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SINGLE SPECIES ACTION PLAN

For the conservation of the Obô Giant Snail
Archachatina bicarinata
2021-2025

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IUCN SSC
Mid-Atlantic Islands
Invertebrates Specialist Group

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Compilation and editing

Prepared by Martina Panisi (FCUL/CE3C)
Frazer Sinclair (FFI)
Yodiney Santos (FP)

Reviewed by Ricardo Faustino de Lima (FCUL/CE3C),
Vicky Wilkins (IUCN SSC Mid-Atlantic Island Invertebrates Specialist Group)
David Holyoak (independent researcher on Mollusca)
João d'Alva (São Tomé and Príncipe Forest and Biodiversity Direction Director)

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Revisions

This plan should be fully reviewed and updated every five years. A brief review should be conducted at the end of year 1 (i.e. 2021) to address any major issues or important feedback that may arise following public release.

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Contributors to workshops

Clara Afonso, Ermilinda Afonso, Francisco Alamô (PNOST), Analito Almeida, Aramis Andrade (FP), João Azevedo Silva (FCUL/MARE), Adanasio Bandeira (DFB), Emmanuel Bettencourt (PGA), Silvino Breves, Claudino Cabinda, Arminda Cabral, Jackson Carvalho, Izaina Constantino (DFB), Ester Costa Alegre (OIKOS), Leonardo Costa (Alisei NGO), Nicho Costo, Mady Cunha (AMP), Ricardo da Fonseca (AMP), Rute da Cruz (DFB), Valdimar das Romas, Ineias Dias (Alisei NGO), Jezreel do Céu Lima (AMP), Diogenes dos Santos, Vanderley dos Ramos, Yodiney dos Santos (FP), Ricardo Faustino de Lima (FCUL/CE3C), Gabriela Fernandes (Associação Programa Tatô), Roldeney Fernandes (FP), Silene Fernandes (FP), Brange Fernandes, Marta Garcia Doce (FP), Daniel Gomes, Manuel Gomes, Francisco Gouveia (FP), Hana Heimerdinger (Alisei NGO), João José d'Alva (DFB), Hamilton Lima (DFB/PNP), Peter Lima (FP), Plácida Lopes (DFB/PNP), Yanick Madeiras (FP), Isaac Martins (PNP), Marquinha Martins (BLI), Júlio Mendes (DFB), Amaro Mendes (Associação Programa Tatô), Vaciley Mendes, Katarzyna Mikolajczak (FP), Yanick Modrinos, Aillane Morte, Raphaela Nazaré (Oikos NGO), Wilsa Novais, Gabriel Oquiongo (AMP), Jorge Palmeirim (FCUL/CE3C), Martina Panisi (FCUL/CE3C), Idalécio Pascal, Ayres Pedronho (FP), Francilina Pinto, Roger Pires (BLI), Amcy Pires, Vasco Pissarra (MARE/Alisei NGO), Guilherme Rebelo (FCUL/CE3C), Aurélio Rita (PNOST), Emanuel Rodrigues, Felipe Samba, Filipe Santiago, Frazer Sinclair (FFI), Carlos Tavares (Adapa NGO), Agostinho Tavares, Riosivelt Tavares, Ruggero Tozzo (Alisei NGO), Michaelson Trindade, Esmael Vonge.

Cover photo credits

Upper - Estrela Matilde, Fundação Príncipe.

Lower - Vasco Pissarra for the National Geographic Society/Forest Giants Project.

List of acronyms

ABS – Associação dos Biólogos Santomenses (Santomean Biologists Association)
AGTP – Associação Guias Turísticos do Príncipe
AMP – Associação Monte Pico (Monte Pico Association)
BLI – BirdLife International
GGBC – Gulf of Guinea Biodiversity Centre
CE3C – Center for Ecology, Evolution and Environmental Changes
CEPF – Critical Ecosystem Partnership Fund
CIAT – Center for Agronomic and Technological Research
DCRAN – Regional Direction for Environment and Nature Conservation
DFB – Direção das Florestas e da Biodiversidade (Forests and Biodiversity Direction)
DGA – Direção Geral do Ambiente (Environmental Direction)
DSRFB – Department of Regional Services for Forests and Biodiversity
FCUL – Lisbon University, Faculty of Sciences
FFEM – Fonds Français pour l'Environnement Mondial
FFI – Fauna & Flora International
FP – Fundação Príncipe
IUCN – International Union for Conservation of Nature
MARAPA - Mar, Ambiente e Pesca Artesanal (Sea, Environment and Artisanal Fisheries)
ONP – Obô Natural Parks (includes PNOST & PNP)
PGA – Príncipe Guides Association
PNOST – Parque Natural Obô de São Tomé (São Tomé Obô Natural Park)
PNP – Parque Natural do Obô do Príncipe (Príncipe Obô Natural Park)
PTRS – Plataforma de Turismo Responsável e Sustentável
SPEA – Sociedade Portuguesa para o Estudo das Aves

Executive summary

The Obô Giant Snail *Archachatina bicarinata* is a large terrestrial mollusc that occurs only in the forests of São Tomé and Príncipe Islands in the Gulf of Guinea. It is a culturally significant species with a long history of harvesting for food and use in traditional medicine. It is classified as Vulnerable on the IUCN Red List, but this is based on an assessment from 1996 and re-assessment is long overdue. Once locally abundant, it has experienced a severe ongoing decline in both population and range during the past 30 years. Although much of its current range is protected by the Obô Natural Park designations on both islands, specific protections for the Obô Giant Snail have so far been lacking and conservation action is needed to safeguard the species from further decline and extinction.

This Species Action Plan describes what is currently known about the Obô Giant Snail and establishes a framework for conservation action. The framework and an associated threat assessment were developed through two stakeholder workshops – one on each island – during October 2019. These involved more than 60 participants from public, private, and civil society organisations ensuring that a broad spectrum of views were shared and incorporated. Key threats identified through the workshops include: (1) harvesting by people for food or traditional medicine; (2) spread of the invasive West African Giant Snail (*Archachatina marginata*) resulting in transmission of disease and competition for resources; & (3) loss or degradation of forest habitats through timber extraction and/or conversion to agriculture.

The defined goal of this Action Plan is to **improve knowledge, legal protection, and public engagement in the conservation of the Obô Giant Snail, resulting in no further declines in its ranges and populations**. This will be achieved through undertaking a set of actions that contribute to each of the following objectives: (1) Increase understanding of ecology, population size, genetic diversity, and main threats; (2) Support legal mechanisms to address the main threats and ensure protection; & (3) Improve and implement environmental awareness and public involvement strategies for the protection of the species. An advisory panel of expert stakeholders shall perform an annual evaluation and communicate progress using established indicators for each objective.

1. BIOLOGICAL ASSESSMENT

Taxonomy and identification

The Obô Giant Snail *Archachatina bicarinata* was first described in 1792 by Bruguière as *Achatina bicarinata*, the name being based on the two-keeled body-whorl (last and largest whorl) of its shell. It is now placed in the genus *Archachatina* which was named by Albers in 1850, for which his type species was *Achatina sinistrorsa* L. Pfeiffer, 1848. However, this species name is invalid because it is a junior synonym of that introduced by Bruguière. The epithet *sinistrorsa* was based on the sinistral shell (left-handed coiling), a feature that is uncommon in the genus *Archachatina*.

The Obô Giant Snail belongs to the family Achatinidae Swainson, 1840 (the "agate snails") and can easily be identified by the combination of sinistral coiling and very large shell size, along with the broad blunt apex to the shell, characteristic of the genus *Archachatina*. Adults can be recognised by the thick dark to blackish-purple shell coloration, marked with obscure brown waves with a bluish-white interior of the aperture; it also has six to seven shell whorls and an arched columella (Reeve, 1849). Adult shells can reach up to 15.6 cm in shell length (Panisi, 2017). The sinistral coiling of the shell allows distinction of its juveniles from those of the West African Giant Snail *A. marginata*, the only other coexisting species of giant land snail. Recent DNA sequencing confirm that the two *Archachatina* are distinct separate species (M. Panisi, unpublished data).

Distribution

The Obô Giant Snail occurs on the Islands of São Tomé and Príncipe in the Gulf of Guinea, off the west coast of central Africa. It is restricted to native and secondary forests in the south of Príncipe Island (Fundação Príncipe, 2019), and in the centre and west of São Tomé Island (Panisi, 2017). Although currently treated as endemic to both islands it is likely to have originated on one and then colonised the other, either naturally or – more likely – through anthropogenic dispersal. Based on distribution models, its potential area of occupancy is estimated at around 181 km² in São Tomé and 65 km² in Príncipe (Figure 1).

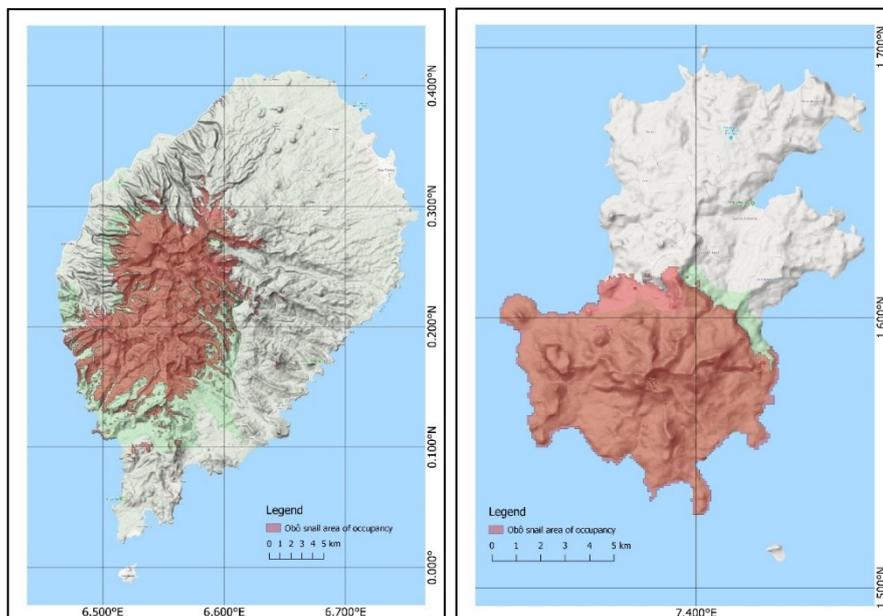


Figure 1. Predicted area of occupancy of the Obô Giant Snail on São Tomé (left), and Príncipe (right), based on areas with a probability of occurrence of 10% or more from distribution models (Panisi 2017 & Fundação Príncipe 2019).

Ecosystem function and habitat requirements

The specific functions of the Obô Giant Snail in the forest ecosystems of São Tomé and Príncipe have yet to be studied, but land snails often fulfil a diversity of ecological roles including: accelerating leaf litter decomposition; influencing the nitrogen and phosphorus contents of the soil; providing a source of calcium to birds and other predators; and contributing to the retention of calcium in the upper soil layer (Astor, 2014). The species is currently mostly restricted to remote patches of native forest but also occurs in some areas of maturing secondary forest. In São Tomé it is associated with higher altitudes and valleys, although in the past it was common at lower altitudes and in plantations (Girard, 1894; Panisi, 2017). It is also associated with the occurrence of native and endemic plant species such as *Drypetes glabra*, *Begonia baccata*, *Sterculia tragacantha* and *Santiria trimera*, preferring substrates with stones and moss, and avoiding bare soil and grasses (Panisi, 2017). In Príncipe, the probability of its occurrence is also correlated with areas of with high rainfall (Fundação Príncipe, 2019).

The Obô Giant Snail is largely absent from man-altered landscapes, and from most areas where the invasive West African Giant Snail *Archachatina marginata* now occurs. Observations in the field indicate predation of juveniles by the São Tomé thrush *Turdus olivaceofuscus*, and in Príncipe (Baillie, 2001) by the Blue-breasted Kingfisher *Halcyon malimbica*.

In São Tomé Island, observations in captivity indicates that the species can feed a wide variety of fruits and leaves it finds on the ground, namely from introduced (e.g. banana *Musa spp.*, avocado *Persea americana*, jackfruit *Artocarpus heterophylla*, taro *Xanthosoma saggitifolium*) and native plant species (e.g. *Begonia baccata*, *Tabernaemontana stenosphon* and *Sterculia tragacantha*).

Survival and productivity

The species seems to be mainly diurnal, an uncommon characteristic for African giant land snails (Panisi 2017). Mating and egg-laying has been observed during the wet seasons (e.g. mating was observed in the field in May and November, egg-laying was observed in captivity during March, April, May, September, October), with hatching occurring both during the wet seasons and at the beginning of the long dry season (e.g. June and November). Eggs have been found in clutches of from 3 to 7, laid on the soil surface or superficially buried. Eggs laid in one clutch in captivity in São Tomé took 40-42 days to hatch. Observations of two individuals at the Lisbon Zoo over a 15 months period during 2018-2020 indicated an average growth in shell length of 0.2 cm per month and an average weight gain of 8.5 g per month (shell lengths measured 7.4 and 8.1 cm at the beginning of observation). The smallest individual observed mating had a shell length of 12 cm.

Cultural and socio-economic importance

The Obô Giant Snail has cultural value for the communities of São Tomé and Príncipe, where it is used for food and traditional medicine. In São Tomé, consumption of the Obô Giant Snail was reported as early as 1894 (Moller 1894). The species is widely known, particularly among older generations in rural communities where many acknowledge its rapid decline (Panisi, 2017; Fundação Príncipe, 2019). In recent decades, this decline in the abundance of the Obô Giant snail has been accompanied by the introduction and increase of the West African Giant Land Snail, which has come to represent an important source of protein for rural inhabitants (Carvalho et al., 2015). However, the Obô Giant snail is the preferred species for consumption as, unlike the West African Giant Land Snail it is also used as medicine (Panisi, 2017).

The decline of the Obô Giant Snail may have initially led to intensified harvesting efforts, because of its higher price in local markets. Nowadays, the species continues to be targeted by local hunters and palm wine-harvesters, and used within the communities or sold in the local markets of the Capital, São Tomé, for ca 15-30 STD per individual (Panisi, unpublished data). In Príncipe, interviewees reported harvesting as one of the primary causes for the species decline (Fundação Príncipe, 2019), and this is supported by the large deposits of collected shells observed by Baillie (2001), and Dallimer & Melo (2010).

Population size and trends

There have been no estimates of population size, but there is evidence of severe ongoing declines on both Islands. In Príncipe, reports from the late 1990's indicate the species was still abundant at this time (Baillie, 2001; Baillie & Stevart, 2000), but by 2007 it was found to be in rapid decline (Dallimer & Melo, 2010), and recent interviews indicated a population decline of >75% and a range reduction of approximately 40% over the past 20 years (Fundação Príncipe, 2019). In São Tomé, its decline was first reported in 1994 by Gascoigne, and recent interviews indicate a notable population decline and a range reduction of approximately 50% over the past 40 years (Panisi, unpublished data).

2. POLICIES AND LEGISLATION

International level

São Tomé e Príncipe is a member state of the United Nations Educational, Scientific and Cultural Organization (UNESCO), and is signatory to the Convention on Biological Diversity (CBD) and the Convention on International Trade in Endangered Species (CITES). The entirety of Príncipe Island has been designated as a UNESCO Man & Biosphere reserve since 2013.

In the IUCN Red List, the Obô Giant Snail is currently categorised as Vulnerable due to a suspected population reduction based on a decline in its extent of occurrence, area of occupancy, quality of habitat, number of locations, potential levels of exploitation, and effects of introduced taxa (A1cde, B1 +2b, Clarke & Naggs, 1996). However, this assessment is almost 25 years old and requires updating to at least Endangered, especially considering the significant additional data obtained in recent years on this species.

National level

Various mechanisms and laws relate to the potential protection of the Obô Giant Snail and its habitat, including the following:

- Environmental law (Law n.10/99) - defines the basic principles of environmental law.
- Law for the conservation of fauna, flora, and protected areas (Law n. 11/99) - provides a framework for species protection.
- Regulation on the process of environmental impact assessment (Decree n. 37/99) - valuable regulation for ensuring habitat protection.
- Forestry law (Law n. 5/01) - regulates the mechanisms for the sustainable management of the forest and its resources.

- The laws creating São Tomé Obô Natural Park (Law n. 6/06), and Príncipe Obô Natural Park (Law n. 7/06) - identifying the boundaries and regulations. These are supported by 5 year Management Plans - most recently for the period 2015-2020 (Albuquerque & Carvalho, 2015) – which include details of zonation and management activities such as enforcement and monitoring.
- Hunting law (Law n. 1/16) - identifying hunting seasons and permitted/prohibited species.

However, these laws often overlook the Obô Giant Snail – for example, the hunting law prohibits the hunting of threatened species but the Obô Giant Snail is not included in the list in Annex VI of the law, despite its globally threatened status. Moreover, despite formal protection for the Obô Natural Park, unauthorized human activities persist inside its boundaries and constitute an ongoing threat to many taxa including the Obô Giant Snail (de Lima et al., 2017).

3 – THREATS

At stakeholder workshops in both Príncipe and São Tomé, participants were presented with a series of potential threats – based on IUCN guidelines and identified from earlier scoping activities – and were asked to vote for up to three that they thought applied to the Obô Giant Snail. Participants also had the option to identify additional threats that they felt were important. The identified threats included:

- **Agriculture** – deforestation for small-holder farming, livestock, and cash-crops (oil palm, coffee, and cocoa) is a serious ongoing threat in and around the protected area buffer zones, particularly in São Tomé. It is however unlikely to extend significantly within the protected areas on either island.
- **Biological resource use** – collecting of the Obô Giant Snail for food and traditional medicine is a serious ongoing threat and is likely to have been at least partly responsible for the decline in populations. Impact is expected to be greatest in accessible areas near to communities, although both opportunistic and focused collecting in remote areas is also likely. Pressure from collection may be decreasing with the decline of the Obô Giant Snail populations, particularly in Príncipe, as the required collection effort is greater than for the more abundant West African Giant Snail.
- **Human intrusions and disturbance** – recreational activities (e.g. tourists using trails within protected areas) are a potential minor threat on Príncipe.
- **Invasive and other problematic species** – Competition with the West African Giant Snail, disease, and predation by invasive mammals are all potentially serious ongoing threats. There is also some circumstantial evidence of snails dying in poor condition, possibly due to a disease potentially transmitted by the West African Giant Snail, that may be responsible for the serious decline in populations.
- **Climate change and severe weather** – climate mediated habitat shifts are a potential future threat that was particularly recognised by stakeholders in Príncipe.

In Príncipe, a disease of unknown cause, collecting, and invasion by the West African Giant Snail were regarded by the workshop participants as the key threats, while in São Tomé the voting highlighted the role of collecting, agriculture, and invasion by the West African Giant Snail, followed in some distance by a disease of unknown cause (Table 1).

Table 1. Number of opinions obtained by each IUCN threat category and individual threat during the stakeholder workshops.

Threat category (following IUCN guidelines)	Threat (following IUCN guidelines)	Votes	
		Príncipe	São Tomé
2. Agriculture & aquaculture	2.1.2. Small-holder farming	1	27
	2.1.3. Agro-industry farming	0	
	2.2.1. Small-holder plantations	1	
	2.2.2. Agro-industry plantations	0	
	2.3.2. Small-holder grazing, ranching, or farming	1	
	2.3.3. Agro-industry grazing, ranching, or farming	0	
5. Biological resource use	5.1.1. Hunting & collecting terrestrial animals - intentional use	14	28
6 Human intrusions & disturbance	6.1. Recreational activities	1	0
8. Invasive & other problematic species, genes & diseases	8.1.1a. Invasive non-native/alien species - West African Giant Snail	13	25
	8.1.1b. Invasive non-native/alien species - Mammals	5	6
	8.2.1. Problematic native species - unspecified	0	4
	8.6. Diseases of unknown cause	16	17
11. Climate change & severe weather	11.1 Habitat shifting & alteration	8	1
	Max (i.e. number of voters)	18	43

At each workshop, participants were divided into three groups and were asked to complete a problem tree for one of the three threats with the most votes (the threats with most votes differed between workshops). The resulting problem trees (Fig. 2a-f) were presented back to the workshop group for feedback and helped guide for the framework for action (section 4).

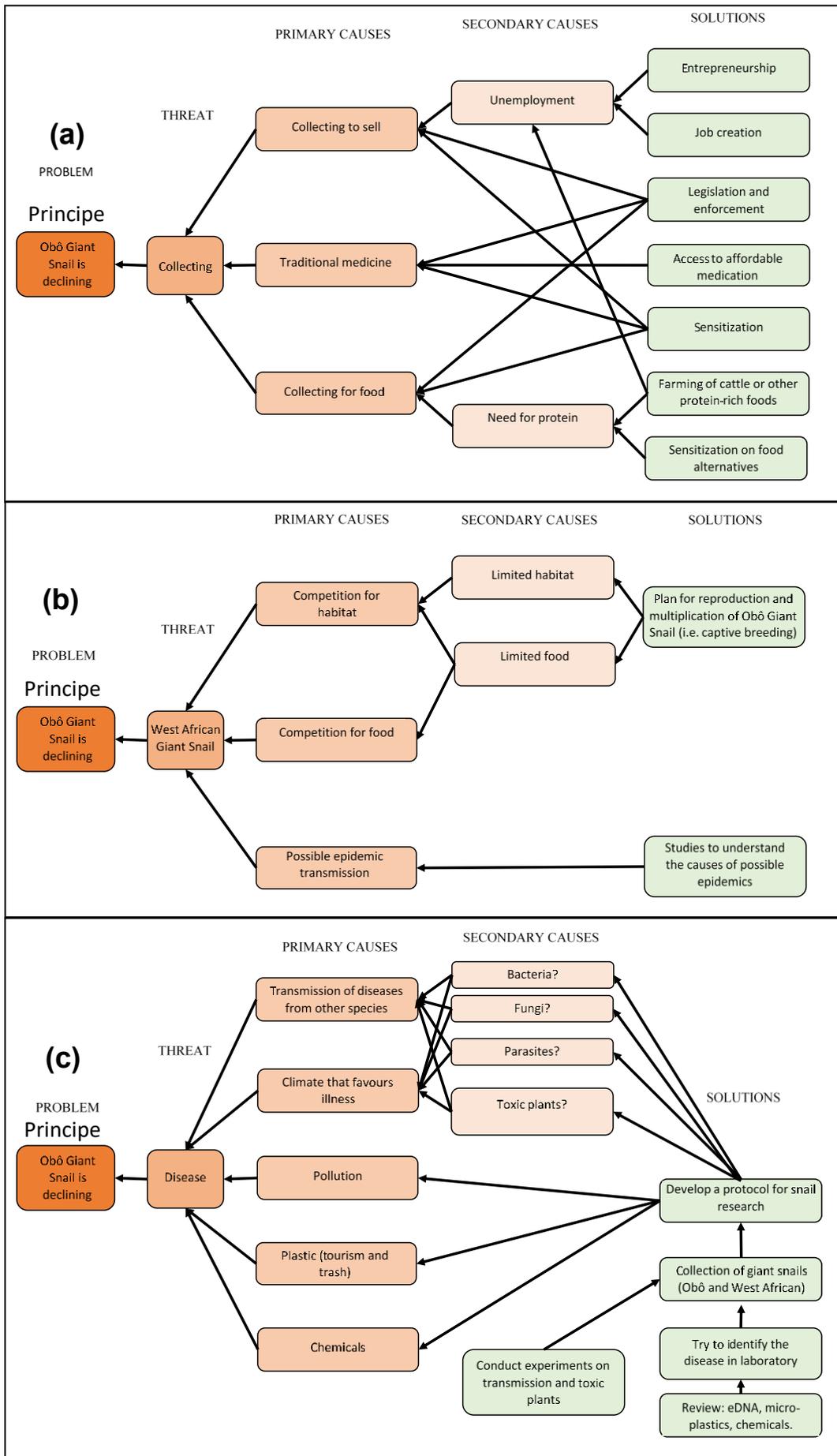


Figure 2a-c. Problem trees for priority threats, as completed by workshop participants in Príncipe).

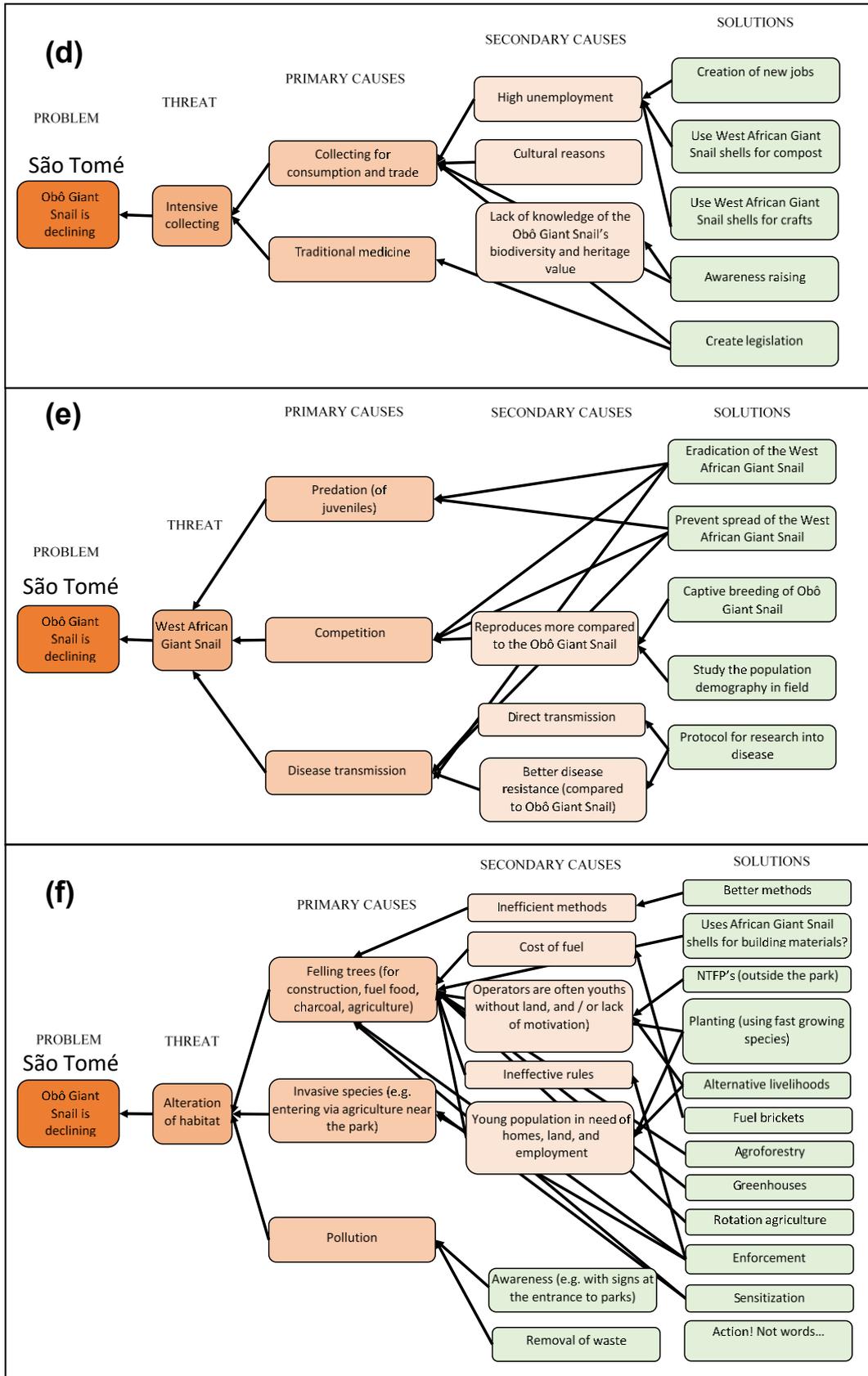


Figure 2 d-f. Problem trees for priority threats, as completed by workshop participants in São Tomé.

4 – FRAMEWORK FOR ACTION

Goal:

To improve knowledge, legal protection, and public engagement in the conservation of the Obô Giant Snail, resulting in no further declines in its ranges and populations.

Objectives and actions:

Three main objectives were pre-identified to align with those of other existing species plans for São Tomé (BirdLife International, 2014a) and Príncipe (BirdLife International, 2014b). During each workshop the participants were separated into three groups based on their expertise, and each worked on a single objective to identify actions* and assign priorities, timescales, responsibilities, and resources. The results are presented below as a framework for action.

*To help focus the exercise, some actions were pre-identified by the coordinators based on their knowledge and experience of the species.

Objective 1: Increase understanding of ecology, population size, genetic diversity, and main threats

Action	Priority Essential > High > Medium > Low			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
1.1 Undertake scientific research							
(a) Competition mechanisms with the West African Giant Snail <i>Archachatina marginata</i>	Essential	Essential	Medium	DFB, CIAT, FCUL, Alisei NGO, PNOT, FP, BLI, AMP, other universities, local guides	DCRAN, FP, Universities FFI, Alisei NGO	Immediate / ongoing 2020-25	Human resources for fieldwork; Equipment (field and technical); Training
(b) Mortality from diseases or parasites	Essential	High	Essential				
(c) Origin of the native population	Essential	Medium	Essential				

Action	Priority Essential > High > Medium > Low			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
(d) Population age structure	High	High	Medium				
(e) Predation by non-native mammals (wild pigs, rats, cats, dogs, genets, monkeys)	High	Medium	High				
(f) Use by humans e.g. collection rates, commodity chain	Medium	Medium	-				
(g) Effects of habitat change	Medium	Medium	-				
1.2 Ex-situ conservation							
(a) Establish and maintain long-term ex-situ conservation centres	Essential	Essential	Essential	Alisei NGO, Lisbon Zoo, FCUL, PPOST, FP, BLI, AMP, other universities, local guides, local communities, schools/ professors	PNP, FP, FFI, DGA, Biosfere Reserve, BLI, Alisei NGO, Universities, Lisbon Zoo, AGTP, local communities, schools/ professors	Immediate / ongoing 2020-25	Bigger space with better environmental conditions; Equipment; Maintenance; Human resources; Knowledge
(b) Study optimal conditions for survival, growth and reproduction	High	High	High				
(c) Study competition and predation by the West African Giant Snail and geoplanids	High	High	Medium				
(d) Study medicinal effects and benefits	High	High	-				
(e) Study diet and habitat preferences	High	Medium	High				

Action	Priority Essential > High > Medium > Low			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
1.3 Undertake monitoring of the species:							
(a) Sample in the most inaccessible and under-represented areas	Essential	Essential	High	DFB, DGA, BLI, SPEA, Alisei NGO, PNOST, FP, DFB, AMP, FCUL, GGBC, other universities, local guides, local communities,	PNP, FP	Immediate / ongoing 2020-25	Human resources; Transportation; Equipment
(b) Implement a transect based monitoring at least once a year	Essential	High	Essential				
(c) Collect sick individuals	Essential	High	Essential				
(d) Develop centralized database of records	Essential	-	Essential				
1.4 Update the species Red List status	Essential	Essential	Essential	IUCN MAISG, DGA, FCUL, Alisei NGO, DGA, PNOST, FP, DFB, AMP, BLI, SPEA, GGBC, other universities, local guides, local communities	FFI, FP, IUCN MAISG, FCUL	Immediate 2020	Integrative contributions; Equipment; Knowledge

Action	Priority Essential > High > Medium > Low			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
1.5 Undertake monitoring of deforestation activities in the areas where the species occurs	High	Medium	High	DFB, DGA, BLI, SPEA, PNOST, DFB, DGA, Alisei NGO, FP, AMP, FCUL, GGBC, other universities, local guides, local communities	DSRFB, PNP, BLI, SPEA, FFI, FP, Universities	Immediate / ongoing 2020-25	Human resources; Equipment; Vigilance; Strong enforcement

Indicators:

- 1.a. Number of completed scientific studies or publications featuring the Obô Giant Snail
- 1.b. Number of (i) ex-situ conservation centres and (ii) number of snails within centres
- 1.c. Number of completed monitoring rounds (target = at least once per year on each island)
- 1.d. Extent of change in population sizes and/or extent of occurrence (target = no decrease)
- 1.e. Updated IUCN Red List status (target = update during 2020 and at least every 5 years thereafter)
- 1.f. Extent of deforestation of native & mature secondary forest habitats (target = no deforestation)

Objective 2: Support legal mechanisms to address the main threats and ensure protection

Action	Priority			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
2.1 Enforce prevention of deforestation and degradation inside the ONP	Essential	Essential	Essential	DFB, PNOST, PTRS, AMP, DGA, communities, local guides, National assembly	DSRFB, PNP, DGA, Biosphere reserve	Immediate	Laws; Governance; Financial, material, and human resources
2.2 Monitor access to the ONP	Essential	Essential	Essential	DFB, PNOST, BLI, DGA, communities, local guides, PTRS	PNP, Biosphere reserve, BLI, AGTP	Immediate / Ongoing	Support of conservation projects, organizations, government and community associations; Human resources; Presence of structures at the entrances of PNO
2.3 Revise / strengthen existing regulations to explicitly include the Obô Giant Snail (e.g. CITES)	Essential	Essential	High	DGA, DFB National assembly	PNP, DCRAN, FP, DGA, Biosphere reserve, Governo Regional do Príncipe	Immediate 2020-22	Governance; Assembly; Financial resources
2.4 Enforce regulations relating to harvesting and trade / transportation	Essential	Essential	High	DGA, DFB	PNP, DCRAN, DGA	Immediate 2020-22	Country structure (airport controls)

Action	Priority			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
2.5 Include areas of known Obô Giant Snail habitat in core zone(s) of the ONP in updated management plans	Essential	High	Essential	DFB, BLI	PNP, DCRAN, DGA, BLI	Ongoing	Technical and financial support by ongoing conservation projects and organizations
2.6 Implement ONP patrols by eco-guards	Medium	Medium	Medium	DFB, PTRS, AMP	DSRFB		
2.7 Develop plan(s) to prevent the spread of West African Giant Snail inside the limits of the ONP	Low	Low	Low				

Indicators:

- 2.a. Number of (i) law enforcement personnel & (ii) law enforcement patrols deployed within ONP
- 2.b. Number of operational ONP entrance posts
- 2.c. Number of registered ONP visitors
- 2.d. Number of regulations that explicitly feature the Obô Giant Snail
- 2.e. Number of collection/trade infractions documented
- 2.f. Extent of Obô Giant Snail habitat included within core zone(s) of ONP
- 2.g. Number of (i) eco-guards & (ii) eco-guard patrols deployed within ONP
- 2.h. Number of formalised plans that address spread of West African Giant Snail within the ONP

Objective 3: Improve and implement environmental awareness and public involvement strategies for the protection of the species

.Action	Priority			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
3.1 Implement environmental education focusing on the Obô Giant Snail							
(a) Harvesters and sellers (including restaurants)	Essential	Essential	Essential	NGOs, DFB, FCUL, DGA, schools & teachers	FP, Biosphere reserve, Oikos NGO and other NGOs	Immediate	Didactic materials and contents; Human, financial, & transport resources; Protocols for the actions
(b) Traditional doctors	Essential	Essential	Medium				
(c) Schools (students and teachers as part of the school curriculum)	Essential	High	Essential				
(d) Local communities	Essential	Medium	Essential				
(e) Decision makers (Government, NGOs, tourism operators, community leaders)	High	High	High				
(f) Snail buyers	High	High	-				
(g) Guides and eco-guides	High	Medium	High				
(h) University students	High	Medium	High				
(i) Tourists	High	Low	High				

.Action	Priority			Responsible organizations (leading organizations are in bold)		Timescale	Resources needed
	Overall	São Tomé	Príncipe	São Tomé	Príncipe		
3.2 Develop alternatives to harvesting of the species				DFB, NGOs DGA, local communities	FP, Biosphere reserve , Oikos NGO, local communities, other NGOs	Immediate / medium term	Studies that identify alternative sources of income and medicine
(a) Alternative sources of financial income	Essential	Medium	Essential				
(b) Alternative sources of medicine	High	High	Medium				
(c) Alternative sources of food	Medium	Low	Medium				
3.3 Engage national and international public in species conservation centre(s)	Medium	Medium	-	Alisei NGO, Other NGOs , DGA, DFB, Universities, Lisbon Zoo	NGOs	Ongoing	Training of local guides; Funding for Santomeans to visit the centre(s)

Indicators:

- 3.a. Number of relevant environmental education (i) campaigns, (ii) events, and (iii) participants
- 3.b. Number of (i) activities (e.g. presentations or workshops) and (ii) enterprises specifically aimed at developing or promoting alternatives to Obô Giant Snail harvesting
- 3.c. Number of visitors to Obô Giant Snail conservation centres
- 3.d. Number of articles / media posts that feature the Obô Giant Snail

Advisory Panel

To promote the effectiveness of this Action Plan, an advisory panel of interested scientists and stakeholders has been established to evaluate and communicate progress at least once a year, and to coordinate the review and update of the Plan every five years. The members of the panel are identified below.

Member	Institution	Contact
Frazer Sinclair	FFI/FP	frazer_sinclair@yahoo.co.uk
Martina Panisi	FCUL/CE3C	martinapanisi@gmail.com
Yodiney dos Santos	FP	yodi.santos@fundacaoprincipe.org
Tania Bird	FFI/FP	tania.bird@fauna-flora.org
Ricardo de Lima	FCUL/CE3C	rfaustinol@gmail.com
Arlindo Carvalho	DGA	arlindode.carvalho54@gmail.com
Lourenço de Jesus	DGA	lmonteirodejesus@gmail.com
João d'Alva	DFB	jjcm.alva@gmail.com
Ruggero Tozzo	Alisei ONG	aliseistp@gmail.com
Vasco Pissarra	Alisei ONG	vasco.pissarra@gmail.com
Hugo Sampaio	SPEA	hugo.sampaio@spea.pt
Conceição Neves	BLI	conceicao.neves@birdlife.org
Mariana Carvalho	CEPF Regional Implementation Team	Mariana.Carvalho@birdlife.org

References

- Albuquerque, C., & Carvalho, A. (2015). *Plano de Manejo 2015/2020 do Parque Natural do Príncipe*. RAPAC, ECOFAC V, São Tomé, São Tomé e Príncipe.
- Astor, Tina (2014). What do snails do in ecosystems? Swedish University of Agricultural Sciences [Doctoral thesis].
- Baillie, J. (2001). One month in the forest of Príncipe. Gulf of Guinea Conservation Group.
- Baillie, J., & Stevart, T. (2000). Exploration du Pico de Príncipe. *Canopee*, 16.
- BirdLife International. (2014a). International Action Plan for conservation of Critically Endangered birds on São Tomé.
- BirdLife International. (2014b). Single Species Action Plan for the Conservation of the Príncipe Thrush *Turdus xanthorhynchus* 2014-2018. BirdLife International, Cambridge.
- Bruguière, J. G. (1792). *Bulimus bicarinatus*. Encyclopédie méthodique ou par ordre de matières. Histoire naturelle des vers, (1789-1792), 1, no. 102 (359).
- Carvalho, M., Rego, F., Palmeirim, J. M., & Fa, J. E. (2015). Wild meat consumption on São Tomé Island, West Africa: implications for conservation and local livelihoods. *Ecology and Society*, 20(3).
- Clarke, D., & Naggs, F. (1996). *Archachatina bicarinata*, *The IUCN Red List of Threatened Species*. <https://doi.org/10.2305/IUCN.UK.1996.RLTS.T2039A9194771.en>
- Dallimer, M., & Melo, M. (2010). Rapid decline of the endemic giant land snail *Archachatina bicarinata* on the island of Príncipe, Gulf of Guinea. *Oryx*, 44(2), 213–218.
- Fundação Príncipe. (2019). Understanding the Remarkable Biodiversity of Príncipe Island – Scientific Report. [URL](#)
- Gascoigne, A. (1994). The dispersal of terrestrial gastropod species in the Gulf of Guinea. *Journal of Conchology*, 35, 1-7.
- Girard, A. (1893). Revision de la faune malacologique des iles St. Thomé et du Prince. *Jornal de Sciencias mathematicas physicas e naturaes*, 3.
- de Lima R.F., Sampaio H., Dunn J.C., Cabinda G., Fonseca R., Oquiongo G., Oquiongo J., Samba S., Santana A., Soares E., Viegas L. (2017). Distribution and habitat associations of the critically endangered bird species of São Tomé Island (Gulf of Guinea). *Bird Conservation International*, 1, 15.
- Moller, A. (1894). *Achatina bicarinata*. *Annaes de Sciencias Naturaes*, 1 (4), 203.
- Panisi, M. (2017). Biological invasion and the conservation of endemic island species: São Tomé Archachatina giant land snails (Pulmonata: Achatinidade). Universidade de Lisboa [Master thesis].
- Reeve, L. (1849). *Conchologia Iconica or, Illustrations of the Shells of Molluscous Animals*. Volume 5. Reeve Brothers.