Malagasy amphibians;

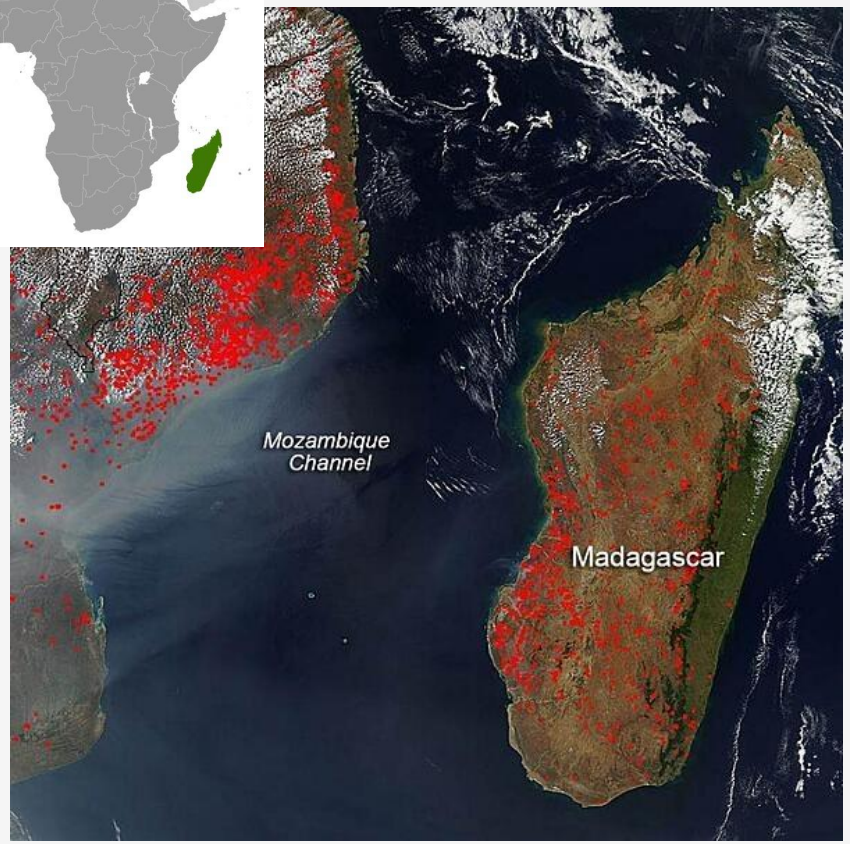
…competing drivers & their impacts on conservation progress?

Dr Angus I. Carpenter
(IoSE, Ambleside campus, University of Cumbria)
13/12/2024

this session

- Madagascar; background info & setting the scene.
- history of amphibian IWT (International Wildlife Trade).
- conservation going forward (pressures &/or progress).

background info & setting the scene

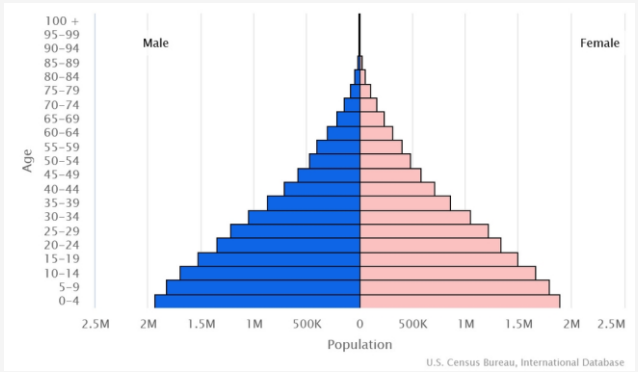


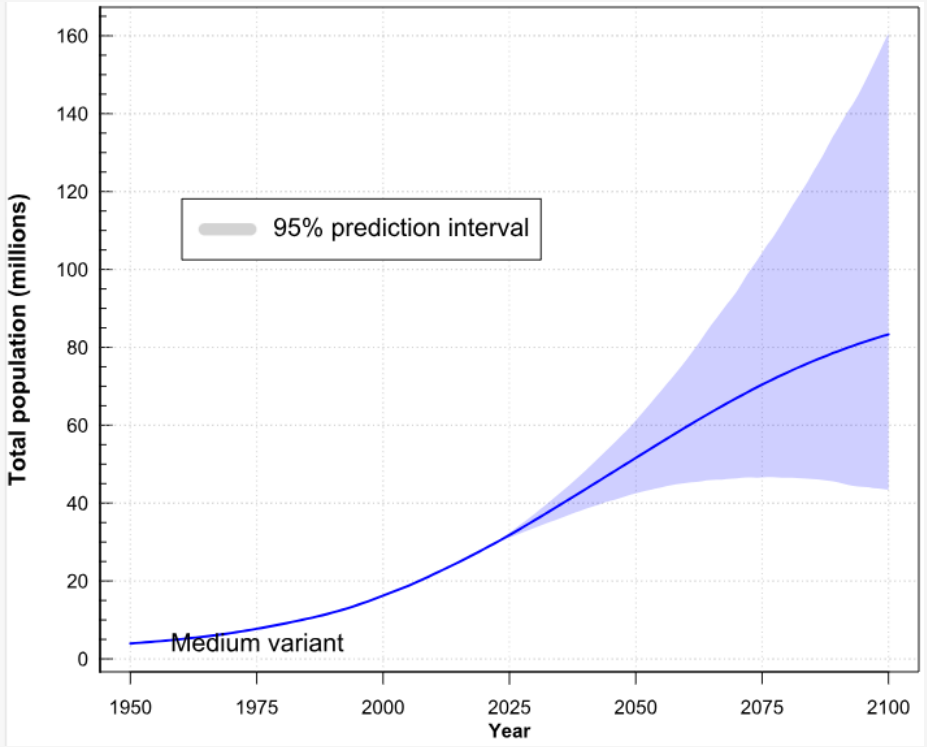
- world's fourth-largest island.
- 6 provinces (faritany); (Antananarivo, Antsiranana, Fianarantsoa, Mahajanga, Toamasina, Toliara).
- Independence in 26th June 1960.
- President Andry Rajoelina.
- Land use (2018); agricultural land 71.1%, forest 21.5%.
- main exports; nickel, clothing, titanium, gold, vanilla, cloves (2021).
- **~71% population below the poverty line**
- **~ 90% of the flora and fauna endemic.**

https://www.cia.gov/the-world-factbook/countries/madagascar/

background info & setting the scene

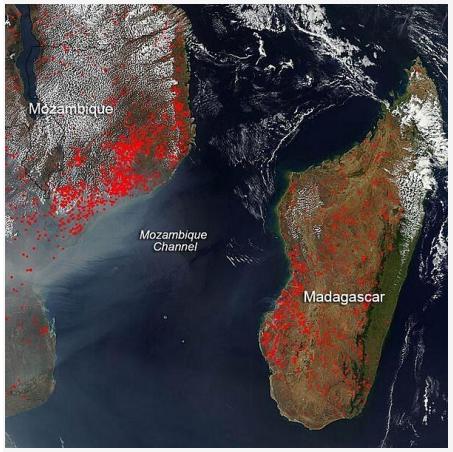
UN ‘total population’ size for Madagascar;
1950’s to 2100.





UN. 2022. World Population Prospects. https://population.un.org/wpp/Graphs/DemographicProfiles/Line/450

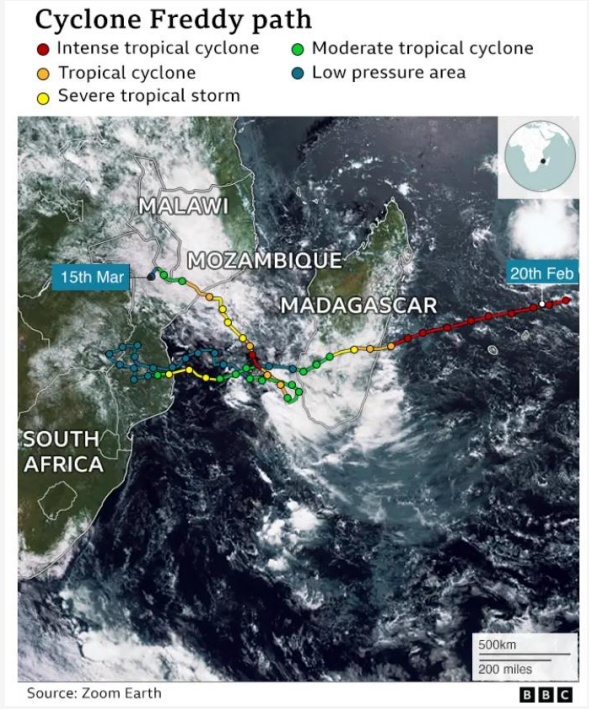
background info & setting the scene



Drought & Cyclones

"25 people …died… 21 are missing, ~40,000 homeless" BBC News

"More than 400 people have been killed and thousands of homes destroyed." BBC News.



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NEWS

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Madagascar on the brink of climate change-induced famine

25 August 2021

Climate

Madagascar: UN's WFP warns of a humanitarian crisis due to drought and Covid-19

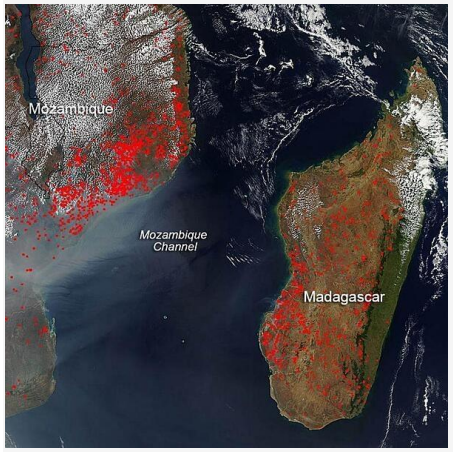
A third of the population of Madagascar will suffer from food insecurity due to ongoing droughts and a recession.

16 January 2021 · News · Africa

Madagascar: 1.5m face hunger because of drought, UN says

The UN says 1.5 million people in southern Madagascar are facing hunger because of a severe drought.

background info & setting the scene



Ways of trading

Madagascar lychee trade mired in corruption … “Most profits of the lucrative lychee trade between Madagascar and the EU are concentrated in the hands of a few powerful and politically-connected individuals”.

The rosewood was being shipped from Madagascar to Hong Kong… Illegal logging in Madagascar's rainforests has worsened since a coup in 2009, conservationists say.

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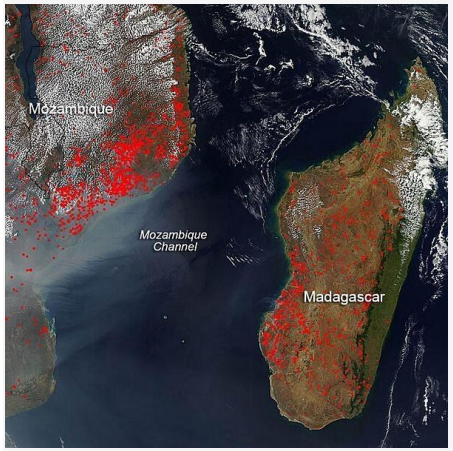

Politics & commitments

Mongabay Series: Conservation in Madagascar

Madagascar minister calls protected areas a 'failure,' seeks people-centric approach

by Rivonala Razafison and Malavika Vyawahare on 20 August 2020

"The conservation of our biodiversity through Madagascar protected areas' system for 30 years was a failure…

We have to change the paradigm and to move toward a system which doesn't exclude humans and doesn't put local communities on the side lines; it should be deeply social.."

https://news.mongabay.com/2020/08/madagascar-minister-calls-protected-areas-a-failure-seeks-people-centric-approach/

adf Home Daily News Security Threats Ma

Home › Daily News › New Program Targets Wildlife Trafficking and Corruption in Madagascar

New Program Targets Wildlife Trafficking and Corruption in Madagascar

By ADF — On Nov 3, 2021

Madagascar is among the world's most corrupt countries;
- Madagascar's wildlife among the most poached on the planet.
- between 2018 & 2021, >21,000 native tortoises were seized from traffickers.

New Program Targets Wildlife Trafficking and Corruption in Madagascar - Africa Defense Forum (adf-magazine.com)

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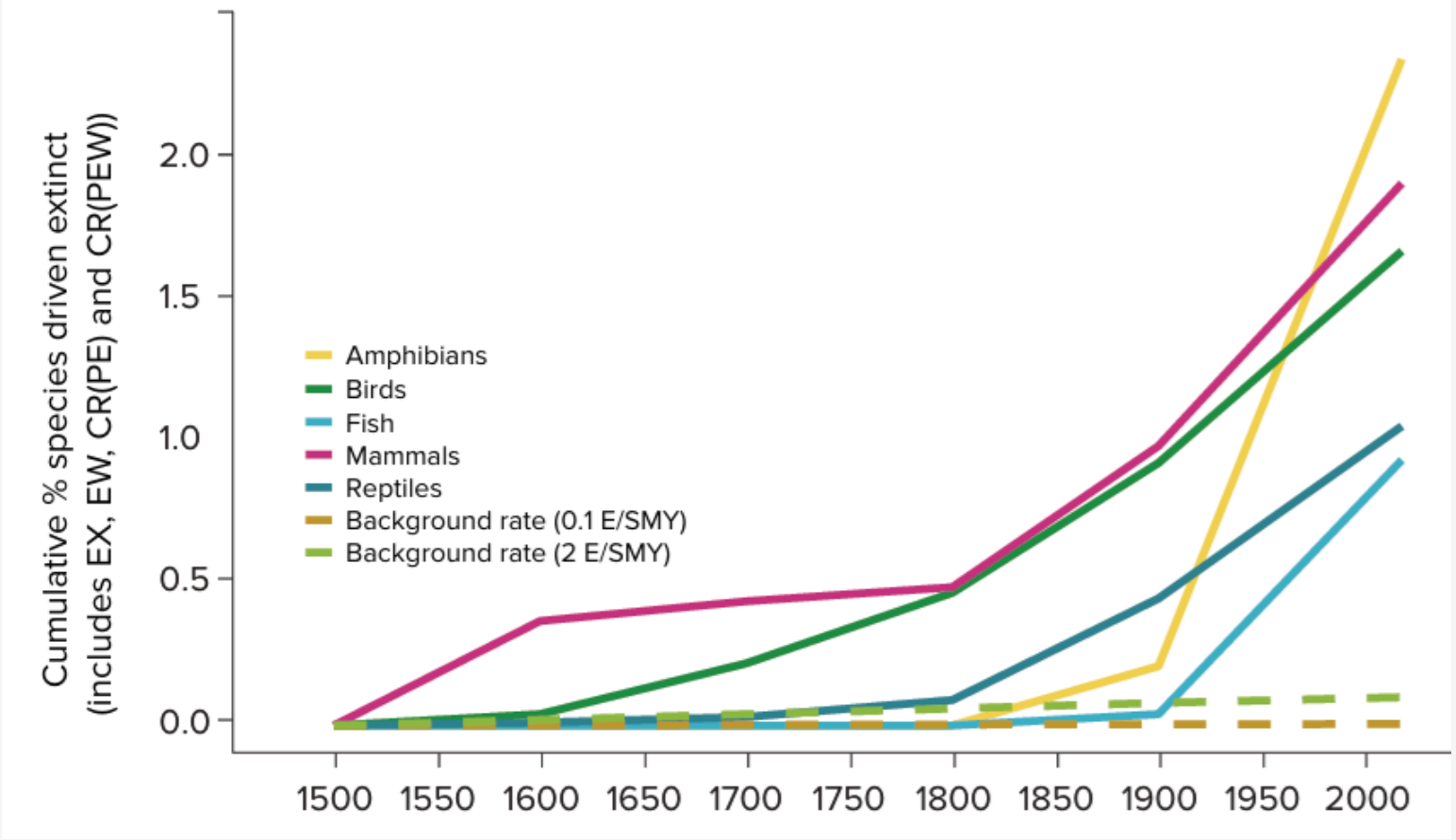
Malagasy amphibian trade

WWF Living planet report (2024)

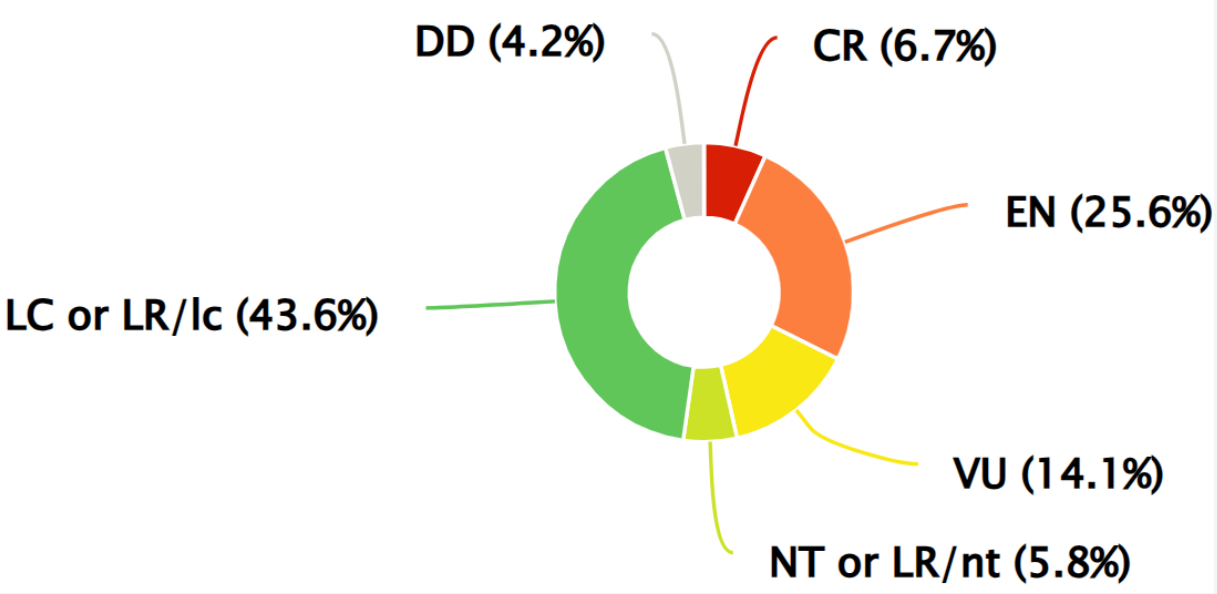
Globally:
the cumulative number of species known to have gone extinct
(WWF 2024)



Malagasy amphibian trade

IUCN Red List

- currently >365 Malagasy amphibian species formally recognised.
- 312 listed on IUCN RedList (searched 22/11/2023).



EX – Extinct
EW – Extinct In The Wild
RE – Regionally Extinct (regional category)
CR – Critically Endangered
EN – Endangered
VU – Vulnerable
LR/cd – Lower Risk: Conservation Dependent
NT or LR/nt – Near Threatened
LC or LR/lc – Least Concern
DD – Data Deficient
NA – Not Applicable (regional category)

IUCN Red List of Threatened Species

Malagasy amphibian trade

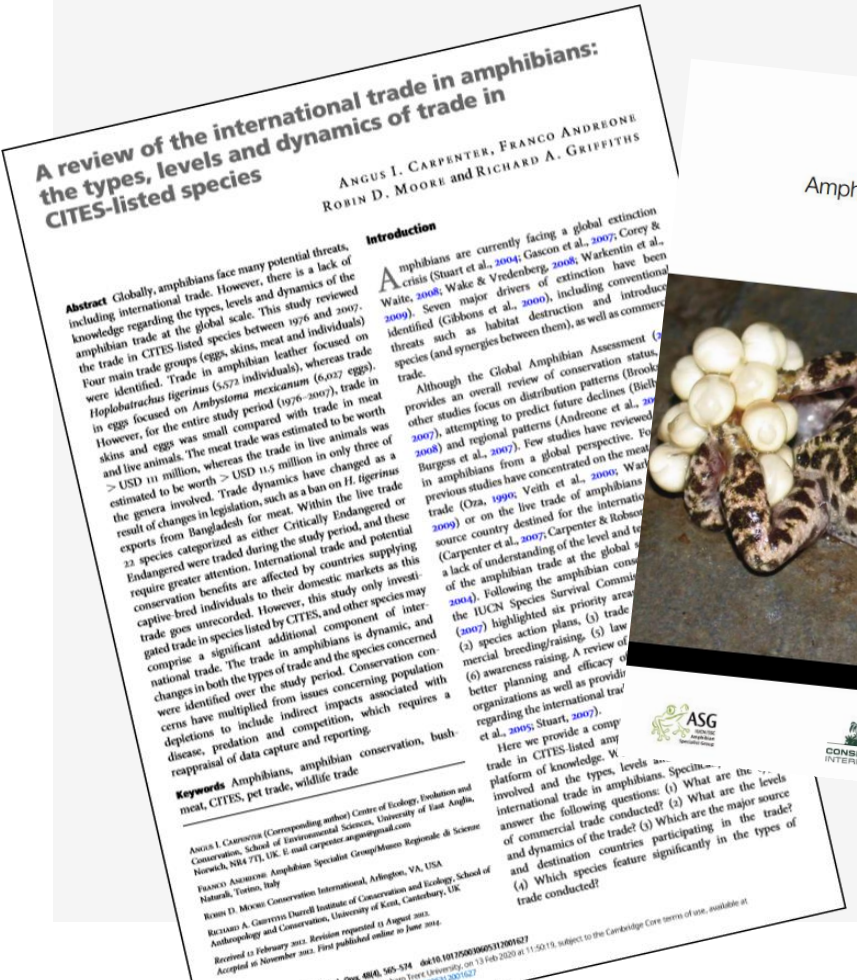
IUCN Red List

Gephyromantis tschenki	Decreasing	Global	LC
Gephyromantis tahotra	Decreasing	Global	VU
Guibemantis liber	Unknown	Global	LC
Guibemantis pulcher	Decreasing	Global	LC
Boophis quasiboehmei	Decreasing	Global	NT
Boophis andreonei	Decreasing	Global	VU
Boophis fayi	Decreasing	Global	VU
Boophis haingana	Decreasing	Global	EN
Boophis baetkei	Decreasing	Global	CR
Boophis schuboeae	Decreasing	Global	EN
Boophis arcanus	Decreasing	Global	EN
Boophis pyrrhus	Decreasing	Global	LC
Mantidactylus zolitschka	Decreasing	Global	CR
Aglyptodactylus madagascariensis	Decreasing	Global	LC
Boophis erythrodactylus	Decreasing	Global	LC
Mantidactylus aerumnalis	Decreasing	Global	LC
Boophis madagascariensis	Decreasing	Global	LC
Boophis rappiodes	Decreasing	Global	LC
Mantidactylus grandidieri	Decreasing	Global	LC
Boophis williamsi	Decreasing	Global	CR
Mantidactylus mocquardi	Unknown	Global	LC
Boophis albilabris	Decreasing	Global	LC
Heterixalus punctatus	Stable	Global	LC
Mantella haraldmeieri	Decreasing	Global	EN
Scaphiophryne boribory	Decreasing	Global	VU
Mantella crocea	Decreasing	Global	VU
Mantella milotympanum	Decreasing	Global	CR
Ptychadena mascareniensis	Unknown	Global	LC
Mantella baroni	Unknown	Global	LC
Heterixalus betsileo	Stable	Global	LC
Mantella cowanii	Unknown	Global	EN
Mantella pulchra	Decreasing	Global	NT
Mantella madagascariensis	Decreasing	Global	VU
Dyscophus antongilii	Decreasing	Global	LC
Plethodontohyla tuberata	Decreasing	Global	NT
Cophyla tsaratananaensis	Decreasing	Global	EN
Cophyla tetra	Decreasing	Global	EN
Mantella expectata	Decreasing	Global	EN
Scaphiophryne gottlebei	Decreasing	Global	EN
Mantella aurantiaca	Decreasing	Global	EN
Guibemantis methueni	Decreasing	Global	LC
Guibemantis timidus	Unknown	Global	LC
Spinomantis tavaratra	Decreasing	Global	VU
Spinomantis brunae	Decreasing	Global	EN
Spinomantis fimbriatus	Decreasing	Global	LC
Guibemantis kathrinae	Decreasing	Global	VU
Spinomantis massi	Decreasing	Global	VU
Guibemantis diphonus	Decreasing	Global	CR
Tsingymantis antitra	Unknown	Global	EN
Spinomantis nussbaumi	Decreasing	Global	CR
Wakea madinika	Unknown	Global	DD
Spinomantis phantasticus	Decreasing	Global	LC
Guibemantis tornieri	Decreasing	Global	LC
Blommersia angolafa	Decreasing	Global	LC
Blommersia kely	Unknown	Global	LC
Blommersia galani	Stable	Global	LC
Blommersia variabilis	Stable	Global	LC
Spinomantis elegans	Decreasing	Global	NT
Gephyromantis moseri	Decreasing	Global	LC
Guibemantis punctatus	Decreasing	Global	CR
Gephyromantis ranjomavo	Decreasing	Global	EN
Spinomantis aglavei	Decreasing	Global	LC
Spinomantis guibei	Decreasing	Global	VU
Gephyromantis schilfi	Decreasing	Global	VU
Gephyromantis striatus	Decreasing	Global	VU
Gephyromantis enki	Decreasing	Global	VU
Gephyromantis atsingy	Decreasing	Global	EN
Laliostoma labrosum	Stable	Global	LC
Gephyromantis ambohitra	Decreasing	Global	VU
Guibemantis flavobrunneus	Decreasing	Global	LC
Gephyromantis leucocephalus	Stable	Global	NT
Gephyromantis salegy	Decreasing	Global	VU
Gephyromantis sculpturatus	Decreasing	Global	LC
Gephyromantis zavona	Decreasing	Global	EN
Gephyromantis thelenae	Decreasing	Global	EN
Gephyromantis azzurrae	Decreasing	Global	EN
Gephyromantis mafy	Decreasing	Global	CR

IUCN Red List of Threatened Species

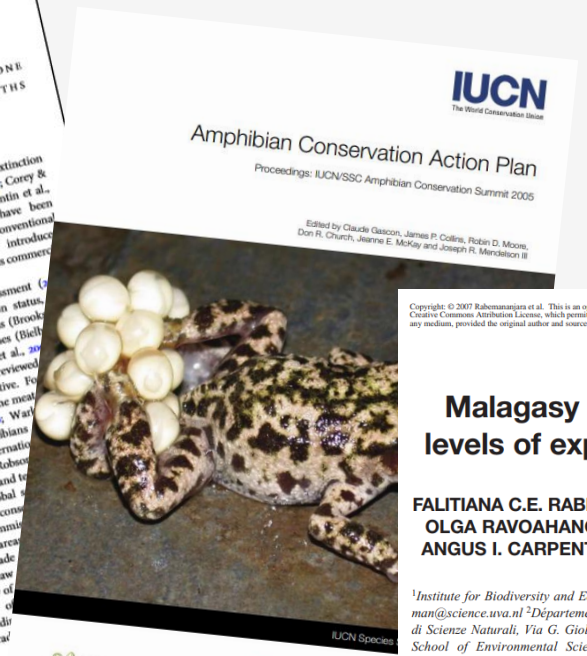
Malagasy amphibian trade

amphibian trade



A review of the international trade in amphibians: the types, levels and dynamics of trade in CITES-listed species

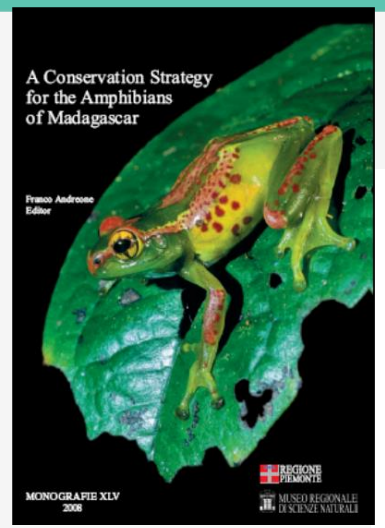
Angus I. Carpenter, Franco Andreone, Robin D. Moore and Richard A. Griffiths



IUCN

Amphibian Conservation Action Plan

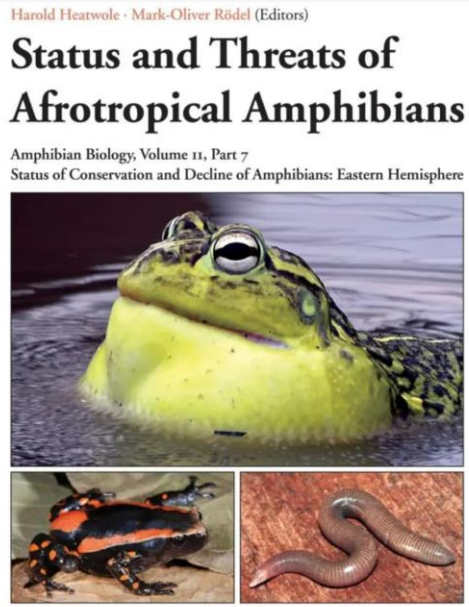
Proceedings: IUCN/SSC Amphibian Conservation Summit 2005



A Conservation Strategy for the Amphibians of Madagascar

Franco Andreone Editor

MONOGRAFIE XLV 2008



Harold Heatwole · Mark-Oliver Rödel (Editors)

Status and Threats of Afrotropical Amphibians

Amphibian Biology, Volume 11, Part 7

Status of Conservation and Decline of Amphibians: Eastern Hemisphere

Edition Chimaira

Amphibian and Reptile Conservation 5(1):3-16.
DOI: 10.1514/journal.arc.0050020 (5604KB PDF)

Malagasy poison frogs in the pet trade: a survey of levels of exploitation of species in the genus *Mantella*

FALITIANA C.E. RABEMANANJARA[1,2], NOROMALALA RASOAMAMPIONONA RAMINOSOA[2], OLGA RAVOAHANGIMALALA RAMILIJAONA[2], FRANCO ANDREONE[3], PARFAIT BORA[2], ANGUS I. CARPENTER[4], FRANK GLAW[5], TOKIHERY RAZAFINDRABE[2], DENIS VALLAN[6], DAVID R. VIEITES[7], AND MIGUEL VENCES[1*]

[1]Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Mauritskade 61, 1092 AD Amsterdam, The Netherlands; frabeman@science.uva.nl [2]Département de Biologie Animale, Université d'Antananarivo, BP 906, 101 Antananarivo, Madagascar [3]Museo Regionale di Scienze Naturali, Via G. Giolitti 36, I-10123 Torino, Italy; f.andreone@libero.it [4]Centre for Ecology, Evolution and Conservation (CEEC), School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK; Chameleon.project@uea.ac.uk [5]Zoologische Staatssammlung, Münchhausenstr. 21, 81247 München, Germany; frank.glaw@zsm.mwn.de [6]Natur-Museum Luzern, Kasernenplatz 6, CH-6003 Luzern, Switzerland; denis.vallan@lu.ch [7]Museum of Vertebrate Zoology and Department of Integrative Biology, 3101 Valley Life Sciences Building, University of California, Berkeley, CA 94720-3160, USA; vieites@berkeley.edu

***Abstract.*—Malagasy poison frogs of the genus Mantella are small, colorful amphibians that are in high demand for the pet trade. Mantella aurantiaca was included in CITES Appendix II in February 1995 and the whole genus included in Appendix II in 2000. CITES Annual report data indicate reported exports of about 230,000 specimens from 1994 to 2003. The reported trade in the most prominent species, M. aurantiaca, increased sharply from 1996 to 1998, with more than 30,000 specimens exported in 1998, but dropped after the implementation of an unofficial quota system in Madagascar. Limited information exists on their distribution, habitat preferences and impacts from potential threats, such as harvesting for commerce, and several species are currently listed as Critically Endangered. Based on field surveys of the trade network, the bene-**

Malagasy amphibian trade

Does not include non-CITES listed species!

Malagasy wildlife trade (all fauna)

conservation

MDPI

Article

Valorisation of Madagascar's Wildlife Trade and Wildlife Tourism: What Are the Conservation Benefits?

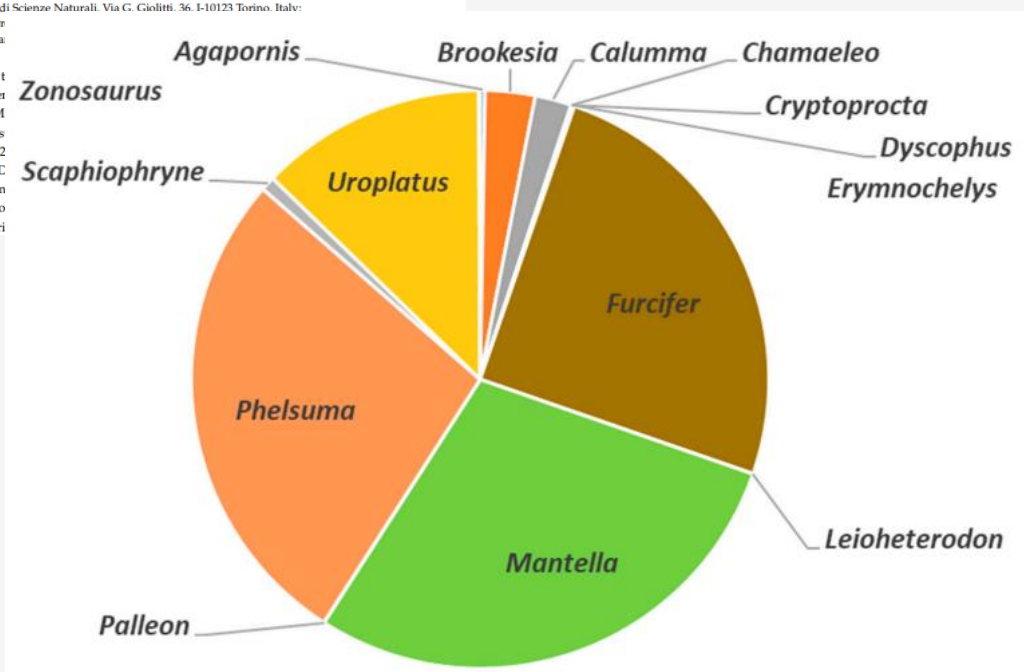
Angus I. Carpenter [1,*] and Franco Andreone [2]

[1] Institute of Science and Environment, University of Cumbria, Ambleside Campus, Rydal Road, Ambleside LA22 9BB, UK

[2] Museo Regionale di Scienze Naturali, Via G. Giolitti, 36, I-10123 Torino, Italy; franco.andreone@r

* Correspondence: a

Abstract: Wildlife t
aligning, income ge
sets collated from M
to 2018, this study es
Between 2007 and 2
up to a high of USD
to benefit local com
the estimated econo
72,299.80 for the peri



top genera traded

Genus	Species	No.	%
	AMPHIBIANS		
Mantella		68,798	
	Mantella betsileo	22,737	33.0
	Mantella baroni	21,110	30.7
	Mantella nigricans	7306	10.6
	Mantella pulchra	5969	8.7
	REPTILES		
Phelsuma		65,329	
	Phelsuma lineata	17,939	27.5
	Phelsuma quadriocellata	15,534	23.8
	Phelsuma laticauda	14,124	21.6
	Phelsuma madagascariensis	10,563	16.2
Uroplatus		30,335	
	Uroplatus sikorae	10,059	33.2
	Uroplatus fimbriatus	6170	20.3
	Uroplatus phantasticus	5002	16.5
	Uroplatus ebenaui	4202	13.9
Brookesia		6686	
	Brookesia superciliaris	1927	28.8
	Brookesia stumpffi	1657	24.8
	Brookesia thieli	1326	19.8
	Brookesia therezieni	1169	17.5
Furcifer		59,722	
	Furcifer pardalis	19,029	31.9
	Furcifer lateralis	15,908	26.6
	Furcifer oustaleti	11,268	18.9
	Furcifer verrucosus	11,312	18.9

Malagasy amphibian trade

Amphibian species traded

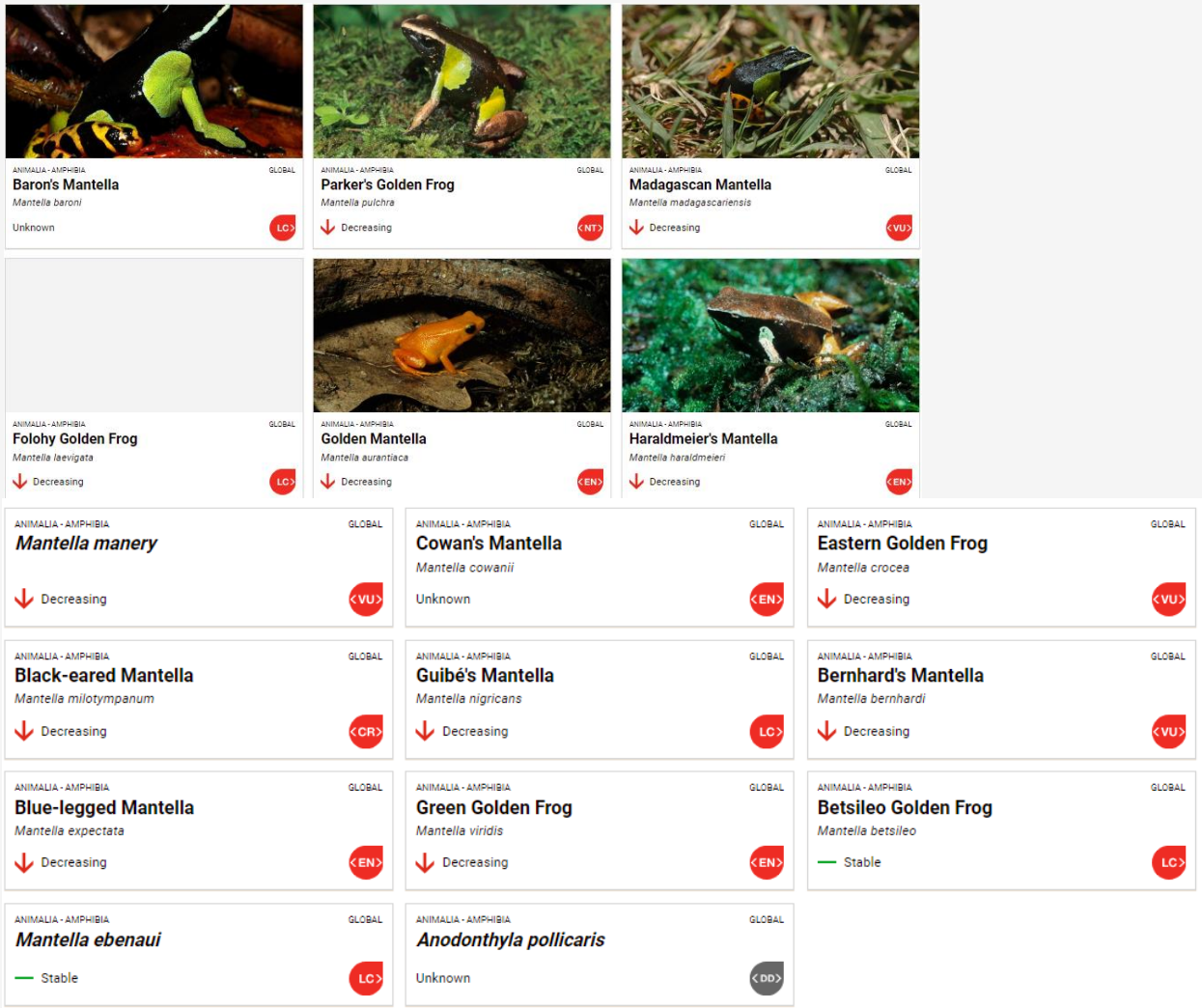
animals MDPI

Article

Malagasy Amphibian Wildlife Trade Revisited: Improving Management Knowledge of the Trade

Angus I. Carpenter [1,*] and Franco Andreone [2]

Amphibian Species	Total Traded	% of Trade
Mantella aurantiaca	64,745	23.89
Mantella betsileo	38,930	14.37
Mantella baroni	29,805	11.00
Mantella madagascariensis	24,753	9.14
Mantella pulchra	21,147	7.80
Mantella spp.	20,343	7.51
Mantella laevigata	15,068	5.56
Mantella viridis	12,056	4.45
Mantella nigricans	9842	3.63
Mantella expectata	9096	3.36
Mantella crocea	8018	2.96
Mantella milotympanum	6043	2.23
Scaphiophryne gottlebei	4130	1.52
Mantella bernhardi	1883	0.69
Mantella cowanii	1667	0.62
Dyscophus guineti	1021	0.38
Mantella haraldmeieri	940	0.35
Dyscophus insularis	731	0.27
Scaphiophryne spinosa	410	0.15
Scaphiophryne marmorata	195	0.07
Dyscophus antongilii	95	0.04
Dyscophus spp.	45	0.02



IUCN Red List of Threatened Species

Malagasy amphibian trade

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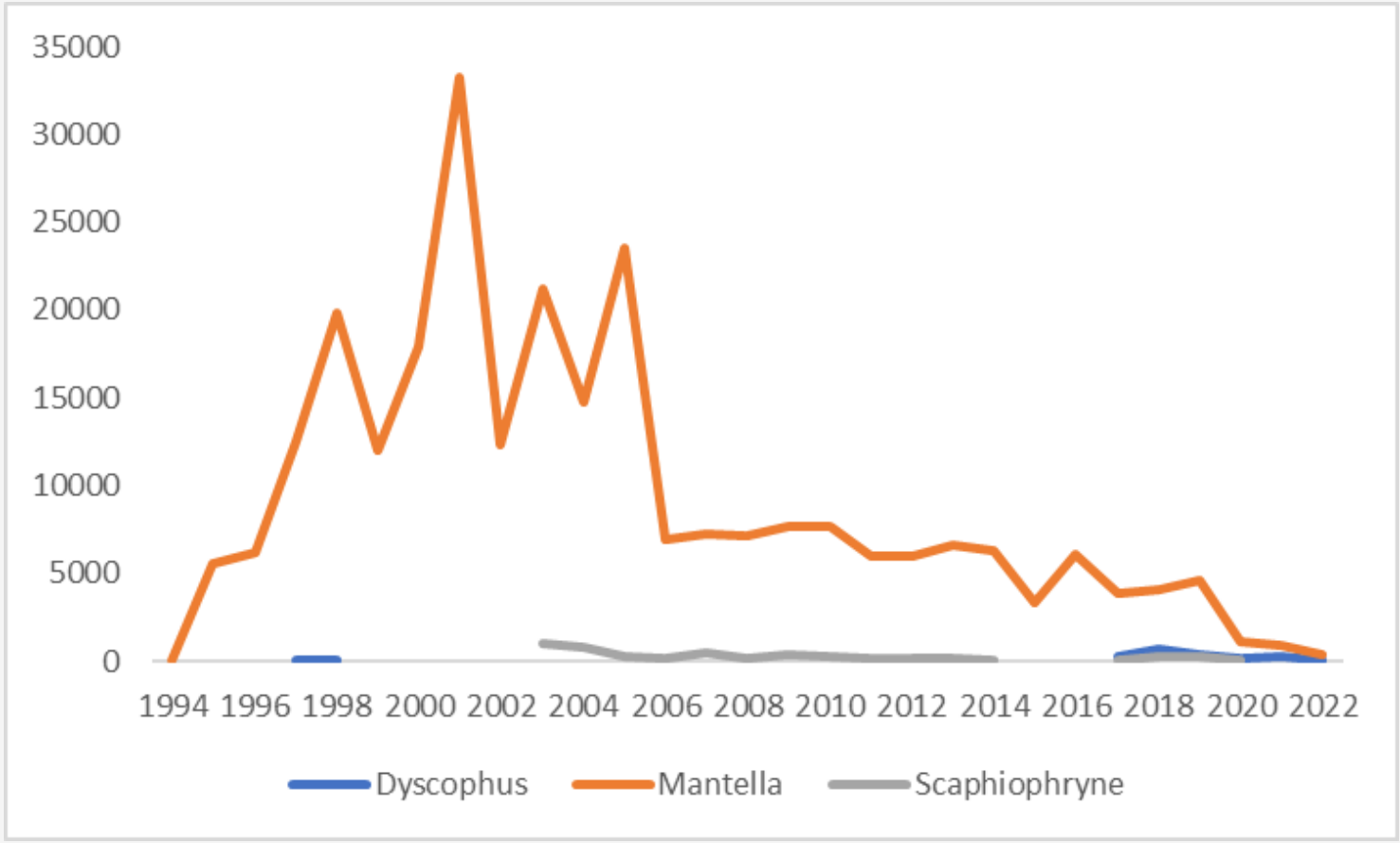
trade patterns

(CITES data @ 23/11/2023)

Year Range:	*From: 1975 To: 2023*
Exporting countries:	*Madagascar*
Importing countries:	*All Countries*
Source:	*W - Wild,R - Ranched,F - Born in captivity (F1 and subsequent),U - Source unknown*
Purpose:	*T - Commercial*
Trade Terms:	*BOD - bodies,LIV - live,SPE - specimens*
Species:	*Amphibia (Amphibians)*



CITES Trade Database

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amphibian conservation going forward

setting the scene / tensions

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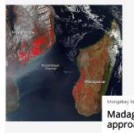
setting the scene / tensions



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setting the scene / tensions

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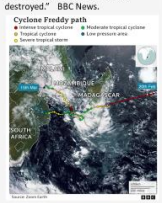
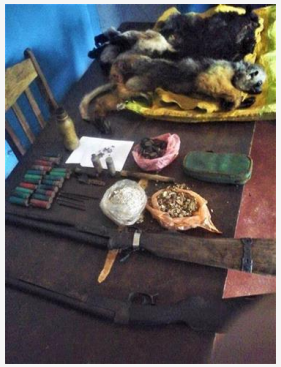
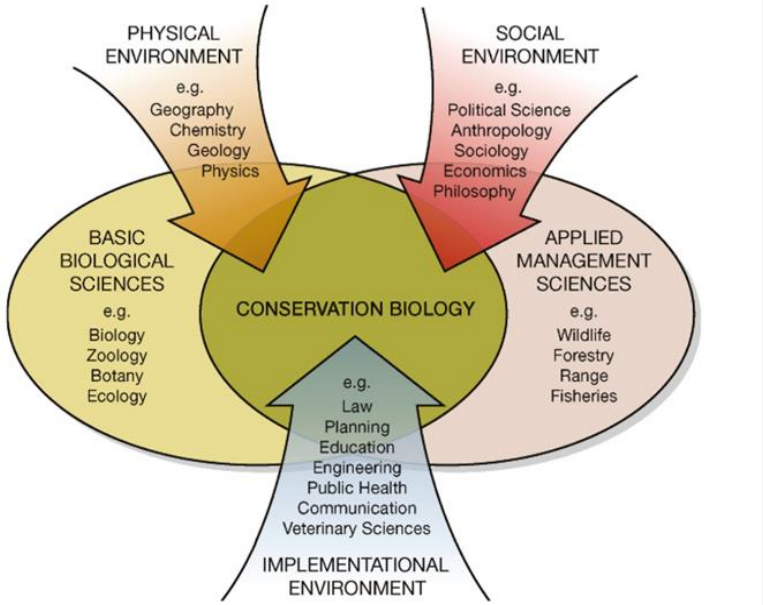


Madagascar: UN's WFP warns of a humanitarian crisis due to drought and Covid-19

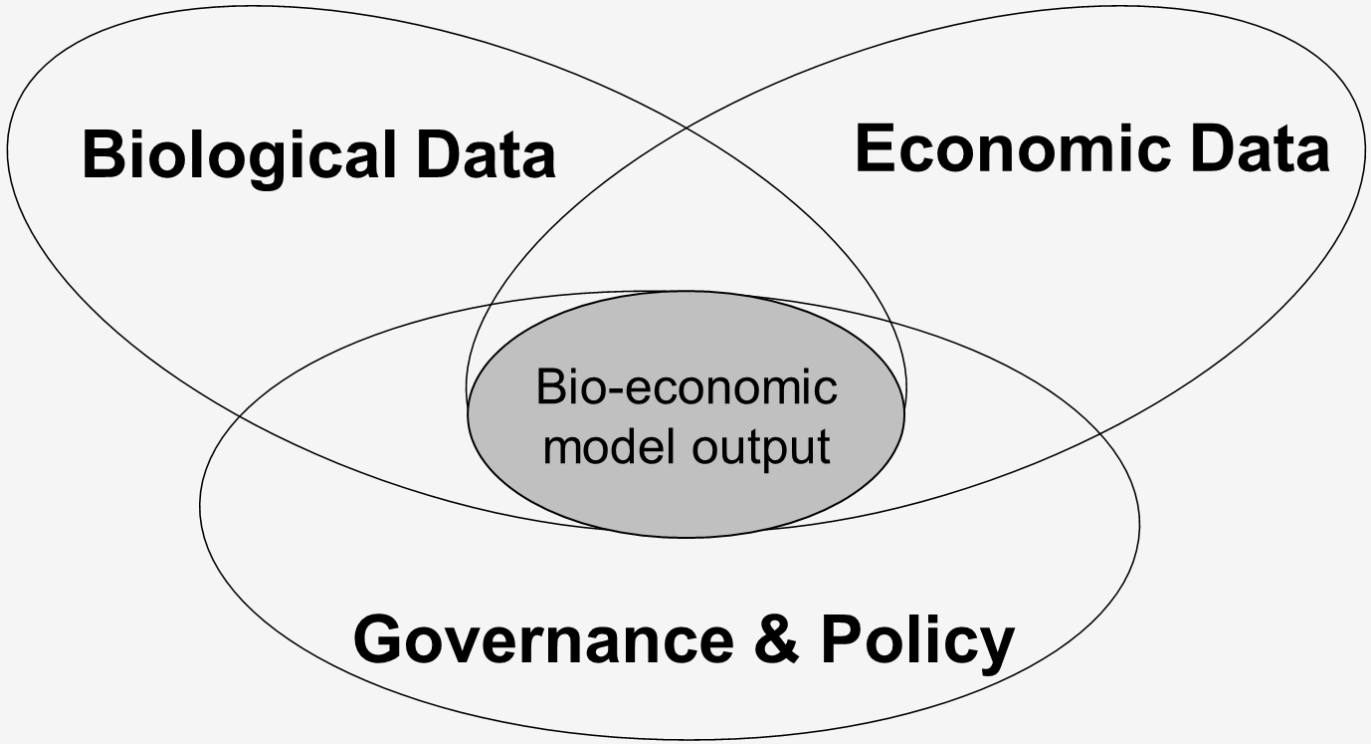
Madagascar: 1.5m face hunger because of drought, UN says



amphibian conservation going forward



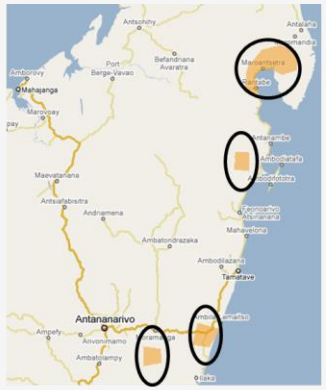
(extracted from Hunter *et al*., 2021)



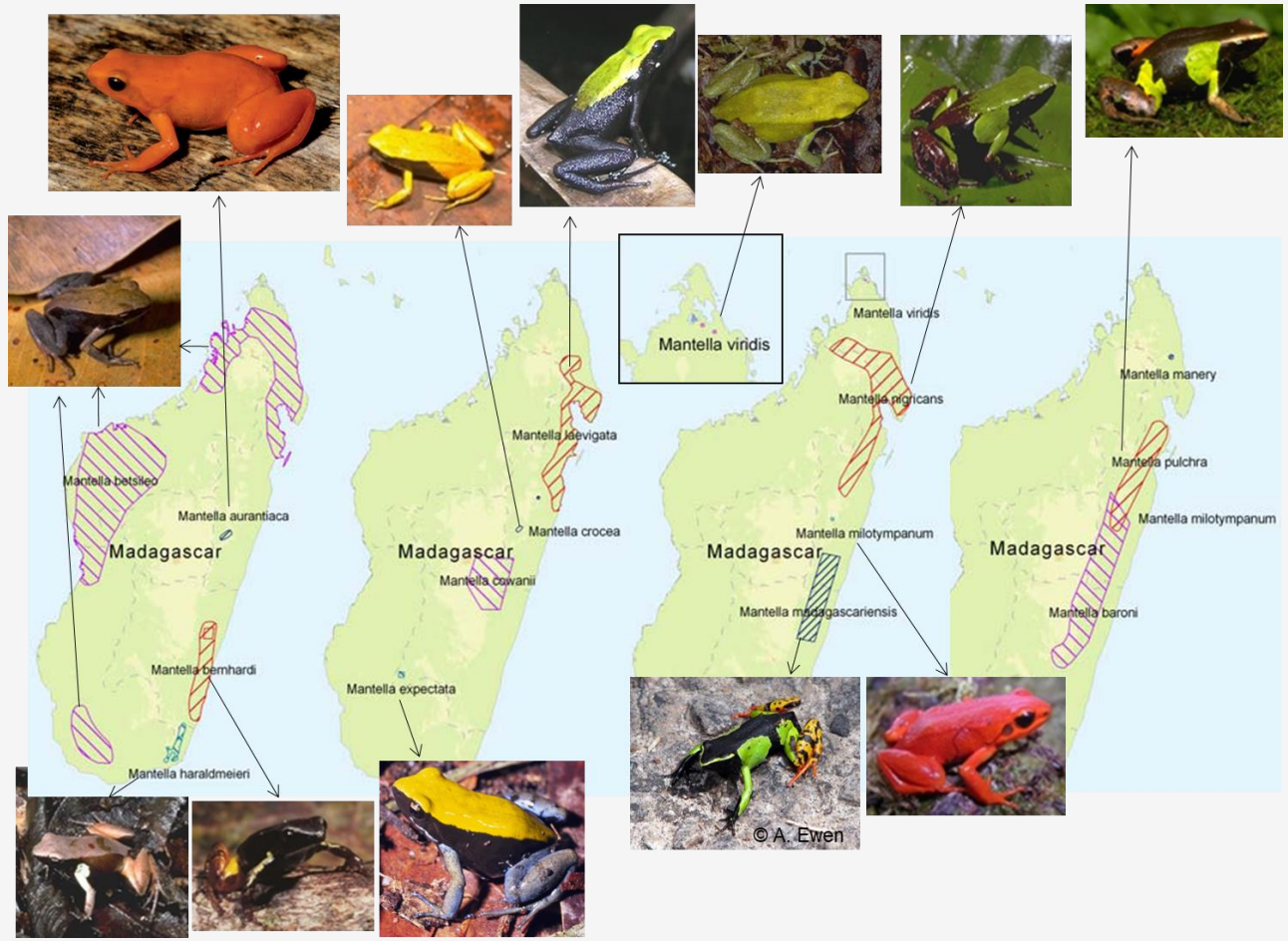
Malagasy amphibian trade

biology / species distributions

Dyscophus antongilii



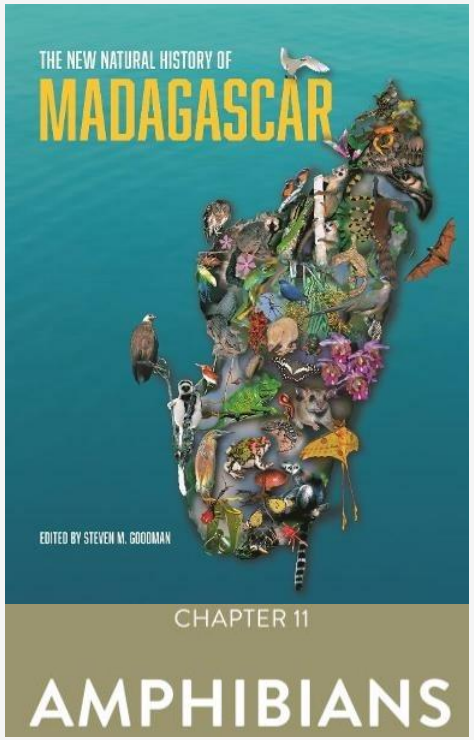
Scaphiophryne gottlebei



CITES Secretariat (2008). *Review of significant trade in specimens of Appendix-II species*. Twenty-third meeting of the Animals Committee Geneva (Switzerland), 19-24 April 2008. Convention on International Trade in Endangered Species of Wild Fauna and Flora. http://www.cites.org

Malagasy amphibian trade

biology / breeding ecology



Aquatic eggs

- Eggs deposited in water

Mode 1. Eggs and feeding (exotrophic) tadpoles in lentic water (*Ptychadena*, *Heterixalus*, *Hoplobatrachus*, *Laliostoma*, *Dyscophus*, *Scaphiophryne*, *Paradoxophyla*, *Aglyptodactylus*, and subgenus *Sahona* in *Boophis*).

2. Eggs and feeding (exotrophic) tadpoles in lotic water (other species of *Boophis*).

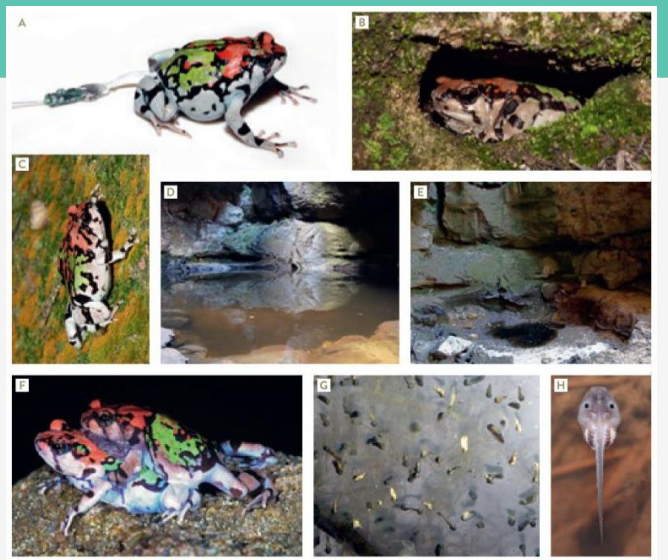
8. Eggs and nonfeeding (endotrophic) tadpoles in water in tree holes or aerial plants (*Anodonthyla*, *Cophyla*, *Platypelis*, several *Plethodontohyla* species including *P. notosticta*, *P. inguinalis*, and *P. mihanika*), or in cavities such as snail shells (some *Stumpffia*).

Eggs terrestrial or arboreal (not in water)

- Eggs on ground, on rocks, or in burrows

17. Eggs and early tadpoles in excavated nest; subsequent to flooding (e.g., after heavy rains), feeding (exotrophic) tadpoles live in ponds or streams (*Mantella* except *M. laevigata* and *M. expectata*, *Mantidactylus* subgenera *Brygoomantis*, *Chonomantis*, *Ochthomantis*, and perhaps *Hylobatrachus* and *Mantidactylus*).

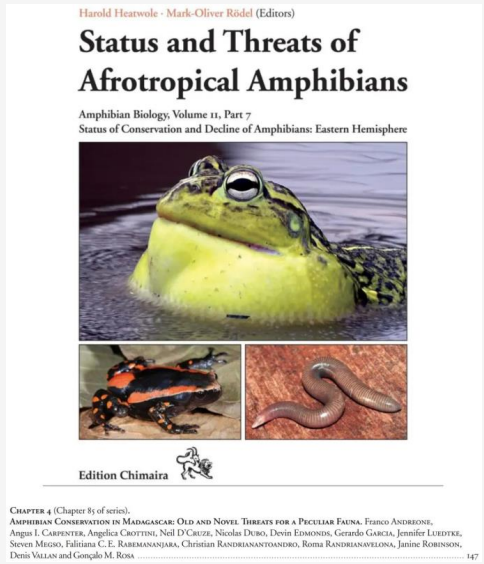
SPECIES	MEAN CLUTCH SIZE
Anodonthyla pollicaris	28.5
Blommersia blommersae	74.6
Boophis pyrrhus	82.6
Gephyromantis boulengeri	8.2
Guibemantis aff. albolineatus	17.3
Mantella aurantiaca	69.4
Mantidactylus betsileanus	67.2
Platypelis barbouri	26.2
Plethodontohyla mihanika	52.0

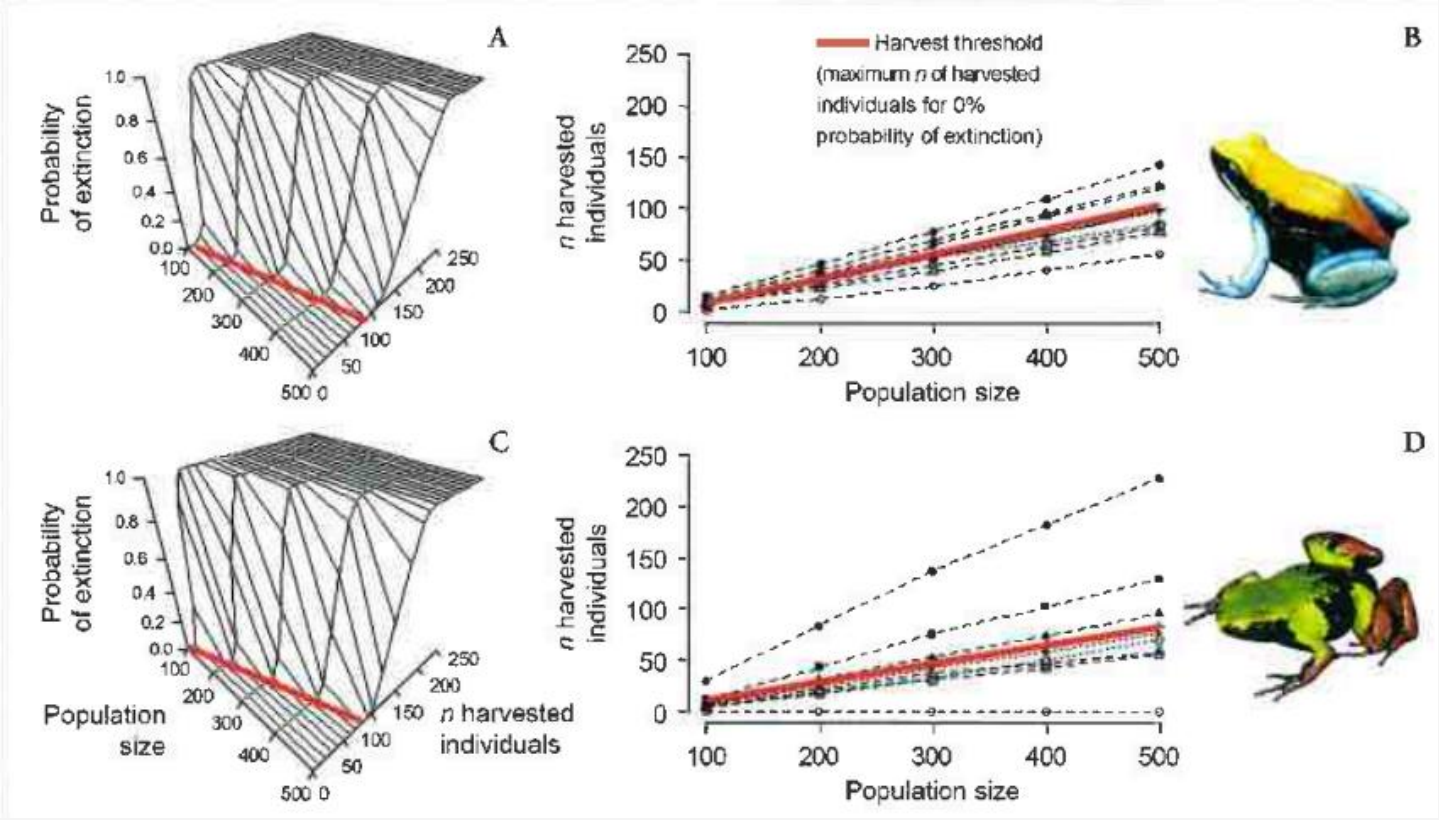


Natural history and spatial ecology of *Scaphiophryne gottlebei*. Years of research in the canyons of the Isalo Massif have unveiled some secrets of this elusive species. A) Radio-tracking individuals allowed us to better understand movements and dispersal, and B) to discover where these frogs hide and seek refuge. C) This species is highly adapted to live in narrow canyons, as it can climb up vertical walls. D) These are also extremely seasonal breeding habitats, with temporary water basins formed after the first heavy rains that E) dry out afterward. F) Males and females aggregate to breed, and G) and H) the hatching psammonektonic larvae will develop in a race against time to complete their metamorphosis.

Malagasy amphibian trade

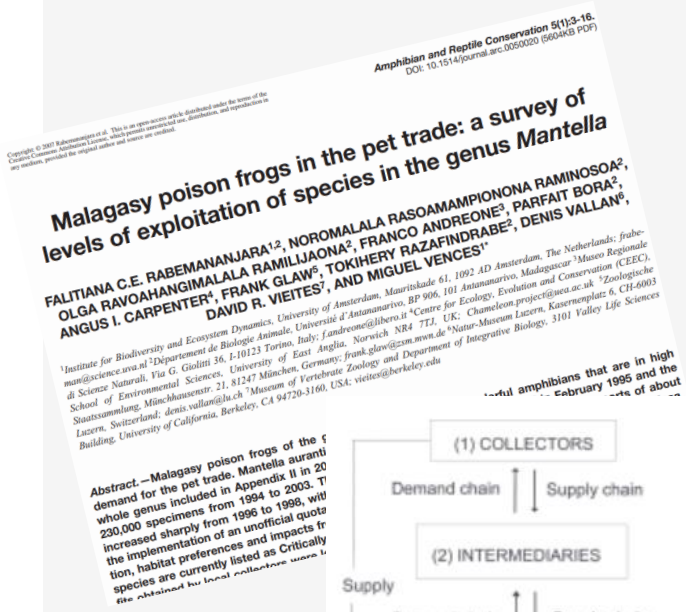
draft sustainable harvest levels





amphibian conservation going forward

trade structure & economic data



Amphibian and Reptile Conservation 5(1):3-16.
DOI: 10.1514/journal.arc.0050020 (5604KB PDF)

Malagasy poison frogs in the pet trade: a survey of levels of exploitation of species in the genus *Mantella*

FALITIANA C.E. RABEMANANJARA[1,2], NOROMALALA RASOAMAMPIONONA RAMINOSOA[2], OLGA RAVOAHANGIMALALA RAMILIJAONA[2], FRANCO ANDREONE[3], PARFAIT BORA[2], ANGUS I. CARPENTER[4], FRANK GLAW[5], TOKIHERY RAZAFINDRABE[2], DENIS VALLAN[6], DAVID R. VIEITES[7], AND MIGUEL VENCES[1]*

[1]Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Mauritskade 61, 1092 AD Amsterdam, The Netherlands; [2]Département de Biologie Animale, Université d'Antananarivo, BP 906, 101 Antananarivo, Madagascar; [3]Museo Regionale di Scienze Naturali, Via G. Giolitti 36, I-10123 Torino, Italy; [4]Centre for Ecology, Evolution and Conservation (CEEC), School of Environmental Sciences, University of East Anglia, Norwich NR4 7TJ, UK; [5]Zoologische Staatssammlung, Münchhausenstr. 21, 81247 München, Germany; [6]Museum of Vertebrate Zoology and Department of Integrative Biology, 3101 Valley Life Sciences Building, University of California, Berkeley, CA 94720-3160, USA; [7]Natur-Museum Luzern, Kasernenplatz 6, CH-6003 Luzern, Switzerland; denis.vallan@lu.ch

Abstract.—Malagasy poison frogs of the

conservation
MDPI

Article

Valorisation of Madagascar's Wildlife Trade and Wildlife Tourism: What Are the Conservation Benefits?

Angus I. Carpenter [1,*] and Franco Andreone [2]

[1] Institute of Science and Environment, University of Cumbria, Ambleside Campus, Rydal Road, Ambleside LA22 9BB, UK
[2] Museo Regionale di Scienze Naturali, Via G. Giolitti, 36, I-10123 Torino, Italy; franco.andreone@regione.piemonte.it or franco.andreone@gmail.com
* Correspondence: angus.carpenter@cumbria.ac.uk or carpenter.angus@gmail.com

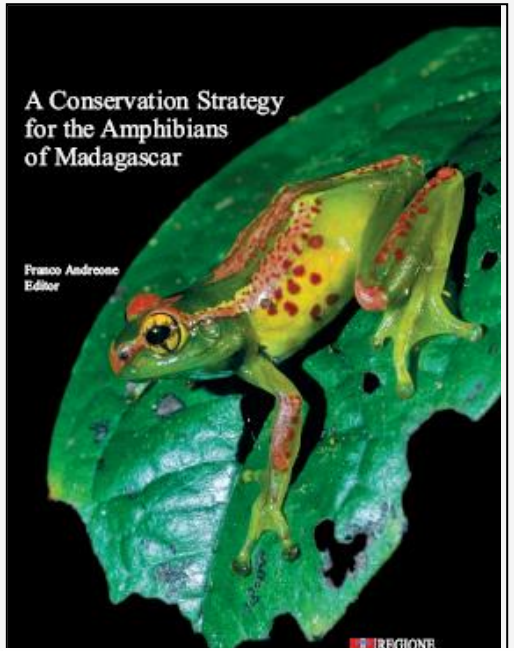
Abstract: Wildlife tourism and wildlife trade may appear juxtaposed, but are two, potentially aligning, income generators that could benefit conservation in developing countries. Utilising data sets collated from Madagascar's Ministère du Tourisme and CITES, respectively, for the period 2007 to 2018, this study estimated levels of income from wildlife tourism and wildlife trade for Madagascar. Between 2007 and 2018, tourism reported yearly incomes ranging from a low of USD 1.4 million up to a high of USD 15.7 million. However, it was unclear what percentage of this figure flowed to benefit local communities. Alternatively, using reported networks for the live wildlife trade, the estimated economic value reaching collectors and/or intermediaries in Madagascar was USD 72,299.80 for the period 2007 to 2018. Both revenue generators operated within different geographical

Animals		2007	Price	Value
Anura		7772		
	Dyscophus		0.25	0
	Mantella *	7307	0.11	803.77
	Scaphiophryne	465	0.25	116.25
Carnivora				0
	Cryptoprocta			0
Psittaciformes				0
	Agapornis ^		0.3	0
Sauria		12,991		0
	Brookesia	267	0.25	66.75
	Calumma		0.25	0
	Chamaeleo †		0.25	0
	Furcifer	4079	0.25	1019.75
	Palleon		0.25	0
	Phelsuma	4273	0.25	1068.25
	Uroplatus	4297	0.25	1074.25
	Zonosaurus	75	0.25	18.75
Serpentes				0
	Leioheterodon		0.25	0
Testudines		14		0
	Erymnochelys	14	0.25	3.5

2018	Price	Value	Grand Total
703			71,050
110	0.3	33	342
593	0.13	77.09	68,798
	0.3	0	1910
			4
		0	4
100			650
100	0.36	36	650
2592			167,131
235	0.3	70.5	6686
28	0.3	8.4	4871
	0.3	0	10
958	0.3	287.4	59,722
	0.3	0	32
1305	0.3	391.5	65,329
41	0.3	12.3	30,335
25	0.3	7.5	146
			21
	0.3	0	21
			105
	0.3	0	105
3395		923.69	238,961

amphibian conservation going forward

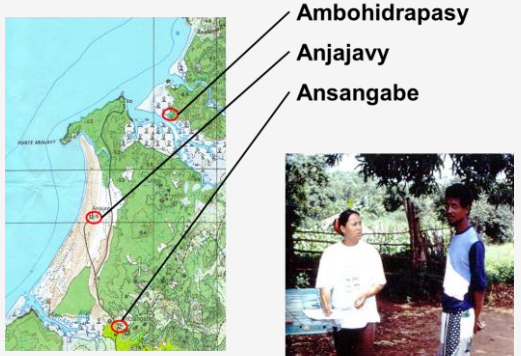
socio-economic profile

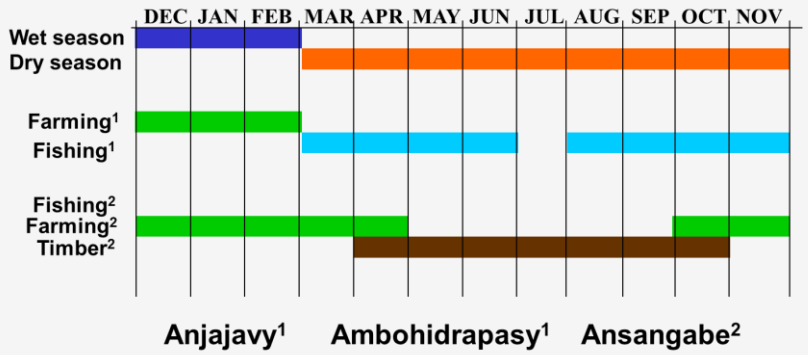


A Conservation Strategy for the Amphibians of Madagascar | Monografie del Museo Regionale di Scienze Naturali di Torino, XLV (2008): pp. 357-376

Angus I. CARPENTER[1], Onja ROBSON[2]

Madagascan amphibians as a wildlife resource and their potential as a conservation tool: species and numbers exported, revenue generation and bio-economic model to explore conservation benefits





Timber -	**Palisander:**	**£2 tree^{-1}**	**20**	**£40**
	Other timber:	**50p tree $^{-1}$**	**40**	**£20**
	Transport:	**38p shipment $^{-1}$**	**6**	**£2.28**
Farming -	Valley rice:	28p kg $^{-1}$	1500 kg	£420
	Hill rice:	**28p kg $^{-1}$**	**500 kg**	**£140**
	Maize:	**2p cob $^{-1}$**	**800**	**£16**
		35p kg $^{-1}$	**500 kg**	**£175**
	Manioc:	**20p kg $^{-1}$**	**500 kg**	**£100**
	Bananas:	25p tamgozany $^{-1}$	800	£200
	Coconuts:	10p coconut $^{-1}$	800	£80
	Honey:	50p litre $^{-1}$	50 litre	£25
		£1.50 rum	100 litre	£150
	Mangos:	2p each	500	£10

Total - **£493.28 ($720.19)**

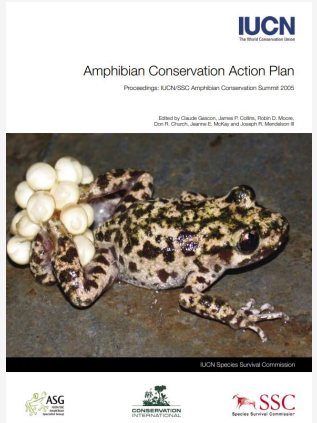
Harvester's revenue = Harvester's costs

➡ Economic costs / harvest No. = price unit $^{-1}$

↳ $ 720.19 / 2000 = $ 00.36 price unit $^{-1}$

amphibian conservation going forward

institutional governance / demand declines



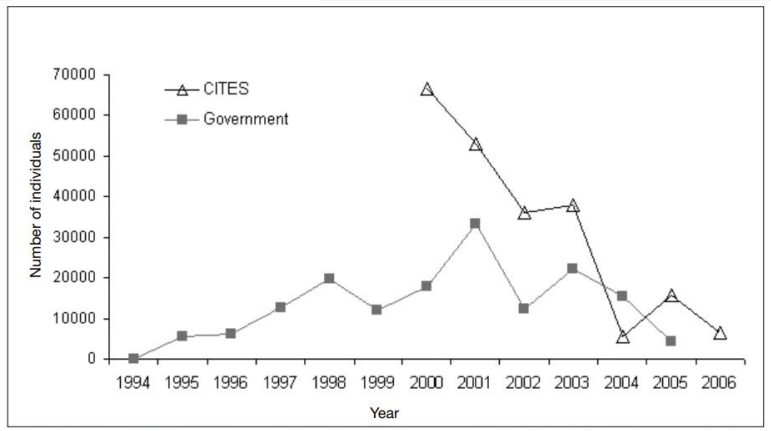


Figure 5.1. Trading trends for the number of individuals of amphibians exported between 1994 and 2006 for both CITES and Malagasy government dataset.

animals

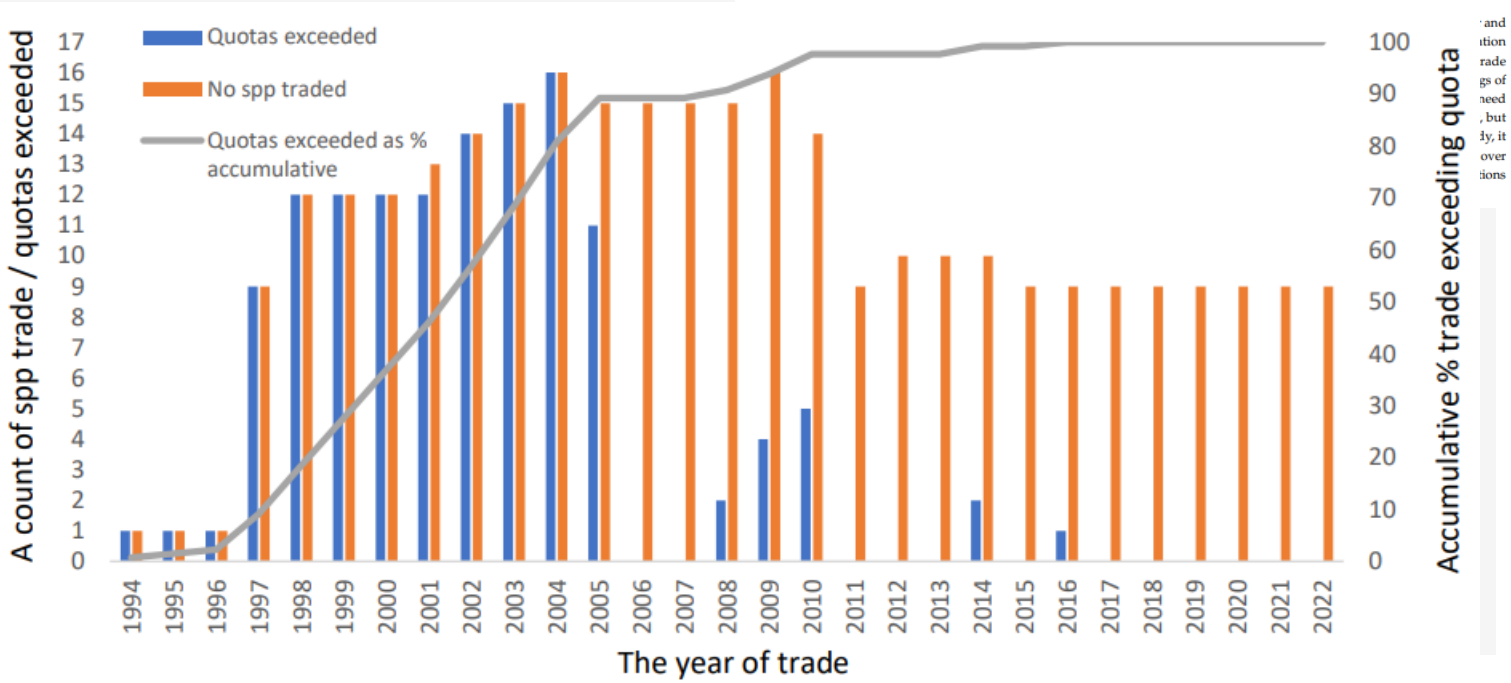
MDPI

Article

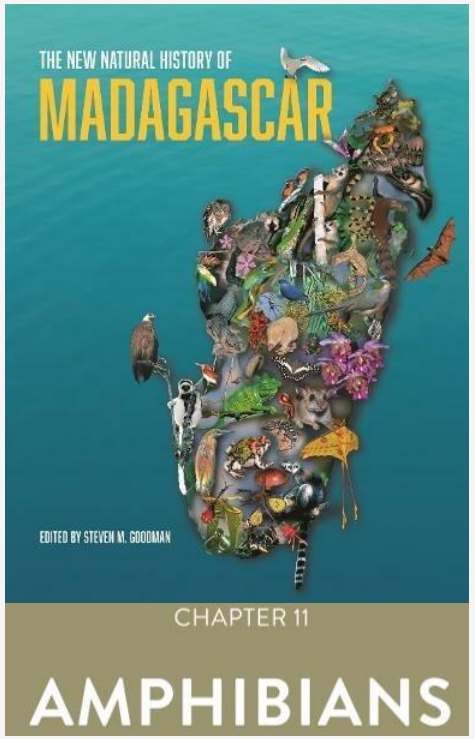
Malagasy Amphibian Wildlife Trade Revisited: Improving Management Knowledge of the Trade

Angus I. Carpenter [1,*] and Franco Andreone [2]

[1] Institute of Science and Environment, University of Cumbria, Ambleside Campus, Rydal Road, Ambleside, Cumbria LA22 9BB, UK
[2] Museo Regionale di Scienze Naturali, Via G. Giolitti, 36, I-10123 Torino, Italy; franco.andreone@rehione.piemonte.it
* Correspondence: carpenter.angus@gmail.com



amphibian conservation going forward



- currently >365 Malagasy amphibian species formally recognised.

- the number will increase as 100–150 candidate species already identified but not yet assessed and scientifically named.

- predicted that Madagascar will host >500 amphibian species.

- considering scientifically named species only, Madagascar holds ~4.5% of the world's amphibian fauna.

Glaw et al., 2022. In The new natural history of Madagascar (ed S. Goodman), Princeton University Press, USA

amphibian conservation going forward

drivers of trade

Raptors:

… hobbyists and small falconry groups were found to be the predominant drivers of sales… .

Panter & White. 2020. Insights from social media into the illegal of wild raptors in Thailand. *Traffic Bulletin*, 32

Reptiles:

The pursuit of novelty … species include numerous endangered or range-restricted species… Exploitation can occur immediately after scientific description, leaving new endemic species especially vulnerable.

Marshall, *et al*., 2020. Thousands of reptile species threatened by under-regulated global trade. *Nature Communications*, 11, 4738

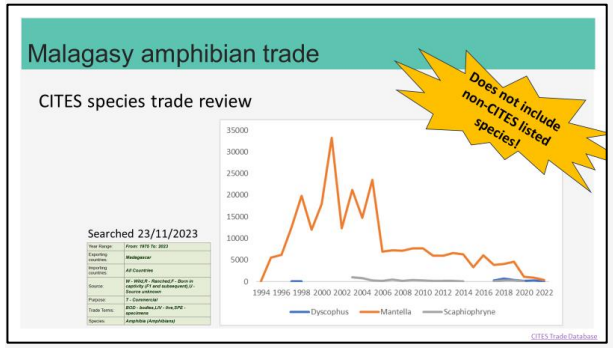
Reptiles & Amphibians:

In the last few decades, exotic pets have become much more common. In the UK in 2008, reptiles and amphibians were more popular than dogs, with over eight million in captivity. But while almost all pet cats and dogs are born and bred in captivity, exotic pets are often taken from the wild, putting species and their habitats at risk.

Hughes, *et al*., 2021. Gaps in global wildlife trade monitoring leave amphibians vulnerable. *eLife., 10: e70086*

amphibian conservation going forward

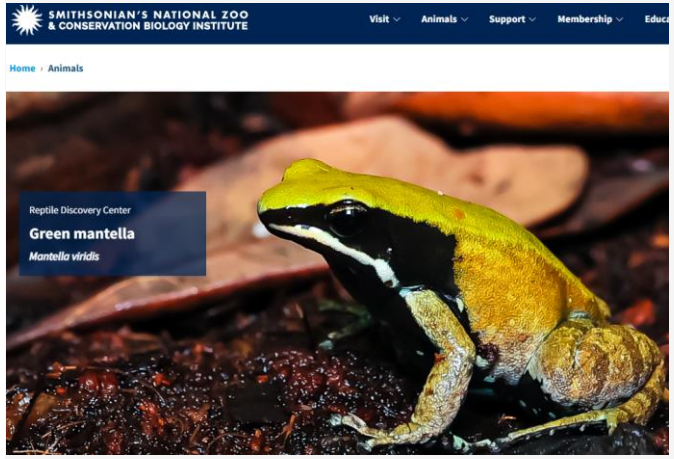
zoo CB programs

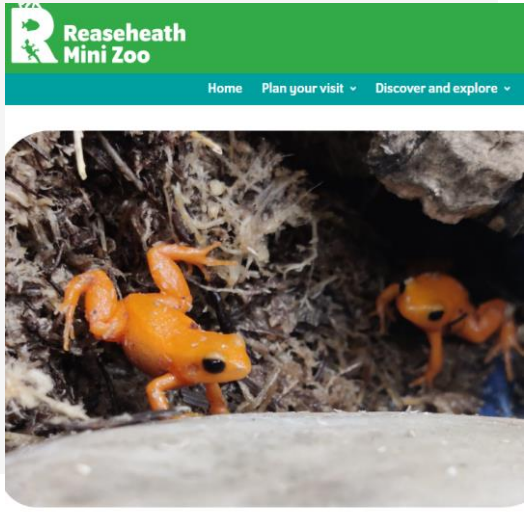


News | 10 Oct, 2023

IUCN Species Survival Commission acknowledges vital contributions of Botanic Gardens, Aquariums, and Zoos to wildlife conservation

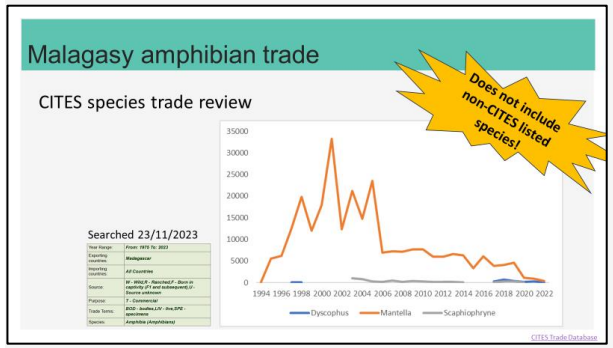
The IUCN Species Survival Commission Position Statement on the Role of Botanic Gardens, Aquariums, and Zoos in Species Conservation recognizes the leading role that these organisations already play in the science and practice of conservation, and invites others to reach their full potential, working alongside governments and key partners to collectively achieve IUCN's One Plan Approach."





amphibian conservation going forward

zoo CB programs



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CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora

Espan

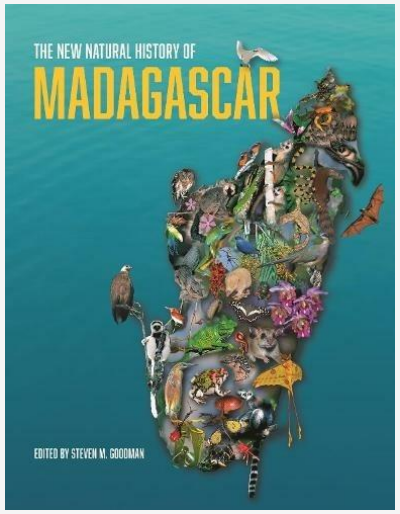
New Search

Comparative Tabulation Report

Year	App.	Taxon	Class	Order	Family	Genus	Importer	Exporter	Origin	Importer reported quantity	Exporter reported quantity	Term	Unit	Purpose	Source
2010	I	Prolemur simus	Mammalia	Primates	Lemuridae	Prolemur	MG	GB		1		live		S	C
2016	I	Neofelis nebulosa	Mammalia	Carnivora	Felidae	Neofelis	MG	GB	DE	1	1	live		B	C
2016	I	Neofelis nebulosa	Mammalia	Carnivora	Felidae	Neofelis	MG	GB	DE	1		live		Z	C
2016	II	Prionailurus rubiginosus	Mammalia	Carnivora	Felidae	Prionailurus	MG	GB			2	live		B	C
2016	II	Prionailurus rubiginosus	Mammalia	Carnivora	Felidae	Prionailurus	MG	GB		2		live		Z	C
2017	I	Osteolaemus tetraspis	Reptilia	Crocodylia	Crocodylidae	Osteolaemus	MG	GB			4	live		B	C

amphibian conservation going forward

CB on Madagascar



MITSINJO CAPTIVE-BREEDING FACILITY

FIGURE 11.8 **The main room of the Mitsinjo amphibian captive-breeding facility near Andasibe. Terraria in the photo house *Mantella aurantiaca*.** (PHOTO by D. Edmonds.)

TABLE 11.2. **Amphibian species maintained at Mitsinjo's amphibian captive-breeding facility since 2011**

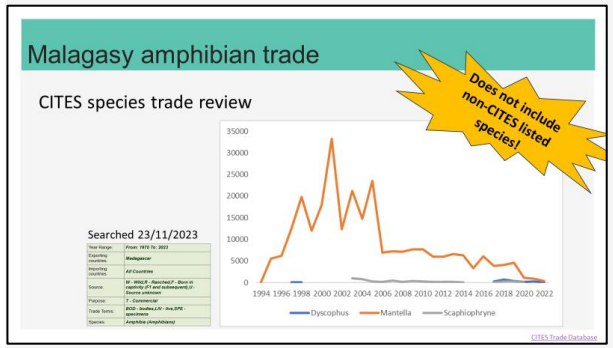
SPECIES	BRED TO F1	BRED TO F2
Anodonthyla pollicaris	X	–
Blommersia blommersae	X	–
Boophis bottae	X	–
B. pyrrhus	X	–
Dyscophus guineti	–	–
Gephyromantis boulengeri	X	–
Guibemantis aff. *albolineatus*	X	–
G. pulcher	–	–
Heterixalus betsileo	X	–
H. punctatus[1]	–	–
Mantella aurantiaca	X	X
Mantidactylus betsileanus	X	X
Platypelis barbouri	X	–
Plethodontohyla mihanika	X	–
Stumpffia sp.[1]	–	–

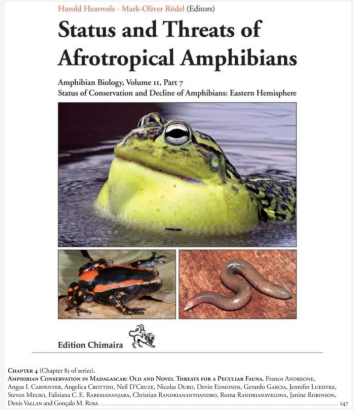
TABLE 11.4. Species recommended for ex situ rescue by the Conservation Needs Assessment

SPECIES
Anodonthyla emilei
A. jeanbai
A. theoi
Boophis baetkei
B. jaegeri
B. williamsi
Cophyla maharipeo
Gephyromantis hintelmannae
G. mafy
Mantella aurantiaca
M. milotympanum
Mantidactylus pauliani
Platypelis alticola
P. mavomavo
P. olgae
Rhombophryne longicrus
Spinomantis brunae
Stumpffia hara
S. staffordi

amphibian conservation going forward

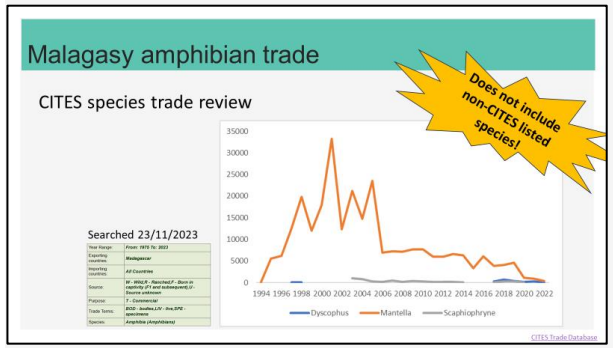
CB in hobbyist community

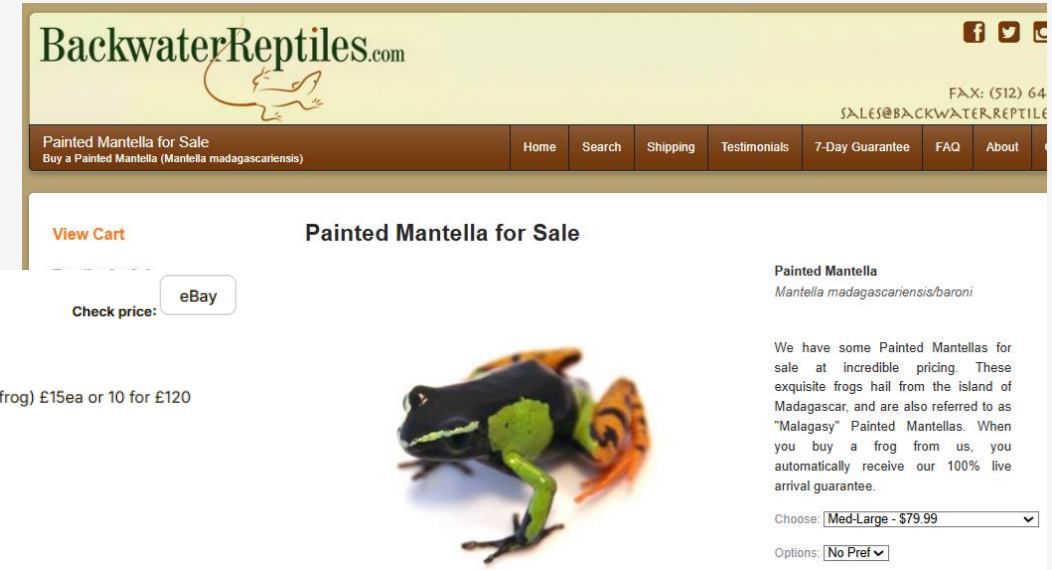


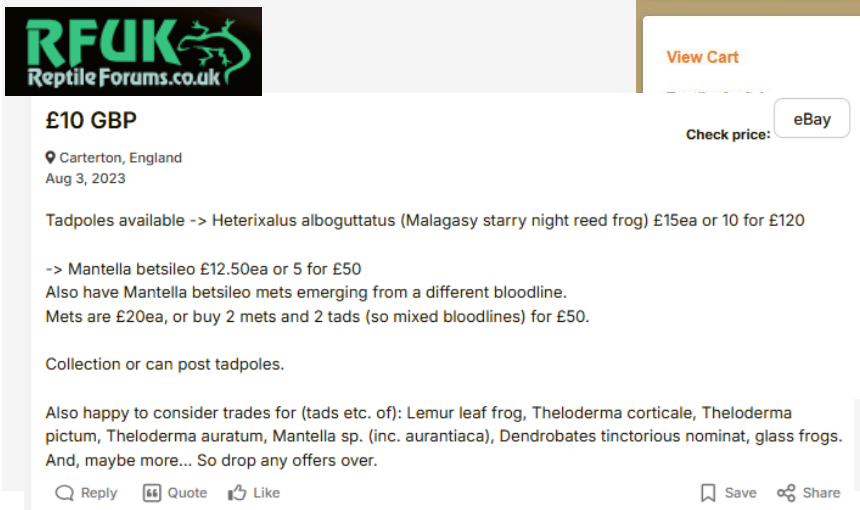


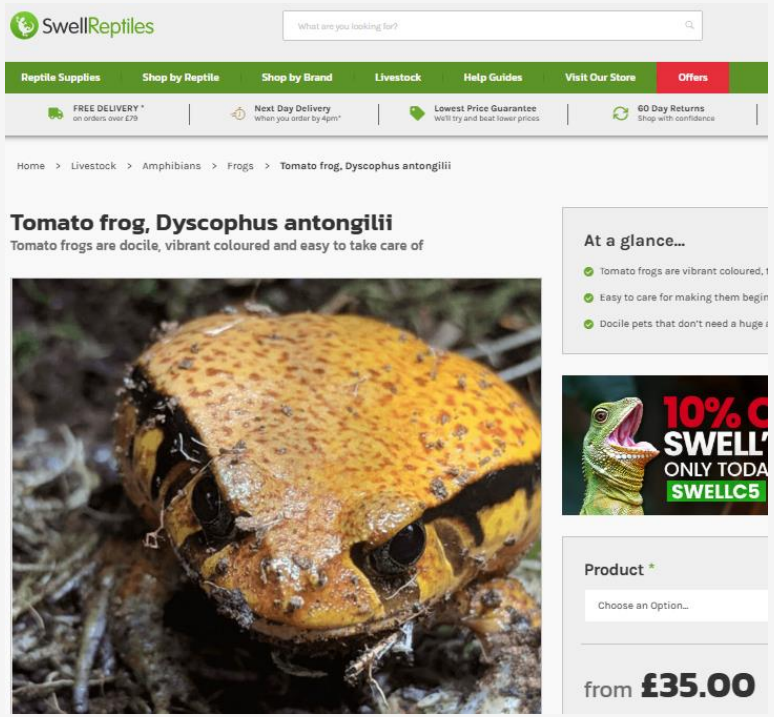
amphibian conservation going forward

Malagasy amphibians for sale



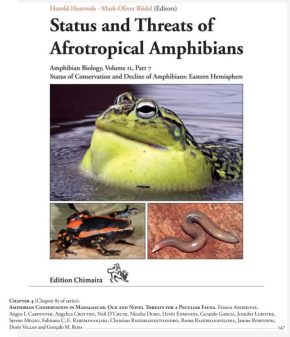






amphibian conservation going forward

window of opportunity



The disconnect of ‘spp : habitat : local people’ being replaced by ex-situ supply to trade removes NTFP value of native forests to local communities.
Resulting in more deforestation??