by creating another, larger controlled area in an accessible part of Fatu Hiva



© FAO

## *Pristis pristis*

### Common sawfish

Population size: Unknown

Range: Coastal tropical and subtropical waters of Indo-Pacific and Atlantic Oceans. Currently largely restricted to northern Australia

Primary threats: Exploitation - has removed the species from 95 per cent of its historical range

Action required: Further research required to understand current distribution and threats and ways of managing these



© Kevin Schafer www.kevinschafer.com

## *Propithecus candidus*

### Silky sifaka

Population size: 100-1,000 individuals

Range: Maroantsetra to Andapa basin, and Marojeju Massif, Madagascar

Primary threats: Hunting and habitat disturbance

Action required: Continuation and expansion of efforts to end hunting and establishment of protected areas



© Atherton de Villiers

## *Psammobates geometricus*

### Geometric tortoise

Population size: Unknown

Range: Western Cape Province, South Africa  
Primary threats: Habitat destruction and degradation, and predation

Action required: Establishment of additional reserves and management of fire regimes



© Loïc Ruellan

## *Psiadia cataractae*

Population size: Unknown

Range: Mauritius

Primary threats: Habitat degradation and destruction due to development project and alien invasive plant species

Actions required: Effective protection of the area, continuous and effective control of invasive alien plants particularly grasses and replanting of hardened nursery plants



© Battal Ciplak and Sarp Kaya

## *Psorodonotus ebneri*

### Beydaglari bush-cricket

Population size: Unknown

Range: Beydaglari range, Antalya, Turkey

Primary threats: Climate change / habitat loss

Action required: Development of a bioacoustic monitoring scheme and strategic conservation action plan, establishment of a nature reserve, implementation of habitat management scheme, and research on population size, trends, distribution, and ecology



© Le Khac Quyêt/ University of Colorado Boulder

## *Rhinopithecus avunculus*

### Tonkin snub-nosed monkey

Population size: < 200 individuals

Range: Northeastern Viet Nam

Primary threats: Habitat loss and hunting

Action required: Establishment of a conservation area for Khau Ca Conservation area in Ha Giang province and increase law enforcement to reduce hunting pressure



© Kingsley Dixon

## *Rhizanthella gardneri*

### West Australian underground orchid

Population size: < 100 individuals

Range: Western Australia, Australia

Primary threats: Land clearance for agriculture (96 per cent habitat cleared to date), climate change and salinisation

Action required: In-situ protection of the two supporting organisms, and protection of seed stocks and the fungus partner in a seed bank



## *Rhynchocyon sp.*

### Boni giant sengi

Population size: Unknown

Range: Boni-Dodori Forest, Lamu area, Kenya

Primary threats: Habitat destruction due to development

Actions required: Formal protection of Boni-Dodori forest and finalisation of formal identification



## *Rosa arabica*

Population size: unknown, 10 sub-populations

Range: 14.6km<sup>2</sup>, St Katherine Mountains, Egypt

Primary threats: Domestic animals grazing, climate change and drought, medicinal plant collection and restricted range

Action required: Protection of individuals from exploitation



## *Salanoia durrelli*

### Durrell's vontsira

Population size: Unknown

Range: 200km<sup>2</sup> in marshes of Lake Alaotra, Madagascar

Primary threats: Habitat loss

Action required: Improved management of the Lake Alaotra protected area



## *Santamartamys rufodorsalis*

### Red crested tree rat

Population size: Unknown

Range: Sierra Nevada de Santa Marta, Colombia

Primary threats: Habitat loss through urban development and coffee cultivation

Action required: Surveys to map species range and continued habitat protection at known site of occurrence



## *Squatina squatina*

### Angel shark

Population size: Unknown

Range: Formerly coastal waters of NE Atlantic as far north as Norway and into the Mediterranean Sea. Now restricted to Canary Islands only

Primary threats: Benthic trawling

Actions required: Protection of Canary Islands habitat and nearby continental shelf habitats from trawling



## *Sterna bernsteini*

### Chinese crested tern

Population size: <50 mature individuals

Range: Breeding in Zhejiang and Fujian, China, and outside breeding season in Indonesia, Malaysia, Philippines, Taiwan, Thailand

Primary threats: Egg collection and habitat destruction

Action required: Protect breeding sites, strengthen legal protection status and raise awareness at breeding colonies



## *Tokudaia muenninki*

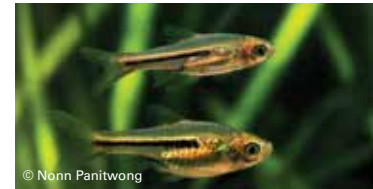
### Okinawa spiny rat

Population size: Unknown

Range: 3km<sup>2</sup> on Okinawa Island, Japan

Primary threats: Habitat loss and predation by feral cats

Action required: Surveys to map species range, protection of remaining habitat and feral cat control programme



## *Trigonostigma somphongsii*

### Somphongs's rasbora

Population size: Unknown

Range: Mae Khlong basin, Thailand

Primary threats: Habitat loss and degradation from farmland conversion and urbanization

Action required: Wetland restoration



*Valencia letourneuxi*

Population size: Unknown  
Range: Southern Albania and Western Greece  
Primary threats: Habitat destruction, water abstraction and aggressive interaction with *Gambusia*  
Actions required: Protection of habitat and control of *Gambusia*

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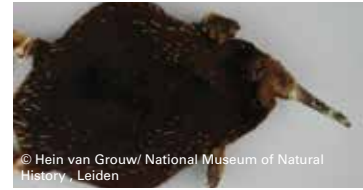


*Voanioala gerardii*

Forest coconut

Population size: <10 individuals  
Range: Masoala peninsula, Madagascar  
Primary threats: Harvesting for consumption of palm heart and deforestation  
Action required: Protection of individuals and habitat coupled with public awareness campaigns

---



*Zaglossus attenboroughi*

Attenborough's echidna

Population size: Unknown  
Range: Cyclops Mountains, Papua Province, Indonesia  
Primary threats: Habitat modification and degradation due to logging, agricultural encroachment shifting cultivation and hunting by local people  
Action required: Enhance awareness and cultural significance of the species, establish sustainable management practices and conduct additional surveys

---

*“Saving all species is not just an option for wealthy societies or a hobby for nature freaks, it is a necessity for humanity”*

Professor Luigi Boitani





*“These 100 species make their own case for survival. They are beautiful, intriguing, unusual, unique, thought provoking, and emotionally stimulating. They are an expression of the world’s diversity and they appeal to our appreciation of beauty, symmetry and color. Each species expresses a solution to a set of very specific environmental conditions, and each appeals to our fascination with adaptive problem solving. They allow us to turn away from our parochial needs and desires, and play on the larger stage of biological richness and variety. We owe it to ourselves, and to them, to find room on this planet for all of them”*

**Dr John G. Robinson**

**Executive Vice-President, Conservation and Science**

**Wildlife Conservation Society**

## Chapter 3

# Past

# Extinctions



These 100 wonderful species could easily follow in the path of the species in this chapter and exist only in history books. Let us not forget what we have already lost.

# Plants

## Bryophytes

*Flabellidium spinosum*  
*Neomacounia nitida*

## Floriophyceae

*Vanvoorstia bennettiana*

## Jungermanniopsida

*Radula visiniaca*

## Liliopsida

*Oeocloides seychellarum*  
*Sporobolus durus*

## Magnoliopsida

*Acalypha rubrinervis*  
*Achyranthes atollensis*  
*Argyroxiphium virescens*  
*Begonia eiromischa*  
*Blutaparon rigidum*  
*Byttneria ivorensis*  
*Campomanesia lundiana*  
*Casearia quinduensis*  
*Casearia tinifolia*  
*Centaurea pseudoleucolepis*  
*Chrysophyllum januariense*  
*Clermontia multiflora*  
*Cnidocolus fragrans*  
*Coffea lemblinii*  
*Crudia zeylanica*  
*Cupaniopsis crassivalvis*  
*Cyanea arborea*  
*Cyanea comata*  
*Cyanea cylindrocalyx*  
*Cyanea dolichopoda*  
*Cyanea giffardii*  
*Cyanea marksii*  
*Cyanea pohaku*  
*Cyanea pycnocarpa*  
*Cyanea quercifolia*  
*Cynometra beddomei*  
*Dipterocarpus cinereus*  
*Euphrasia mendoncae*  
*Fitchia mangarevensis*  
*Galipea ossana*  
*Gomidesia cambessedean*  
*Guettarda retusa*

*Hernandia drakeana*  
*Hibiscadelphus bombycinus*  
*Hibiscadelphus crucibracteatus*  
*Hibiscadelphus wilderianus*  
*Hopea shingkeng*  
*Ilex gardneriana*  
*Ilex ternatiflora*  
*Kokia lanceolata*  
*Licania caldasiana*  
*Madhuca insignis*  
*Melicope cruciata*  
*Melicope haleakalae*  
*Melicope obovata*  
*Melicope paniculata*  
*Myrcia skeldingii*  
*Neisosperma brownii*  
*Nesiota elliptica*  
*Ochrosia fatuhivensis*  
*Ochrosia nukuhivensis*  
*Ochrosia tahitensis*  
*Oldenlandia adscensionis*  
*Ormosia howii*  
*Otophora unilocularis*  
*Pausinystalia brachythyrsum*  
*Pelea obovata*  
*Pluchea glutinosa*  
*Pouteria stenophylla*  
*Pradosia argentea*  
*Pradosia glaziovii*  
*Pradosia mutisii*  
*Psiadia schweinfurthii*  
*Psidium dumetorum*  
*Santalum fernandezianum*  
*Shorea cuspidata*  
*Stenocarpus dumbeensis*  
*Sterculia khasiana*  
*Streblorrhiza speciosa*  
*Trilepidia adamsii*  
*Trochetiopsis melanoxydon*  
*Valerianella affinis*  
*Vernonia sechellensis*  
*Viola cryana*  
*Weinmannia spiraeoides*  
*Wendlandia angustifolia*  
*Wikstroemia skottsbergiana*  
*Wikstroemia villosa*  
*Xanthostemon sebertii*

## Polypodiopsida

*Adiantum lianxianense*  
*Dryopteris ascensionis*



© Sue Wickison / New Zealand Plant Conservation Network

## *Trilepidia adamsii* Adam's mistletoe

Last sighting: 1970

Cause of extinction: habitat destruction,  
over-collection and browsing by introduced species



*Partula arguta*  
Polynesian tree snail

Last sighting: 1994  
Cause of extinction:  
predation by introduced  
snail *Euglandina rosaea*

# Invertebrates

## Annelida

*Hypolimnus pedderensis*

## Bivalvia

*Alasmidonta mccordi*  
*Alasmidonta robusta*  
*Alasmidonta wrightiana*  
*Chambardia letourneuxi*  
*Elliptio nigella*  
*Epioblasma arcaeformis*  
*Epioblasma biemarginata*  
*Epioblasma flexuosa*  
*Epioblasma haysiana*  
*Epioblasma lenior*  
*Epioblasma lewisii*  
*Epioblasma personata*  
*Epioblasma propinqua*  
*Epioblasma sampsonii*  
*Epioblasma stewardsonii*  
*Epioblasma turgidula*  
*Lampsilis binominata*  
*Medionidus mcglameriae*  
*Pleurobema altum*  
*Pleurobema avellanum*  
*Pleurobema bournianum*  
*Pleurobema flavidulum*  
*Pleurobema hagleri*  
*Pleurobema hanleyianum*  
*Pleurobema johannis*  
*Pleurobema murrayense*  
*Pleurobema nucleopsis*  
*Pleurobema rubellum*  
*Pleurobema taitianum*  
*Pleurobema troschelianum*  
*Pleurobema verum*  
*Unio cariei*

## Crustacea

*Afrocylops pauliani*  
*Austrogammarus australis*  
*Cambarellus alvarezii*  
*Cambarellus chihuahuae*  
*Liocypris grandis*  
*Namibocypris costata*  
*Pacifastacus nigrescens*  
*Procambarus angustatus*  
*Stygobromus lucifugus*  
*Syncaris pasadenae*  
*Tropodiptomus ctenopus*

## Gastropoda

*Achatinella abbreviata*  
*Achatinella buddii*  
*Achatinella caesia*  
*Achatinella casta*  
*Achatinella decora*  
*Achatinella dimorpha*  
*Achatinella elegans*  
*Achatinella juddii*  
*Achatinella juncea*  
*Achatinella lehuiensis*  
*Achatinella livida*  
*Achatinella papyracea*  
*Achatinella spaldingi*  
*Achatinella thaanumi*  
*Achatinella valida*  
*Advena campbelli*  
*Amastra albolabris*  
*Amastra cornea*  
*Amastra crassilabrum*  
*Amastra elongata*  
*Amastra forbesi*  
*Amastra pellucida*  
*Amastra porcus*  
*Amastra reticulata*  
*Amastra subrostrata*  
*Amastra subsoror*  
*Amastra tenuispira*  
*Amastra umbilicata*  
*Amphicyclotulus guadeloupensis*  
*Amphigyra alabamensis*  
*Athearnia crassa*  
*Auriculella expansa*  
*Auriculella uniplicata*  
*Belgrandiella intermedia*  
*Bythinella gibbosa*  
*Bythinella limnopsis*  
*Bythinella mauritanica*  
*Bythinella microcochlia*  
*Bythinella punica*  
*Caldwellia phillyrina*  
*Campolaemus perexilis*  
*Carelia anceophila*  
*Carelia bicolor*  
*Carelia cochlea*  
*Careliacumingiana*  
*Carelia doleii*  
*Carelia evelynae*  
*Carelia glossema*  
*Carelia hyattiana*  
*Carelia kalalauensis*  
*Carelia knudseni*  
*Carelia lirata*  
*Carelia lymani*  
*Carelia mirabilis*  
*Carelia necra*  
*Carelia olivacea*  
*Carelia paradoxa*  
*Carelia periscelisi*  
*Carelia pilsbryi*  
*Carelia sinclairi*  
*Carelia tenebrosa*  
*Carelia turricula*  
*Chilonopsis blofeldi*  
*Chilonopsis exulatus*  
*Chilonopsis helena*  
*Chilonopsis melanoides*  
*Chilonopsis nonpareil*  
*Chilonopsis subplicatus*  
*Chilonopsis subtruncatus*  
*Chilonopsis turtoni*  
*Clappia cahabensis*  
*Clappia umbilicata*  
*Collisella edmitchelli*  
*Colparion madgei*  
*Ctenoglypta newtoni*  
*Cyclophorus horridulum*  
*Cyclosurus mariei*  
*Diastole matafaoi*  
*Dupontia proletaria*  
*Elimia brevis*  
*Elimia clausa*  
*Elimia fusiformis*  
*Elimia gibbera*  
*Elimia hartmaniana*



*Elimia impressa*  
*Elimia jonesi*  
*Elimia lachryma*  
*Elimia laeta*  
*Elimia macglameriana*  
*Elimia pilsbryi*  
*Elimia pupaeformis*  
*Elimia pygmaea*  
*Elimia vanuxemiana*  
*Elimia varians*  
*Erepta nevillei*  
*Fluvidona dulvertonensis*  
*Gastrocopta chichijimana*  
*Gastrocopta ogasawarana*  
*Gibbus lyonetianus*  
*Gonidomus newtoni*  
*Gonospora nevillei*  
*Graecoanatolica macedonica*  
*Gulella mayottensis*  
*Gyrotoma excisa*  
*Gyrotoma lewisii*  
*Gyrotoma pagoda*  
*Gyrotoma pumila*  
*Gyrotoma pyramidata*  
*Gyrotoma walkeri*  
*Harmogenanina linophora*  
*Harmogenanina subdetecta*  
*Helenoconcha leptalea*  
*Helenoconcha minutissima*  
*Helenoconcha polyodon*  
*Helenoconcha pseustes*  
*Helenoconcha sexdentata*  
*Helenodiscus bilamellata*  
*Helenodiscus vernoni*  
*Heleobia spinellii*  
*Helicopsis paulhessei*  
*Hirasea planulata*  
*Hydrobia gracilis*  
*Incerticyclus cinereus*  
*Incerticyclus martinicensis*  
*Islamia ateni*  
*Lamellidea monodonta*  
*Lamellidea nakadai*  
*Leiorhagium solemi*  
*Leiostyla lamellosa*  
*Leptoxis clipeata*  
*Leptoxis compacta*  
*Leptoxis foremanii*  
*Leptoxis formosa*  
*Leptoxis ligata*

*Leptoxis lirata*  
*Leptoxis occultata*  
*Leptoxis showalterii*  
*Leptoxis torrefacta*  
*Leptoxis vittata*  
*Leucocharis loyaltiensis*  
*Leucocharis porphyrocheila*  
*Libera subcavernula*  
*Libera tumuloides*  
*Littoraria flammea*  
*Littoridina gaudichaudii*  
*Lottia alveus*  
*Lyropupa perlonga*  
*Marstonia olivacea*  
*Mautodontha acuticosta*  
*Mautodontha consimilis*  
*Mautodontha consobrina*  
*Mautodontha maupiensis*  
*Mautodontha parvidens*  
*Mautodontha punctiperforata*  
*Mautodontha saintjohni*  
*Mautodontha subtilis*  
*Mautodontha unilamellata*  
*Mautodontha zebrina*  
*Megalobulimus cardosoi*  
*Mercuria letourneuxiana*  
*Nancibella quintalia*  
*Neoplanorbis carinatus*  
*Neoplanorbis smithi*  
*Neoplanorbis umbilicatus*  
*Nesopupa turtoni*  
*Newcombia philippiana*  
*Ohridohauffenia drimica*  
*Oleacina guadeloupensis*  
*Omphalotropis plicosa*  
*Pachnodus curiosus*  
*Pachnodus ladiguensis*  
*Pachnodus velutinus*  
*Pachystyla rufozonata*  
*Panulena perrugosa*  
*Partula approximata*  
*Partula arguta*  
*Partula atilis*  
*Partula aurantia*  
*Partula auriculata*  
*Partula bilineata*  
*Partula callifera*  
*Partula candida*  
*Partula castanea*  
*Partula cedista*



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*Incilius periglenes*  
**Golden toad, Sapo dorado**

Last sighting: 1989

Cause of extinction: chytridiomycosis, climate change, restricted range and airborne pollution



*Rheobatrachus vitellinus*  
**Eungella gastric brooding frog, northern gastric brooding frog**

Last sighting: 1985

Cause of extinction: unknown, likely chytridiomycosis

- Partula citrina*  
*Partula compacta*  
*Partula crassilabris*  
*Partula cuneata*  
*Partula cytherea*  
*Partula dolichostoma*  
*Partula dolorosa*  
*Partula eremita*  
*Partula exigua*  
*Partula filosa*  
*Partula formosa*  
*Partula fusca*  
*Partula garretti*  
*Partula imperforata*  
*Partula labrusca*  
*Partula leptochila*  
*Partula levilineata*  
*Partula levistriata*  
*Partula lugubris*  
*Partula lutea*  
*Partula microstoma*  
*Partula navigatoria*  
*Partula ovalis*  
*Partula planilabrum*  
*Partula producta*  
*Partula protea*  
*Partula protracta*  
*Partula radiata*  
*Partula raiatensis*  
*Partula remota*  
*Partula robusta*  
*Partula rustica*  
*Partula sagitta*  
*Partula salifera*  
*Partula salifera*  
*Partula thalia*  
*Partula turgida*  
*Partula umbilicata*  
*Partula variabilis*  
*Partula vittata*  
*Partulina crassa*  
*Partulina montagui*  
*Perdicella fulgurans*  
*Perdicella maniensis*  
*Perdicella zebra*  
*Perdicella zebrina*  
*Physella microstriata*  
*Placostylus cuniculinsulae*  
*Planorbella multivolvis*  
*Pleurodonte desidens*  
*Posticobia norfolkensis*  
*Pseudamnicola barratei*  
*Pseudamnicola desertorum*  
*Pseudamnicola doumeti*  
*Pseudamnicola globulina*  
*Pseudamnicola latasteana*  
*Pseudamnicola oudrefrica*  
*Pseudamnicola ragia*  
*Pseudamnicola singularis*  
*Pseudocampylaea loweii*  
*Pseudoheleococoncha spurca*  
*Pupilla obliquicosta*  
*Pyrgulopsis nevadensis*  
*Quintalia flosculus*  
*Quintalia stoddartii*  
*Rhachis comorensis*  
*Rhachis sanguineus*  
*Rhachistia aldabrae*  
*Rhodacmea filosa*  
*Samoana inflata*  
*Samoana jackieburchi*  
*Sinployea canalis*  
*Sinployea decorticata*  
*Sinployea harveyensis*  
*Sinployea otareae*  
*Sinployea planospira*  
*Sinployea proxima*  
*Sinployea rudis*  
*Sinployea tenuicostata*  
*Sinployea youngi*  
*Somatogyrus alcoviensis*  
*Somatogyrus amnicoloides*  
*Somatogyrus crassilabris*  
*Somatogyrus wheeleri*  
*Taipidon anceyana*  
*Taipidon marquesana*  
*Taipidon octolamellata*  
*Thaumatodon multilamellata*  
*Tomigerus gibberulus*  
*Tomigerus turbinatus*  
*Tornelasmias capricorni*  
*Trochoidea picardi*  
*Tropidophora desmazuresi*  
*Tropidophora semilineata*  
*Vitrinula chaunax*  
*Vitrinula chichijimana*  
*Vitrinula hahajimana*

## Insecta

*Acanthometropus pecatonica*  
*Agrotis crinigera*  
*Agrotis fasciata*  
*Agrotis kerri*  
*Agrotis laysanensis*  
*Agrotis photophila*  
*Agrotis procellaris*  
*Alloperla roberti*  
*Argyresthia castaneela*  
*Campsicnemus mirabilis*  
*Clavicoccus erinaceus*  
*Coleophora leucochrysell*  
*Conozoa hyalina*  
*Deloneura immaculata*  
*Drosophila lanaiensis*  
*Dryophthorus distinguendus*  
*Dryotribus mimeticus*  
*Ectodemia castaneae*  
*Ectodemia phleophaga*  
*Genophantis leahi*  
*Glaucopsyche xerces*  
*Helicoverpa confusa*  
*Helicoverpa minuta*  
*Hydropsyche tobiasi*  
*Hygrotus artus*  
*Hypena laysanensis*  
*Hypena newelli*  
*Hypena plagiota*  
*Hypena senicula*  
*Karocolens tuberculatus*  
*Lepidochrysops hypopolia*  
*Levuana iridescens*  
*Libythea cinyras*  
*Macrancylus linearis*  
*Mecodema punctellum*  
*Megadytes ducalis*  
*Megalagrion jugorum*  
*Neduba extincta*  
*Oedemasyllus laysanensis*  
*Oeobia sp. nov.*  
*Pentagenia robusta*  
*Pentarthrum blackburni*  
*Phyllococcus oahuensis*  
*Pseudobactricia ridleyi*  
*Rhantus novacaledoniae*  
*Rhantus orbignyi*  
*Rhantus papuanus*  
*Rhyacophila amabilis*  
*Rhyncogonus bryani*

*Scotorythra megalophylla*  
*Scotorythra nesiotes*  
*Siettitia balsetensis*  
*Stonemyia volutina*  
*Tischeria perplexa*  
*Triaenodes phalacris*  
*Triaenodes tridonata*  
*Trigonoscuta rossi*  
*Trigonoscuta yorbalindae*  
*Tritocleis microphylla*

## Oligochaeta

*Hypolimnus pedderensis*

## Turbellaria

*Romankenkius pedderensis*



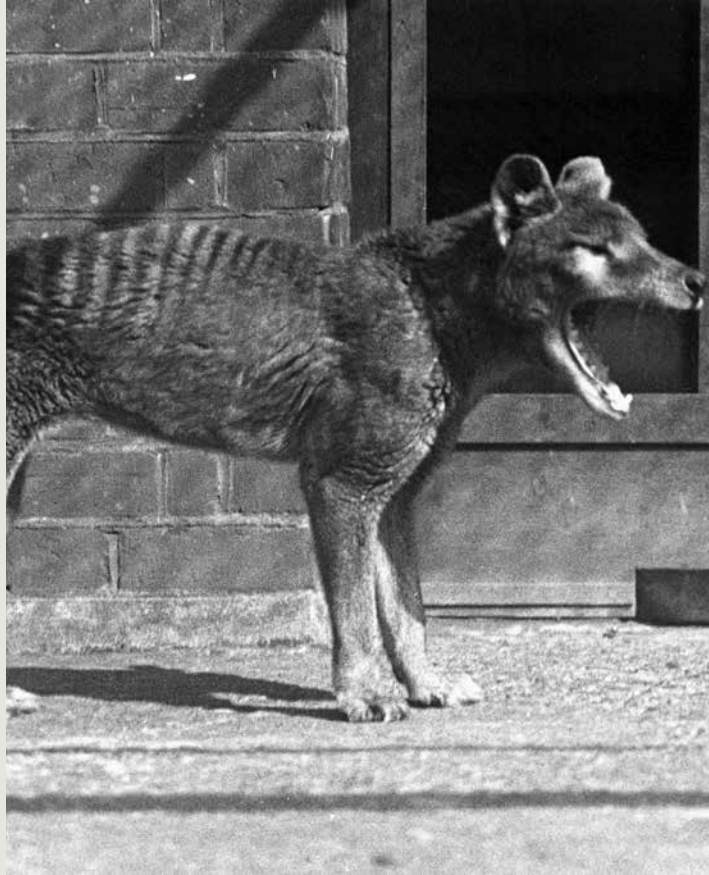
*Heteralocha acutirostris*

## Huia

Last sighting: 1907

Cause of extinction: Capture for use in ceremonial dress and predation by introduced species





*Thylacinus cynocephalus*  
**Thylacine, Tasmanian tiger, Tasmanian wolf**

Last sighting: 1936

Cause of extinction: hunting, habitat modification,  
 competition from domestic dogs and disease

## Vertebrates

### Actinopterygii

*Acanthobrama hulensis*  
*Alburnus akili*  
*Anabarilius macrolepis*  
*Aplocheilichthys* sp. nov. 'Naivasha'  
*Barbus microbarbis*  
*Characodon garmani*  
*Chasmistes muriei*  
*Chondrostoma scodrense*  
*Coregonus alpenae*  
*Coregonus bezola*  
*Coregonus fera*  
*Coregonus gutturosus*  
*Coregonus hiemalis*  
*Coregonus johannae*  
*Coregonus nigripinnis*  
*Coregonus oxyrinchus*  
*Coregonus restrictus*  
*Cottus echinatus*  
*Ctenochromis pectoralis*  
*Cyprinodon ceciliae*  
*Cyprinodon inmemoriam*  
*Cyprinodon latifasciatus*  
*Cyprinodon* spp.  
*Cyprinus yilongensis*  
*Empetrichthys merriami*  
*Etheostoma sellare*  
*Evarra bustamantei*  
*Evarra eigenmanni*  
*Evarra tlahuacensis*  
*Fundulus albolineatus*  
*Gambusia amistadensis*  
*Gambusia georgei*  
*Gasterosteus crenobiontus*  
*Gila crassicauda*  
*Lepidomeda altivelis*  
*Moxostoma lacerum*  
*Notropis amecae*  
*Notropis aulidion*  
*Notropis orca*  
*Notropis saladonis*  
*Pantanodon madagascariensis*  
*Platytrypius siamensis*  
*Pogonichthys ciscooides*  
*Priapella bonita*  
*Prototroctes oxyrhynchus*  
*Ptychochromis* sp. nov. 'Kotro'

*Ptychochromoides itasy*  
*Rhinichthys deaconi*  
*Rhizosomichthys totae*  
*Romanogobio antipai*  
*Salmo pallaryi*  
*Salvelinus agassizi*  
*Salvelinus neocomensis*  
*Salvelinus profundus*  
*Stypodon signifer*  
*Telestes ukliva*  
*Tristramella intermedia*  
*Tristramella magdalenae*  
*Xystichromis bayoni*

### Amphibia

*Adenomus kandianus*  
*Atelopus ignescens*  
*Atelopus longirostris*  
*Atelopus vogli*  
*Craugastor chrysozetetes*  
*Craugastor escocens*  
*Cynops wolterstorffi*  
*Discoglossus nigriventer*  
*Incilius holdridgei*  
*Incilius periglenes*  
*Lithobates fisheri*  
*Nannophrys guentheri*  
*Phrynomedusa fimbriata*  
*Plethodon ainsworthi*  
*Pseudophilautus adpersus*  
*Pseudophilautus dimbullae*  
*Pseudophilautus eximius*  
*Pseudophilautus extirpo*  
*Pseudophilautus halyi*  
*Pseudophilautus hypomelas*  
*Pseudophilautus leucorhinus*  
*Pseudophilautus maia*  
*Pseudophilautus malcolmsmithi*  
*Pseudophilautus nanus*  
*Pseudophilautus nasutus*  
*Pseudophilautus oxyrhynchus*  
*Pseudophilautus pardus*  
*Pseudophilautus rugatus*  
*Pseudophilautus stellatus*  
*Pseudophilautus temporalis*  
*Pseudophilautus variabilis*  
*Pseudophilautus zal*  
*Pseudophilautus zimmeri*  
*Raorchestes travancoricus*  
*Rheobatrachus silus*

*Rheobatrachus vitellinus*  
*Taudactylus diurnus*

#### **Aves**

*Alectroenas nitidissima*  
*Alectroenas rodericana*  
*Alopochen kervazoi*  
*Alopochen mauritianus*  
*Amazona martinicana*  
*Amazona violacea*  
*Anas marecula*  
*Anas theodori*  
*Anthornis melanocephala*  
*Aphanapteryx bonasia*  
*Aphanapteryx leguati*  
*Aplonis corvina*  
*Aplonis fusca*  
*Aplonis mavornata*  
*Ara atwoodi*  
*Ara erythrocephala*  
*Ara gossei*  
*Ara guadeloupensis*  
*Ara tricolor*  
*Aratinga labati*  
*Argusianus bipunctatus*  
*Atlantisia podarces*  
*Bowdleria rufescens*  
*Bulweria bifax*  
*Cabalus modestus*  
*Caloenas maculata*  
*Camptorhynchus labradorius*  
*Caracara lutosa*  
*Chaetoptila angustipluma*  
*Chaunoproctus ferreorostris*  
*Chloridops kona*  
*Chlorostilbon bracei*  
*Chlorostilbon elegans*  
*Ciridops anna*  
*Columba duboisi*  
*Columba jouyi*  
*Columba versicolor*  
*Conuropsis carolinensis*  
*Coturnix novaezelandiae*  
*Coua delalandei*  
*Cyanoramphus ulietanus*  
*Cyanoramphus zealandicus*  
*Diaphorapteryx hawkinsi*  
*Drepanis funerea*  
*Drepanis pacifica*  
*Dromaius ater*

*Dromaius baudinianus*  
*Dysmorodrepanis munroi*  
*Dysmoropelia dekachiskos*  
*Ectopistes migratorius*  
*Falco duboisi*  
*Fregilupus varius*  
*Fulica newtoni*  
*Gallinolumba ferruginea*  
*Gallinolumba norfolciensis*  
*Gallinolumba salomonis*  
*Gallirallus dieffenbachii*  
*Gallirallus pacificus*  
*Gallirallus wakensis*  
*Gerygone insularis*  
*Haematopus meadewaldoi*  
*Hemignathus ellisianus*  
*Hemignathus obscurus*  
*Hemignathus sagittirostris*  
*Heteralocha acutirostris*  
*Ixobrychus novaezelandiae*  
*Lophopsittacus bensoni*  
*Lophopsittacus mauritianus*  
*Mascarenotus grucheti*  
*Mascarenotus murivorus*  
*Mascarenotus sauzieri*  
*Mascarinus mascarinus*  
*Mergus australis*  
*Microgoura meeki*  
*Moho apicalis*  
*Moho bishopi*  
*Moho braccatus*  
*Moho nobilis*  
*Mundia elpenor*  
*Myadestes myadestinus*  
*Myadestes woahensis*  
*Myiagra freycineti*  
*Nannococcyx psix*  
*Necropsar rodericanus*  
*Necropsittacus rodericanus*  
*Nesillas aldabrana*  
*Nesoclopeus poecilopterus*  
*Nestor productus*  
*Nycticorax duboisi*  
*Nycticorax mauritianus*  
*Nycticorax megacephalus*  
*Paroreomyza flammea*  
*Pezophaps solitaria*  
*Phalacrocorax perspicillatus*  
*Pinguinus impennis*  
*Podiceps andinus*



*Chelonoidis nigra abingdonii*  
**Pinta Island tortoise**

'Lonesome George'

Last sighting: 2012

Cause of extinction: capture for consumption

*Podilymbus gigas*  
*Pomarea fluxa*  
*Pomarea mira*  
*Pomarea nukuhiuae*  
*Pomarea pomarea*  
*Porphyrio albus*  
*Porphyrio coerulescens*  
*Porphyrio kukwiedei*  
*Porphyrio mantelli*  
*Porzana strictocarpus*  
*Porzana monasa*  
*Porzana nigra*  
*Porzana palmeri*  
*Porzana sandwichensis*  
*Prosobonia ellisi*  
*Prosobonia leucoptera*  
*Psephotus pulcherrimus*  
*Psittacula exsul*  
*Psittacula wardi*  
*Pterodroma rupinarum*  
*Ptilinopus mercierii*  
*Quiscalus palustris*  
*Raphus cucullatus*  
*Rhodacanthis flaviceps*  
*Rhodacanthis palmeri*  
*Sceloglaux albifacies*  
*Tachybaptus rufolavatus*  
*Threskiornis solitarius*  
*Traversia lyalli*  
*Turdus ravidus*  
*Turnagra capensis*  
*Turnagra tanagra*  
*Upupa antaios*  
*Xenicus longipes*  
*Zoothera terrestris*  
*Zosterops strenuus*

### **Cephalaspidomorphi**

*Eudontomyzon* sp. nov. 'migratory'

### **Mammalia**

*Bettongia pusilla*  
*Boromys offella*  
*Boromys torrei*  
*Bos primigenius*  
*Brotomys voratus*  
*Caloprymnus campestris*  
*Chaeropus ecaudatus*  
*Conilurus albipes*  
*Coryphomys buehleri*  
*Cryptonanus ignitus*  
*Cryptoprocta spelea*  
*Cuscomys oblativa*  
*Desmodus draculae*  
*Dusicyon australis*  
*Gazella bilkis*  
*Gazella saudiya*  
*Geocapromys columbianus*  
*Geocapromys thoracatus*  
*Heteropsomys insulans*  
*Hexolobodon phenax*  
*Hippopotamus lemerlei*  
*Hippopotamus madagascariensis*  
*Hippotragus leucophaeus*  
*Hydrodamalis gigas*  
*Isolobodon montanus*  
*Isolobodon portoricensis*  
*Juscuelinomys candango*  
*Lagorchestes asomatus*  
*Lagorchestes leporides*  
*Lagostomus crassus*  
*Macropus greyi*  
*Macrotis leucura*  
*Megalomys desmarestii*  
*Megalomys luciae*  
*Megaoryzomys curioi*  
*Monachus tropicalis*  
*Neotoma anthonyi*  
*Neotoma bunkerii*  
*Neotoma martinensis*  
*Neovison macrodon*  
*Nesophontes edithae*  
*Nesophontes hypomicrus*  
*Nesophontes major*  
*Nesophontes micrus*  
*Nesophontes paramicrus*  
*Nesophontes zamicus*

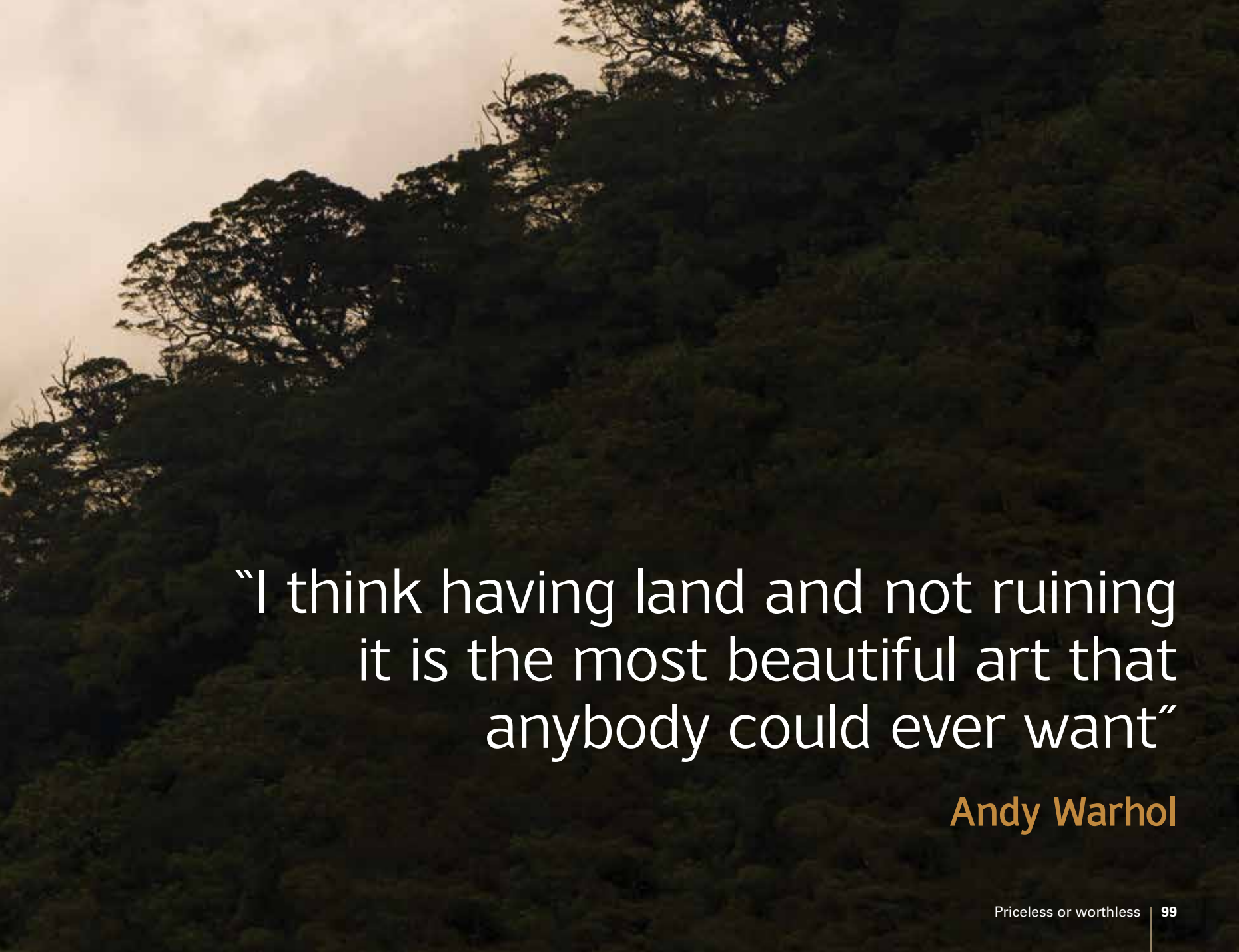
*Nesoryzomys darwini*  
*Nesoryzomys indefessus*  
*Noronhomys vespuccii*  
*Notomys amplus*  
*Notomys longicaudatus*  
*Notomys macrotis*  
*Notomys mordax*  
*Oligoryzomys victus*  
*Onychogalea lunata*  
*Oryzomys antillarum*  
*Oryzomys nelsoni*  
*Palaeopropithecus ingens*  
*Pennatomys nivalis*  
*Perameles eremiana*  
*Peromyscus pembedtoni*  
*Plagiodontia ipnaeum*  
*Potorous platyops*  
*Prolagus sardus*  
*Pseudomys glaucus*  
*Pseudomys gouldii*  
*Pteropus brunneus*  
*Pteropus pilosus*  
*Pteropus subniger*  
*Pteropus tokudae*  
*Rattus macleari*  
*Rattus nativitatis*  
*Rucervus schomburgki*  
*Solenodon marcanoi*  
*Thylacinus cynocephalus*  
*Xenothrix mcgregori*  
*Zalophus japonicus*

### **Reptilia**

*Ameiva cineracea*  
*Ameiva major*  
*Bolyeria multocarinata*  
*Borikenophis sanctaerucis*  
*Celestus occiduus*  
*Cyclura onchiopsis*  
*Cylindraspis indica*  
*Cylindraspis inepta*  
*Cylindraspis peltastes*  
*Cylindraspis triserrata*  
*Cylindraspis vosmaeri*  
*Hoplodactylus delcourti*  
*Leiocephalus eremitus*  
*Leiocephalus herminieri*  
*Leiolopisma mauritiana*  
*Macrosclincus coctei*  
*Pelusios seychellensis*  
*Phelsuma gigas*  
*Tachygia microlepis*  
*Tetradactylus eastwoodae*  
*Typhlops cariei*







“I think having land and not ruining  
it is the most beautiful art that  
anybody could ever want”

**Andy Warhol**

## Chapter 4

# Pulled back from the brink



No species need be lost. Given enough determination and ingenuity we are capable of rescuing even the most desperate of cases, as the stories here show.





# *Equus ferus przewalskii*

## Przewalski's horse

---

Population size:  
**306 (in the wild)**

Range:  
**Mongolia**

Primary threats:  
**Habitat loss, resource limitation  
and small population size**

Actions taken:  
**Captive breeding, reintroduction,  
habitat protection and awareness-  
raising initiatives**

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N.Dovchin, a Mongolian scientist, sighted what could have been the last wild Przewalski's horse, (*Equus ferus przewalskii*) in 1969.

Following this date, extensive surveys by the Joint Mongolian-Soviet Expedition and Chinese biologists confirmed that no wild populations remained, with the species considered to be possibly extinct in the Wild by the IUCN Conservation Monitoring Centre in 1988. However, conservationists and scientists refused to give up on this species, the only living representative of wild horses, and embarked on an ambitious captive breeding and reintroduction project.

The production of an International Studbook in 1959 established the foundation for the development of a Species Survival Plan. Following this, the creation of a European Endangered Species programme in 1986 shaped the conservation breeding and reintroduction strategies for the species. In 1994 reintroductions began in Takhiin Tal Nature Reserve in Dzungarian Gobi Desert, and Hustai National Park in Mongol Daguur Steppe. By 1999, 59 individuals had been reintroduced to Takhiin Tal, while 84 individuals, taken from reserves in Europe, had been introduced to Hustai National Park. Between 2004 and 2005 a further 22 Przewalski's horses were reintroduced to a site in Homiin Tal in Great Lakes Depression. Continual supplementation from reserves in Europe, managed by the Foundation for

the Preservation and Protection of the Przewalski Horse and Mongolian Association for Conservation of Nature and the Environment (MACNE), provided a safety net for these populations. The success of the conservation breeding and reintroduction programme was evident in the downgrading of the species status on the IUCN Red List of Threatened Species™ from 'Extinct in the Wild' to 'Critically Endangered' in 1996, and then a further lowering to 'Endangered' in 2011. All horses alive today are the descendents of just 13-14 individuals, which formed the core of the conservation breeding programme that saved this species. From this small number the population has swelled to an estimated 306 Przewalski's Horses now roaming freely in Ukraine, Kazakhstan, China and Mongolia.

The inspiring recovery of this charismatic equid is a testament to the cooperation and dedication of organisations and individuals from across the world. However, the persistence of the Przewalski's horse in the wild is not yet secure - hybridization with domestic horses poses a serious risk. In addition, competition for resources with both domestic horses and cattle increases the pressure on this iconic species. Finally, although wild populations have increased substantially, they are still quite small and at risk from disease and predation by wolves. Management of all these aspects and the continuation of breeding programmes will be critical to ensure the survival of Przewalski's horse in the wild.



# *Falco punctatus*

## Mauritius kestrel

Population size:

**250-300 mature individuals**

Range:

**Mauritius**

Primary threats:

**Habitat loss and degradation,  
and predation by invasive species**

Actions taken:

**Captive breeding and  
reintroductions, supplementary  
feeding, habitat enhancement and  
protection and predator control**

Early colonists to Mauritius decimated its forest blanket and with it went many of the island's precious endemic species. This deforestation, which spared only three percent of the original forest cover, precipitated the initial declines of the beautiful Mauritius kestrel. By 1974, only four individuals were known to survive in the wild.

The crash in their population was believed to be driven by the widespread use of organochloride pesticides throughout the island in the 1950s and 1960s, both for agriculture and to control malaria carrying mosquitoes. The introduction of predators such as Black rats, Crab-eating macaques, small Indian mongooses and feral cats did little to help dwindling populations of the birds. Finally, the bird's habitat was being overrun by introduced plants, which resulted in the destruction of natural nest sites and reduced the species hunting efficiency.

Fortunately, the perilous state of the species was realised before it joined its cousin, the Reunion kestrel (*Falco dubois*), in the extinct species lists and a recovery programme to rescue the species was launched in 1973. From 1984 to 1994 intensive management and conservation breeding of the species bolstered the population. The conservation programme was comprehensive, including captive propagation and restocking, supplementary feeding, nest-site enhancement, provision of nest boxes, nest guarding, control of predators, clutch and brood manipulations, and the treatment of parasite infections. In the late 1980s, the first group of captive bred birds were re-introduced into the Bambous Mountains. These re-introductions ceased in 1994, and now around 400 individuals fly freely around their island home.

The value and affection which the Mauritians feel towards this splendid species is evident. Out of danger of extinction, the species now plays an important role in tourism operations and is depicted on the Mauritian 50 rupee note, reinforcing the importance of the species. This acknowledgement of the significance of this bird is a fitting recognition of the work by various organisations and individuals to ensure the species survival.









# *Foudia flavicans*

## Rodrigues fody

Population size:

**668 - 1,000 mature individuals**

Range:

**Rodrigues, Mauritius**

Primary threats:

**Loss of habitat through deforestation and introduction of exotic species**

Actions taken:

**Reforestation (both active and passive regeneration) and reduced deforestation rates**

Less than one fifth of the entire world's bird species are restricted to islands but over 90 per cent of all bird extinctions have occurred on islands.

These unique island species are being wiped out by the introduction of new predators and competitors into their ecosystems, the destruction of their native habitat and over-exploitation for hunting or other uses. Sadly, having lost at least 28 endemic birds since 1600, the Mascarene Islands provide a classic example of this.

Residing on one of the world's most degraded tropical islands; the Rodrigues fody (*Foudia flavicans*) seemed fated to follow in the tragic footsteps of its fellow endemics. Common in the 19th century, the species populations began to plummet following the clearance of its habitat for agriculture in the 1960s. Following the passage of Cyclone Monica in 1968 scientists estimated that only five to six pairs of the species remained. However this stubborn bird hung on, weathering multiple storms throughout the 1970s to increase to 60 pairs in 1979. As the lack of habitat for Rodrigues fody was a major factor contributing to its decline, regeneration of vegetation was identified as being a key activity required to ensure the species recovery. Island watersheds were fenced and protected, allowing the vegetation to regenerate. The introduction of bottled gas for cooking in the 1980s

also reduced the pressure off the forests, as island inhabitants no longer needed to rely on firewood for fuel. Little native vegetation remained on the island, but the Rodrigues fody populations flourished in forests of introduced exotics.

Many recovery programmes for critically endangered species rely on sophisticated manipulation of breeding and foraging regimes. This makes the resurgence of the Rodrigues fody all the more notable as it revolved primarily around re-vegetation initiatives and the restoration of degraded habitat. Ironically, while the introduction of invasive, exotic plants often spell disaster for island endemics, the establishment of fast-growing exotics to Rodrigues saved the fody and two other endemic vertebrates, the Rodrigues flying fox (*Pteropus rodricensis*) and the Rodrigues warbler (*Acrocephalus rodericanus*), from extinction.

However, as the ultimate goal for this hugely modified island is ecosystem conservation, the island's forests are now being replanted with native vegetation. Large scale restoration of the landscape began in 1996 and has been progressing steadily since. Plots are progressively thinned of exotics and are then replanted with native seedlings. The invasive vegetation provides a makeshift nursery for the native plants, protecting them from the elements. This gradual approach ensures that there is always sufficient vegetation for the endemic fauna of the island to flourish.

# Megaptera novaengliae

## Humpback whale

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Population size:  
**60,000 (global estimate)**

Range:  
**All major ocean basins**

Primary threat:  
**Commercial whaling**

Actions taken:  
**Worldwide protection from commercial whaling in 1966, establishment of numerous sanctuaries and listing on the CMS and Appendix I of CITES**

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In 1979 National Geographic included a sound sheet, 'Songs of the Humpback Whale' with the January issue of their magazine.

This ground breaking recording provided many people with their first introduction to the magical song of one of the ocean's giants – the humpback whale (*Megaptera novaeangliae*). The complicated pattern of trills, whistles and booms emitted by males of this species are particular to populations – groups from different ocean basins will sing distinctively different songs. Sung by males during migrations and at breeding grounds, probably as a form of sexual display, these complex songs evolve over time. While today we marvel at their beauty and transcendental qualities, we almost robbed ourselves of the chance to ever hear them.

The humpback whale is a coastal species over much of its range and as such was an early target of the whaling industry. It was frequently hunted to commercial extinction, at which time whalers would switch to an alternate species. During the last century over two million large whales were slaughtered, and of this number over 200,000 humpbacks were killed in the southern hemisphere alone. Worldwide protection from commercial whaling in 1966 may have arrived just in time, as the humpback whale was drifting ever closer to extinction. Today the species is also protected by

sanctuaries in a number of countries, and is listed on Appendix I of both CITES and the CMS.

Although commercial whaling decimated humpback populations, this resilient species has bounced back. There are continuing threats to the whales including ongoing and planned offshore oil and gas development, entanglement in fishing gear and injury by ship strikes; however, the increases observed in most populations suggest that human induced mortality is not currently at a level where it will significantly impact the species.

Assessed as 'Endangered' on the 1988 IUCN Red List of Threatened Species™, the species was downgraded to 'Least Concern' in 2008. This inspiring recovery creates optimism for the future survival of the humpback whale, as there seems little chance of a return to widespread commercial hunting of the species. There is also considerable commercial value of the species in ecotourism operations – whale watching now occurs in almost 100 countries and has an estimated value of over \$1 billion (US). The exhilaration that people draw from this awe-inspiring ocean acrobat – humpback whales are known for their spectacular breaching displays – seems likely to ensure its songs permeate our oceans for many years to come.





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# *Petroica traversi*

## Black robin

Population size:

**224 mature individuals**

Range:

**Mangere and Rangatira, Chatham Islands, New Zealand**

Primary threats:

**Habitat loss and predation by invasive species**

Actions taken:

**Re-location, restoration of habitat and cross-fostering of clutches**



© Don Merton

“If the rarest bird in the world can be saved then, given human determination and effort, no species need become extinct” - Dr Don Merton

Trapped on windswept Little Mangere Island, the diminutive Chatham Islands black robin (*Petroica traversi*) numbered just seven birds in 1976. Its island home had lost the majority of its forest cover and was teeming with introduced rats and cats as a result of human settlement. These predators had extirpated all but a handful of species, but the seven black robins hung on in the last remnants of bush. In a last attempt to save the species staff from the New Zealand Wildlife Service scaled the cliffs of Little Mangere, captured the last of the robins and transferred them to Mangere Island, where 120,000 native trees had been planted in an attempt to boost habitat and prey availability. Unfortunately, by 1980 a further two birds had died and none had bred.


Luckily, there was one tenacious bird that refused to give in. Robins usually mate for life, but when all seemed lost, Old Blue, hailed as the saviour of the species, changed mates and tried to breed again. Laying more eggs and mothering more chicks than any other robin, this miraculous bird lived for over 13 years and is the ancestor of every black robin alive today.

In a bid to boost Old Blue's breeding productivity, scientists implemented an ambitious program pinned on cross-fostering black robin eggs with Chatham Island tomtits (*Petroica macrocephala chathamensis*). This innovative approach proved successful and has since been adopted and adapted to save endangered bird species around the world. The main population of the Chatham Island black robin now resides on Rangatira (South East) Island, while a smaller population remains on Mangere Island. New Zealand's Department of Conservation continues to manage the species and has strict protocols in place to avoid the transport of pathogens or invasive species into the bird's island habitat.

Once the most endangered bird in the world, the black robin population now exceeds 200 individuals. The survival of this endearing bird is testament to the commitment and ingenuity of the people who fought to save it. Intensive management efforts have now been scaled back and this plucky species seems likely to persist in the forests of the Chatham Islands for years to come.







“The curious world we inhabit is  
more wonderful than convenient;  
more beautiful than it is useful;  
it is more to be admired and  
enjoyed than used”

Henry David Thoreau

## Chapter 5

# Final Word

“Earth provides enough to  
satisfy every man’s needs,  
but not every man’s greed”

Mahatma Gandhi



# What needs to be done?

All the species listed in this book are unique, fascinating and irreplaceable – if we lose them no amount of money will be able to bring them back. However, we can still preserve these important components of our global cultural and biological heritage if we take action immediately. By implementing the actions listed alongside each species in this book we can give them a fighting chance for survival.

Urgent cases such as these require species specific actions – this includes the design and implementation of well researched action plans that involve the relevant stake holders, focus on realistic solutions to addressing the threats and have clear and measurable goals with set timeframes. To be successful these action plans must also have adequate resources for their implementation. Unfortunately, the provision of sufficient resources is often absent, resulting in many well written plans sitting on shelves as species move toward extinction.

Therefore, if we are to successfully reverse declines, funding for the world's most threatened species must increase several orders of magnitude. We need a fund to prevent extinction, resourced by governments, that is in the billions, not millions. In 2010 the world's governments made a commitment to prevent extinction by adopting the Strategic Plan for Biodiversity 2011-2020. The Aichi Biodiversity Targets, which form a part of this plan, state: 'By 2020 the extinction of known threatened species has been prevented and their conservation status,

particularly of those most in decline, has been improved and sustained'. It is now time to resource this commitment and to put the legislation and legal frameworks in place to ensure it is achieved. The private sector, which benefits from nature but also plays a significant role in contributing to the decline of many species, should also make major contributions to the fund.

However, saving these species requires more than just a large fund; it requires the conservation movement and society as a whole to support the moral and ethical position that all species have an inherent right to exist. If we accept that a few species can be lost, or that there is an economic argument that justifies extinction, then one by one the species in this book will disappear. Losing the 100 species in this book would represent the thin end of the wedge leading to animal, plant and fungi extinctions on a massive scale. The steadfast belief of the conservation community, public, government and industry that all species have a right to exist, along with a commitment to pooling the resources, time and energy needed to protect every them, would be the first critical step in avoiding a biologically depauperate world. Our treatment of the species in this book reflects the way in which we value all forms of life on the planet. If they are priceless then all forms of life are priceless and must be protected, if worthless then we can rationalise living in a species poor world where only animals, plants and fungi that are deemed useful survive.

And what for the species who are not yet at the doorstep of extinction? To avoid pushing everything to the brink we will need to make some fundamental changes to our current modus operandi. These will include slowing or stabilising population growth, reducing waste (including CO<sup>2</sup> emissions) and consumption and implementing economic and legal structures that promote environmentally sustainable growth and ensure good governance. This will require commitments from across society and a fundamental change in how we value the natural world, and how we see our place within it.

Conservation organisations have a significant role to play in leading this change. To aid the transition to a world where all species are valued and protected, conservation organisations will need to:

- Clearly define the argument for nature conservation and work with the world's leading PR and marketing agencies and cultural icons to ensure it is effectively communicated
- Involve the next generation in conservation through social media and new technology, particularly citizen science, and engage the public with the task of monitoring and managing the planet
- Focus on developing a generation of best conservation scientists and managers in countries throughout the world

- Encourage governments to invest more in our protected areas, greatly improve capacity in management, monitoring and enforcement
- Greatly expand protected area systems on land and in the oceans – ensure that at minimum the Aichi biodiversity target of protecting 10 per cent of the oceans and 17 per cent of land by 2020 is achieved, while aiming much higher
- Work with industry to advance clean technology and pressure governments to promote a rapid transition to clean energy
- Encourage government and industry to better monitor, manage and report on natural capital (e.g. forests, fish stocks, coral reefs, and freshwater systems) and make it accessible to the public and investors
- Promote and assist with effective land use planning at the national level ensuring commitments to sustainable management of natural capital
- Ensure industry follows environmental best practice (specifically the principals of no net loss of biodiversity) and reward those companies that lead the way.

So what can you do to ensure the future of the 100 most threatened species and many others like them? You can have a major positive impact on species conservation if you buy less, buy sustainably sourced food and materials, invest in companies that make nature conservation and sustainability a priority, support conservation organisations, vote for governments that keep biodiversity conservation high on the political agenda (and keep their promises) and ensure that ecology and nature conservation is being taught in the schools near you. However, one of the best things you can do is to choose a species or habitat and make a life-time commitment to ensuring its future. You can start now by working to ensure the future of one of the 100 priceless species on this list. You can stop extinction.

# Glossary

**CBD:**

Convention on Biological Diversity, entered into force on 29 December 1993

**Chytridiomycosis:**

An infectious disease caused by the chytrid, zoosporic fungus, *Batrachochytrium dendrobatidis*. There is currently no effective means of controlling the disease in wild populations and has been cited as a contributing factor to the global decline of amphibians.

**CITES:**

Convention on the International Trade of Endangered Species of Wild Fauna and Flora, entered into force on 1 July 1975.

**CMS:**

Convention on the Conservation of Migratory Species of Wild Animals (also known as the Bonn Convention) entered into force in 1983.

**Critically Endangered:**

Critically endangered species are those considered to be at extremely high risk of going extinct in the wild. They must have met criteria A to E for 'Critically Endangered' in the IUCN Red List of Threatened Species.

**Endangered:**

Endangered species face a very high risk of extinction in the wild and must have met any of criteria A to E for 'Endangered' in the IUCN Red List of Threatened Species.

**Endemic:**

An endemic species is one that is found exclusively in a particular place or country.

**Ex-situ:**

Conservation and maintenance of living species outside their natural habitat. Among other reasons, this may be undertaken to remove the species from threats to assist re-introductions, restoration or reinforcement of natural populations.

**Extinct:**

A species is determined to be extinct following exhaustive surveys which leave no reasonable doubt that the last individual has died.

**Extinct in the Wild:**

A species is determined to be extinct in the wild when the only known, surviving individuals, exist in cultivation, captivity or in naturalized populations well outside the confines of their historic range.

**Head-starting:**

When vulnerable life-stages, juveniles, larvae etc, are protected and then released once they have reached a certain size or life-stage where they will be less threatened.

**In-situ:**

Conservation work that takes place within the natural populations or habitat of a species. This may be carried out by restoring or protecting the habitat and species, removing the factors which are threatening them.

**Invasive:**

A species that is introduced to an area and survives, thrives and reproduces, and causes economic and/ or environmental harm to the area it has been introduced into.



**Least Concern:**

This category includes widespread and abundant species and is assigned to those species which do not qualify for any of the other threat categories on the IUCN Red List of Threatened Species™.

**Native:**

A species that is indigenous to a particular place or country, i.e. it occurs naturally in an area and has not been introduced either intentionally or unintentionally.

**Near threatened:**

Species in this category are those that don't currently meet the criteria, but are close to qualifying in the near future, for a threatened category of the IUCN Red List of Threatened Species™.

**Re-introduction:**

The intentional release of species back into the wild, either from captivity, or by relocation from another area where the species still survives.

**Vulnerable:**

A vulnerable species will have met one of criteria A to E for 'Vulnerable' in the IUCN Red List of Threatened Species™ and will be at high risk of extinction in the wild.

# Bibliography

- Albrecht, C., Eröss, Z., Hauffe, T. & Schreiber, K. 2010. *Goceva ohridana*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Allen, G., Robertson, R., Rivera, R., Edgar, G., Merlen, G., Zapata, F. & Barraza, E. 2010. *Azurina eupalama*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Alonso, R. & Groh, K. 2011. *Hemicycla paeteliana*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Andanje, S., Agwanda, B.R., Ngaruiya, G.W., Amin, R. and Rathbun, G. 2010. Sengi (elephant-shrew) observations from northern coastal Kenya. *Journal of East African Natural History*, 99(1)
- Anderson, R. and Moraes-Barros, N. and Voinir, B. 2011. *Bradypus pygmaeus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Anderson, R. P. and Handley Jr., C. O. 2001. A new species of three-toed sloth (Mammalia: Xenarthra) from Panama, with a review of the genus *Bradypus*. *Proceedings of the Biological Society of Washington* 114: 1-33
- Anderson, R. P. and Handley Jr., C. O. 2002. Dwarfism in insular sloths: biogeography, selection, and evolutionary rate. *Evolution* 56: 1045-1058
- Andrainarivo, C., Andriaholinirina, V.N., Feistner, A., Felix, T., Ganzhorn, J., Garbutt, N., Golden, C., Konstant, B., Louis Jr., E., Meyers, D., Mittermeier, R.A., Perieras, A., Princee, F., Rabarivola, J.C., Rakotosamimanana, B., Rasamimanana, H., Ratsimbazafy, J., Raveloarino, G., Razafimanantsoa, A., Rumpler, Y., Schwitzer, C., Thalmann, U., Wilmé, L. & Wright, P. 2008. *Prolemur simus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Andrainarivo, C., Andriaholinirina, V.N., Feistner, A., Felix, T., Ganzhorn, J., Garbutt, N., Golden, C., Konstant, B., Louis Jr., E., Meyers, D., Mittermeier, R.A., Patel, E., Perieras, A., Princee, F., Rabarivola, J.C., Rakotosamimanana, B., Rasamimanana, H., Ratsimbazafy, J., Raveloarino, G., Razafimanantsoa, A., Rumpler, Y., Schwitzer, C., Thalmann, U., Wilmé, L. & Wright, P. 2008. *Propithecus candidus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Andreone, F., Andriamazava, A., Anjeriniaina, M., Brady, L., Glaw, F., Griffiths, R.A., Jenkins, R.K.B., Rabisoa, N., Rakotomalala, D., Randrianantoandro, J.C., Randrianiriana, J., Randrianzahana, H., Ratsoaivina, F. & Robsomanitrondrasana, E. 2011. *Calumma tarzan*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Ashton, P. 1998. *Dipterocarpus lamellatus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Bell, B. 2004. *Leiopelma archeyi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- BirdLife International (2012) *IUCN Red List for birds*. Downloaded from <http://www.birdlife.org> on 23/08/2012.
- Bryophyte Specialist Group 2000. *Bazzania bhutanica*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Burton, F. J. 2008. *The threatened plants of the Cayman Islands: The Red List*. Kew Publishing, United Kingdom.
- Butler, D. and Merton, D. 1992. *The black robin: saving the world's most endangered bird*. Oxford University Press, Auckland.
- Calderon, E. 1998. *Magnolia wolfii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- CAMP Workshop, Kenya (November 1996) 1998. *Euphorbia tanaensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- CAMP Workshop, Kenya (November 1996) 1998. *Gigasiphon macrosiphon*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Chapman, R.E. 2008. *Cavia intermedia*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Çiplak, B. 2008. The analogy between interglacial and global warming for the glacial relicts in a refugium: a biogeographic perspective for conservation of Anatolian Orthoptera. *Insect ecology and conservation, Research Signpost* 37/661 (2).
- Cisneros-Heredia, D., Yáñez-Muñoz, M., Coloma, L.A. and Ron, S. 2004. *Atelopus balios*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 07 August 2012
- Clark, E. L., Munkhbat, J., Dulamtseren, S., Baillie, J. E. M., Batsaikhan, N., King, S. R. B., Samiya, R. and Stubbe, M. (compilers and editors) 2006. *Summary Conservation Action Plans for Mongolian Mammals. Regional Red List Series Vol. 2*. Zoological Society of London, London.
- Clarke, G.P., Burgess, N.D., Mbago, F.M., Mligo, C., Mackinder, B. and Gereau, R. 2011. Two 'Extinct' Trees Rediscovered Near Kilwa, Tanzania. *Journal of East African Natural History*, 100(1&2):133-140
- Clausnitzer, V. 2010. *Amanipodagrion gilliesi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Clausnitzer, V. 2010. *Oreocnemis phoenix*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Coloma, L.A. and Lötters, S. 1996. The tadpole of *Atelopus balios* (Anura:Bufonidae) from the pacific lowlands of Ecuador. *Herpetologica*, 52(1); 66-70

Conifer Specialist Group 1998. *Abies beshanzuensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Conifer Specialist Group 1998. *Picea neoveitchii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Conifer Specialist Group 1998. *Pinus squamata*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Cook, S.F. & Compagno, L.J.V. 2005. *Pristis pristis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Cowley, P.D., Whitfield A.K. 2001. Ichthyofaunal characteristics of a typical temporarily open/closed estuary on the southeast coast of South Africa. *Ichthyology Bulletin Smithsonian Institute Ichthyology* 71: 1-19.

Crivelli, A.J. 2006. *Valencia letourneuxi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Dávalos, L. & Mancina, C. 2008. *Natalus primus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Department of Conservation 2001 *Black Robin Recovery Plan 2001-2011*. Department of Conservation, Wellington.

Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry of the Republic of Indonesia. 2007. *Strategy and Action Plan for the Conservation of Rhinos in Indonesia*. Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry of the Republic of Indonesia, Jakarta

Donald, P.F., Buchanan, G. M., Collar, N. J., Abebe, Y. D., Gabremichael, M. N., Mwangi, M. A. K., Ndang'ang'a, P. K., Spottiswoode, C. N. and Wondafrash, M. 2010. Rapid declines in habitat quality and population size of the Liben (Sidamo) Lark *Heteromirafra sidamoensis* necessitate immediate conservation action. *Bird Conservation International* 20(1): 1-12.

Dransfield, J. & Beentje, H.J. 1998. *Voanioala gerardii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Esser, L., Cumberlidge, N. and Yeo, D. 2008. *Johora singaporensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Fairfax, R., Fensham, R., Wager, R., Brooks, S., Webb, A. And Unmack, P. 2007. Recovery of the red-finned blue-eye: an endangered fish from the springs of the Great Artesian Basin. *Wildlife Research*. 34 (2) 156-166

Gehring, P.S., Pabijan, M., Ratoavina, F.M., Köhler, J., Vences, M. and Glaw, F. (2010) A Tarzan yell for conservation: a new chameleon, *Calumma tarzan* sp. n., proposed as a flagship species for the creation of new nature reserves in Madagascar. *Salamandra*, 46(3): 167-179

Gerlach, J. 2009. *Moominia willii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Gerlach, J. 2012. *Antisolabis seychellensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

Gerlach, J., Mickleburgh, S., Hutson, A.M. & Bergmans, W. 2008. *Coleura seychellensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

Gibson, R., Grant, T. & Wilson, B.S. 2010. *Cyclura collei*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

Hamalainen, M. 2004. Critical species of Odonata in the Philippines. *International Journal of Odonatology* 7(2): 305-310

Hammerson, G., Richter, S., Siegel, R., LaClaire, L. and Mann, T. 2004. *Lithobates sevosus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Hedges, B. and Thomas, R. 2010. *Eleutherodactylus glandulifer*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Hutson, T., Helgen, K., Flannery, T. & Wright, D. 2008. *Aproteles bulmerae*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

Florens, D. (TPTNC) 2000. *Psiadia cataractae*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Geissmann, T. & Bleisch, W. 2008. *Nomascus hainanus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

Impey, A. J.; Côté, I. M.; Jones, C. G. 2002. Population recovery of the threatened endemic Rodrigues fody *Foudia flavicans* (Aves, Ploceidae) following reforestation. *Biological Conservation* 107: 299-305.

Ishii, N. & Kaneko, Y. 2008. *Tokudaia muenninki*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

IUCN SSC Amphibian Specialist Group, 2012. *Discoglossus nigriventris*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

IUCN SSC Amphibian Specialist Group and South African Frog Re-assessment Group (SA-FROG) 2010. *Heleophryne rosei*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

IUCN SSC Antelope Specialist Group 2008. *Beatragus hunteri*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012

Jenkins, A., Kullander, F.F. & Tan, H.H. 2009. *Pangasius sanitwongsei*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.



- Jones, C. G.; Swinnerton, K. J. 1997. A summary of the conservation status and research for the Mauritius Kestrel *Falco punctatus*, Pink Pigeon *Columba mayeri* and Echo Parakeet *Psittacula eques*. *Dodo: Journal of the Jersey Wildlife Preservation Trust* 33: 72-75.
- Katende, A.B. 1998. *Diospyros katendei*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Kevan, P.G. 2008. *Bombus franklini*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Kottelat, M. 1996. *Aphanius transgrediens*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Lacher, T. & Patterson, B. 2011. *Santamartamys rufodorsalis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Leary, T., Seri, L., Flannery, T., Wright, D., Hamilton, S., Helgen, K., Singadan, R., Menzies, J., Allison, A., James, R., Aplin, K., Salas, L. & Dickman, C. 2008. *Zaglossus attenboroughi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Leuteritz, T. & Pedrono, M. (Madagascar Tortoise and Freshwater Turtle Red List Workshop) 2008. *Astrochelys yniphora*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 07 August 2012.
- Long, D.G., Gurung, B.R. and Pradhan, R. 2010. The rediscovery and conservation status of *Bazzania bhutanica* in Bhutan. *Field Bryology* No 101: 28–33.
- Lorence, D.H. and Wagner, W.L. 1995. Another new, nearly extinct species of hibiscadelphus (Malvaceae) from the Hawaiian Islands. *Novon*, 5(2): 183-187
- Lukoschek, V. & Guinea, M. 2010. *Aipysurus foliosquama*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Maxted, N. 2012. *Lathyrus belinensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Maycock, C. R., Kettle, C. J., Khoo, E., Pereira, J. T., Sugau, J. B., Nilus, R., Ong, R. C., Amaludin, N. A., Newman, M. F. and Burslem, D. F.R.P. (2012), A Revised Conservation Assessment of Dipterocarps in Sabah. *Biotropica*. doi: 10.1111/j.1744-7429.2011.00852.x
- Molur, S., Daniel, B.A. & Siliwal, M. 2008. *Poecilotheria metallica*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Morey, G., Serena, F., Mancusi, C., Fowler, S.L., Dipper, F. & Ellis, J. 2006. *Squatina squatina*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Mittermeier, R. A., Wallis, J., Rylands, A. B., Ganzhorn, J. U., Oates, J. F., Williamson, E. A., Palacios, E., Heymann, E. W., Kierulff, M. C. M., Long Yongcheng, Supriatna, J., Roos, C., Walker, S., Cortés-Ortiz, L. and Schwitzer, C. (eds.). 2009. *Primates in Peril: The World's 25 Most Endangered Primates 2008–2010*. IUCN/SSC Primate Specialist Group (PSG), International Primatological Society (IPS), and Conservation International (CI), Arlington, VA.
- Ng, J. J. D., 2008. *The ecology and conservation of the endemic Singapore Freshwater Crab, Johora singaporensis*. Unpublished Honours Year thesis, Department of Biological Sciences, National University of Singapore.
- Ng, P. K. L., 1987. A revision of the Malayan freshwater crabs of the genus Johora Bott, 1966 stat. nov. (Decapoda: Brachyura: Potamidae). *Malayan Nature Journal*, Kuala Lumpur, 41: 13-44.
- Ng, P. K. L., 1989. Endemic freshwater crabs in Singapore: Discovery, Speciation and Conservation. *The Singapore Institute of Biology Bulletin*, 13(2/3): 45-51.
- Ng Wai Chuen (University of Hong Kong) & Cheung, W. (University of British Columbia) 2006. *Bahaba taipingensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Noble, E., McKeown, S. and Sechrest, W. 2011. Rediscovery of the Santa Marta Toro *Santamartamys rufodorsalis* (Rodentia: Echimyidae), after 113 years, with notes on all three known records and the species' conservation needs in the Sierra Nevada de Santa Marta, *Conservación Colombiana* (15)
- Page, W. 1998. *Elaeocarpus bojeri*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Peters, J. A. 1973. *The frog genus Atelopus in Ecuador (Anura:Bufonidae)*. Smithsonian Institution Press, Washington.
- Phitos, D., Strid, A., Snogerup, S. and Greuter, W. (Eds) 1995. *The Red Data Book of rare and threatened plants of Greece*. WWF-Greece, Athens.
- Plano de Ação Nacional para a Conservação dos Muriquis. 2011. Instituto Chico Mendes de Conservação de Biodiversidade (ICMBio), Brasília, *Série Espécies Ameaçadas no. 11*.
- Rand, P.S. 2006. *Hucho perryi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Reeves, R. R., Smith, B. D., Crespo, E. A. and Notarbartolo di Sciarra, G. 2003. *Dolphins, Whales and Porpoises: 2002-2010 Conservation Action Plan for the World's Cetaceans*. IUCN/SSC Cetacean Specialist Group, Gland, Switzerland and Cambridge, UK.
- Robinson, A.S., Fleischmann, A.S., McPherson, S.R., Heinrich, V.B., Girnoella, E.P. and Peña, C.Q. 2009. A spectacular new species of Nepenthes L. (Nepenthaceae) pitcher plant from central Palawan, Philippines. *Botanical Journal of the Linnean Society* 159: 195-202.
- Robinson, A.S. & Madulid, D.A. 2012. *Nepenthes attenboroughii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.

- Rojas-Bracho, L., Reeves, R.R., Jaramillo-Legorreta, A. & Taylor, B.L. 2008. *Phocoena sinus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Sharifi, M., Papenfuss, T., Rastegar-Pouyani, N., Anderson, S. & Kuzmin, S. 2009. *Neurergus kaiseri*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Spottiswoode, C. N., Wondafrash, M., Gabremichael, M. N., Abebe, Y. D., Mwangi, M. A. K., Collar, N. J. and Dolman, P. M. 2009. Rangeland degradation is poised to cause Africa's first recorded avian extinction. *Animal Conservation* 12(3): 249-257.
- Sorensen, M. & Bills, R. 1996. *Syngnathus watermeyerii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Strier, K.B. 1999. *Faces in the Forest: The Endangered Muriqui Monkeys of Brazil*. Harvard University Press, Cambridge, MA.
- Strier, K.B., Chaves, P.B., Mendes, S.L., Fagundes, V., and Di Fiore, 2011. A. Low paternity skew and the influence of maternal kin in an egalitarian, patrilineal primate. *Proceedings of the National Academy of Science USA* 108:18915-18919.
- Strier, K.B. and Mendes, S.L. 2011. *Brachyteles hypoxanthus*. In Rowe, N. *All the World's Primates*. © All the World's Primates (alltheworldsprimates.org).
- Strier, K.B., Pinto, L.P.S., Paglio, A., Boubli, J.P., Mendes, S.L., and Marini-Filho, O.J. (Guest Editors), 2005. The Ecology and Conservation of the Muriqui (Brachyteles): *Reports from 2002-2005. Neotropical Primates* Volume 13
- Timmins, R.J., Robichaud, W.G., Long, B., Hedges, S., Steinmetz, R., Abramov, A., Do Tuoc & Mallon, D.P. 2008. *Pseudoryx nghetinhensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Turtle Conservation Coalition [Rhodin, A.G.J., Walde, A.D., Horne, B.D., van Dijk, P.P., Blanck, T., and Hudson, R.(Eds.)]. 2011. *Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2011*. IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, Lunenburg, MA
- Van Damme, D. & Ghamizi, M. 2010. *Margaritifera marocana*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Van Strien, N.J., Manullang, B., Sectionov, Isnán, W., Khan, M.K.M, Sumardja, E., Ellis, S., Han, K.H., Boeadi, Payne, J. & Bradley Martin, E. 2008. *Dicerorhinus sumatrensis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Van Strien, N.J., Steinmetz, R., Manullang, B., Sectionov, Han, K.H., Isnán, W., Rookmaaker, K., Sumardja, E., Khan, M.K.M. & Ellis, S. 2008. *Rhinoceros sondaicus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Veloso, A., Núñez, H. and Formas, R. 2010. *Telmatobufo bullocki*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Vidthayanon, C. 2011. *Trigonostigma somphongsi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Villanueva, R.J.T. 2009. *Risicocnemis seidenschwarzi*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Von Staden, L., Victor, J., Raimondo, D. & Hurter, P.J.H. 2012. *Dioscorea strydomiana*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- Vorwerk, P.D., Froneman, P.W., Paterson, A.W., Strydom, N.A. and Whitfield, A.K. 2008. Biological responses to a resumption in river flow in a freshwater-deprived, permanently open Southern African estuary. *Water South Africa* 34: 597-604.
- Wager, R. and Unmack, P. 2004. Threatened fishes of the world: *Scaturiginichthys vermeilipinnis* (Ivantsoff, Unmack, Saeed and Crowley 1991) (Pseudomugilidae), *Environmental Biology of Fishes*. 70 (300)
- Whitfield, A.K. and Bruton, M.N. 1996. Extinction of the river pipefish *Syngnathus watermeyerii* in the Eastern Cape Province, South Africa. *South African Journal of Zoology* 92: 59-61.
- Wilkin, P., Burrows, J., Burrows, S., Muthama Muasya, A. and van Wyck, E. 2010. A critically endangered new species of yam (*Dioscorea strydomiana* Wilkin, Dioscoreaceae) from Mpumalanga, South Africa. *Kew Bulletin*, 65: 1 – 13
- Woodley, J.D. 1980. Survival of the Jamaican iguana, *Cyclura collei*. *Journal of Herpetology*. 14: 45-49
- Woodman, N., Matson, J., Cuarón, A.D. & de Grammont, P.C. 2010. *Cryptotis nelsoni*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012
- World Conservation Monitoring Centre 1998. *Hibiscadelphus woodii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 23 August 2012.
- Wright, P. C., Johnson, S. E., Irwin, M. T., Jacobs, R., Schlichting, P., Lehman, S., Louis Jr, E. E., Arrigo-Nelson, S. J., Raharison, J.-L., Rafalirison, R. R., Razafindratsita, V., Ratsimbazafy, J. R., Ratelolahy, F. R., Dolch, R. and Tan, C. 2008. The Crisis of the Critically Endangered Greater Bamboo Lemur (*Prolemur simus*). *Primate Conservation*, 23.
- Yeo, D. C. J., H.-T. Shih, R. Meier and P. K. L. Ng. 2006. Phylogeny and biogeography of the freshwater crab genus Johora (Crustacea: Brachyura: Potamidae) from the Malay Peninsula, and the origins of its insular fauna. *Zoological Scripta*, 36(3): 255-269.
- Zhang, Y. and Ma, K. 2008. Geographic distribution patterns and status assessment of threatened plants in China, *Biodiversity Conservation*, 17: 1783-1798

