The South West Madagascar Tortoise Survey Project

End of Phase 2 Preliminary Report to Donors and Supporters

The species documented within this report have suffered considerably at the hands of commercial reptile collectors in recent years. Due to the sensitive nature of some information detailing the precise locations of populations of tortoises contained within this report, the author asks that any public dissemination, of the locations of these rare animals be done with discretion.

Cover photo: *Pyxis arachnoides arachnoides*; all photographs by Ryan Walker and Brain Horne

Summary

- This summary report documents phase two of the South West Madagascar Tortoise Survey Project (formally the Madagascar Spider Tortoise Conservation and Science Project). The project has redirected focus during this second phase, to concentrate research and survey effort for both of southern Madagascar's threatened tortoise species; *Pyxis arachnoides* and *Astrocheys radiata*.

- The aims and objectives of this three phase project, were developed during the 2008 Madagascar Tortoise and Freshwater Turtle IUCN/SSC Red Listing and Conservation Planning Meeting held in Antananarivo, Madagascar.

- This project now has five research objectives:

    - Establish the population density and current range of the remaining populations of *P. arachnoides* and radiated tortoise *A. radiata*.

    - Assess the response of the spider tortoises to anthropogenic habitat disturbance and alteration.

    - Assess the extent of global internet based trade in Madagascar's four endemic, Critically Endangered tortoise species.

    - Assess the poaching pressure placed on radiated tortoises for the local tortoise meat trade.

    - Carry out genetic analysis on the three subspecies of spider tortoise and confirm that they are indeed three subspecies and at what geographical point one sub species population changes into another.

- The field work undertaken during this second phase was undertaken by a team of British, American and Malagasy researchers from a number of conservation and research institutions.

- This second phase concentrated effort in surveying the current range of the common spider tortoise sub species; *P. a. arachnoides*. Results show that populations are extinct within the vicinity of Toliara, however there are reasonably healthy and intact populations between the Onilahy and Linta Rivers.

- Results suggest that there is a zone of intergradation in the Linta River region whereby *P. a. arachnoides* and *P. a. oblonga* mix within a transitional zone, similar to the intergradation discovered between *P. a. brygooi* and *P. a. arachnoides* during phase one of the project towards the north of the species range. This intergradation has prompted a genetics study whereby ~300

blood samples were collected across *P. arachnoides'* range encompassing individuals from all three subspecies, plus the two populations of intergrades between these sub species, undertaken during this second phase.

- This second phase of the project undertook a comprehensive population and poaching pressure assessment of the remaining populations of radiated tortoises *A. radiata*, in the coastal zone between Toliara and Cap Sainte Marie Special Reserve. Results suggested the northern extremities of the species' range now only spreads as far north as Tsimanampetsotsa National Park region. Tortoises occurred in greatest numbers within and around the Cap Sainte Marie region. Evidence of poaching pressure was greatest between the Linta and Menarandra Rivers.

- The third year of this projects' capture recapture study to investigate the effects of habitat disturbance to a population of *P. arachnoides,* revealed a year on year decline (2003, 2009 and 2010).

- During this second phase of the project, a Madagascar tortoise internet trade monitoring program was set up, leading to the reporting of two suspicious trade activities of these CITES Appendix I species to the relevant national wildlife trade enforcement authorities.

- Phase two of the project supported and facilitated the fieldwork of a herpetology PhD student from the University of Antananarivo, undertaking studies into the biogeography of *A. radiata*.

- Results documenting phase one of this project to date comprise five manuscripts submitted to peer review journals. Results of the range wide population assessment of *P. a. brygooi* were presented at the 7th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles (August 2009). Further to this results gained exposure through a number of media outlets.

- The project continues to work alongside WWF Madagascar and the Turtle Survival Alliance through the provision of results to these NGOs, with the aim of formulating sound conservation management initiatives for the long term survival of these threatened species.

- Phase two of this project stayed within its £11,070 ($16,900) budget.

- Phase one and two of this project comprise what is the most comprehensive assessment to date into the conservation status of *P. arachnoides* and *A. radiata*.

Contents

Introduction

This three phased project has developed from the Madagascar Spider Tortoise Conservation and Science Project into the South West Madagascar Tortoise Survey Project (SWMTSP). It was felt there was a need to redirect focus to include research into the current status of southern Madagascar's second Critically Endangered tortoise species; the radiated tortoise (*Astrochelys radiata*), as well as the spider tortoise (*Pyxis arachnoides*).

Both of these endemic species inhabit a restricted range within the coastal dry spiny forests of southern Madagascar, with *P. arachnoides* divided into three subspecies (*P. a. brygooi, P. a. arachnoides and P. a. oblonga*) (Fig. 1). Very little is known about the biology and ecology and current conservation status of both species, in particular *P. arachnoides,* however they are thought to be facing threats to their long term survival from a number of sources. The three major conservation issues facing these species are thought to be; (i) range contraction and fragmentation (Pedrono, 2008) as a result of (ii) habitat destruction and conversion of land to support subsistence agriculture and charcoal production (Walker, 2009) and (iii) illegal poaching to supply tortoises to support the exotic pet trade (Walker et al., 2004) in the case of *P. arachnoides* and as food to support the local tortoise meat market, in the case of *A. radiata*. To date, no data exists on the population density and exact distribution of *P. arachnoides* across its range, or indeed, many aspects of the species' conservation biology. Current data on *P. arachnoides'* range is based on dated reports (Bour, 1981; Durrell, et al, 1989), who use habitat distribution as a precursor for the expected distribution of the species without any detailed ground truthing of resident populations of the species.

The Southern Dry forests are thought to be Madagascar's most threatened ecosystems, with contraction in forest cover currently recorded at 1.2% per year^{-1}(Harper et al., 2007), however the effects of habitat disturbance on *P. arachnoides* has never been quantified. This species has been known to be used in the exotic pet trade for many years (Walker et al., 2004, Pedrono, 2008) but the numbers of animals reaching the trade and the subsequent pressure put on wild populations has never been fully established or monitored over a period of time. In addition to this, great pressure is placed upon *A. radiata* by collectors harvesting the species for the local tortoise meat trade. Finally, as a result of last year's field work it became apparent that there is some confusion over the exact geographical boundaries between the three subspecies of *P. arachnoides*, with zones of intergradation and mixing of the northern and mid range subspecies; *P. a. brygooi* and *P. a. arachnoides* evident.

This uncertainty of the population and conservation status has made it very difficult to accurately quantify the threats to both species and act accordingly with appropriate conservation and management plans.

The aim of this three year project is fivefold:

1. To establish the population density and current range of the remaining populations of spider tortoise and radiated tortoise.

2. To assess the response of the spider tortoises to anthropogenic habitat disturbance and alteration.

3. To assess the extent of global internet based trade in spider tortoises, radiated tortoises and Madagascar's two other Critically Endangered tortoise species within the global pet trade.

4. To assess the poaching pressure placed on radiated tortoises across their range to support the local tortoise meat trade.

5. Carry out genetic analysis on the three subspecies of spider tortoise and confirm that they are indeed three subspecies and at what geographical point one sub species population changes into another.

The outcomes of this project will provide a detailed quantitative data set for what is considered to be the three greatest threats to the long term survival of these two threatened species. This will allow the current conservation status of this species to be established. This data will then allow in-country conservation agencies to formulate targeted management and conservation strategies for the species.

It was also felt that it was important to include a capacity building element into this project, therefore the project has, and continues to, facilitate and support the field work of local post graduate students from the University of Antananarivo. This second phase of field work was completed in March 2010.

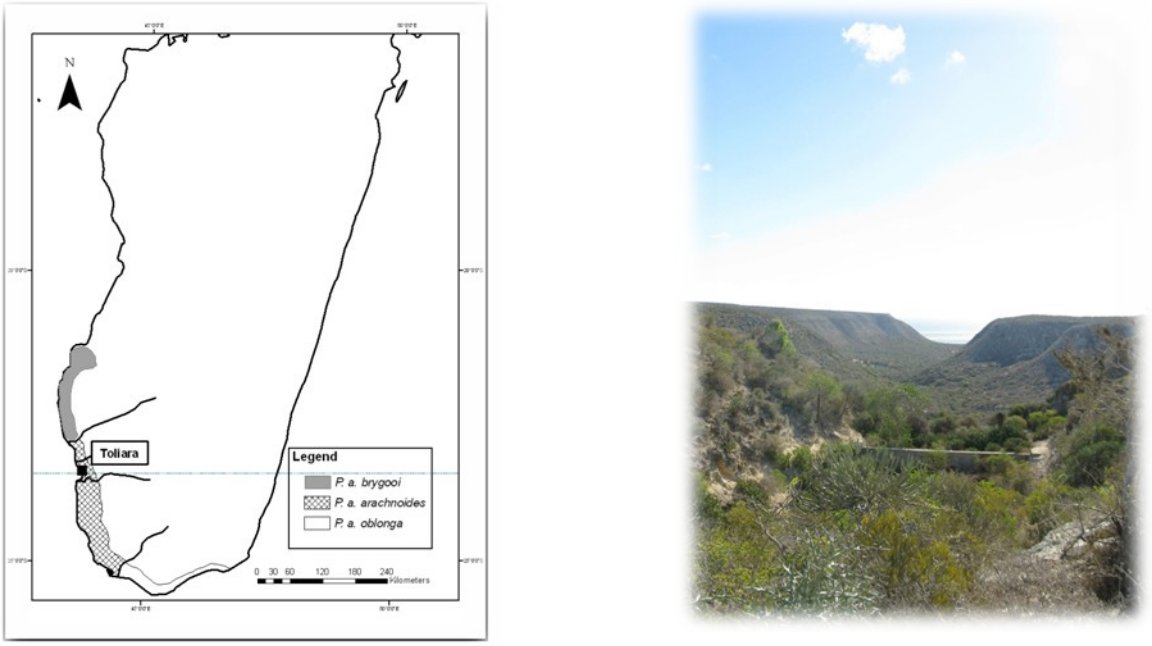


Figure 1: Distribution of *P. arachnoides* based on data reported by Durrell et al, (1989); Endemic Didieraccae dominated dry forest from the Cap Saint Marie region of SW west Madagascar; habitat favoured by *Pyxis arachnoides.*

Project personnel

Phase two of this project comprised of team members from a number of institutions from The United Kingdom, The United States and Madagascar:

Name	Affiliation

Ryan Walker	• Blue Ventures Conservation • IUCN/SSC Tortoise and Freshwater Turtles Specialist Group • Nautilus Ecology • The Open University • The Turtle Survival Alliance
Tsilavo Rafeliarisoa	• IUCN/SSC Tortoise and Freshwater Turtles Specialist Group • Departement de Biologie Animale, Universite´ d'Antananarivo • Henry Doorly Zoo Madagascar Biodiversity and Biogeography Project
Richard Razatimanatsoa	• Madagascar National Parks
Brian Horne	• San Diego Zoo Institute for Conservation Research • IUCN/SSC Tortoise and Freshwater Turtles Specialist Group • The Turtle Survival Alliance
Mike Cummings	• Darwin Ecology
Juln Bruchard	
Mourice Rodrigues	

Figure 2 L-R: The team during the *Pyxis arachnoides arachnoides* range wide survey, Anakoa region. Mike Cummings holding a juvenile *Pyxis arachnoides brygooi*, Lomboara region. The team during the capture recapture study, Anakoa region.



Figure 2 L-R: collecting morphometric data from tortoises during the range wide survey, Cap Sainte Marie Special Reserve region. Brian Horne, Richard Razatimanatsoa and Tsilarvo Rafeliarisoa at Cap Sainte Marie. Ryan Walker and Tsilarvo Rafeliarisoa undertaking population density studies using Distance Sampling, Cap Sainte Marie.

Preliminary results from phase two (2010)

Range wide distribution survey of *Pyxis arachnoides arachnoides*

Introduction

During phase two of this project a Distance Sampling methodology was undertaken with additional incorporation of timed searches in investigate the range and population size of the mid range sub species *P. a. arachnoides* (Fig. 4(a). This sub-species is thought to inhabit the narrow coastal strip of forest between the Manombo River and the Menarandra River (Pedrono, 2008).

Results

(a) (b)

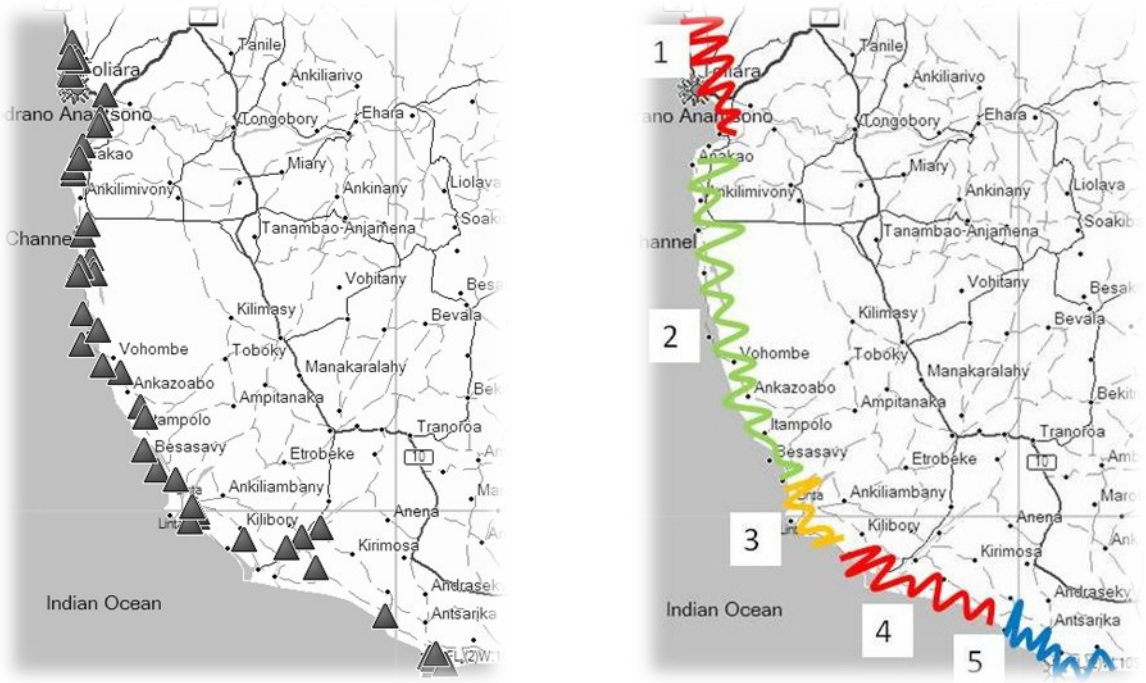


Figure 4. (a); location of the 50 1km distance sampling transect and timed search sites between the Fiherenana River north of Toliara to Cap Sainte Marie Special Reserve. (b); results of *P. a. arachnoides* distribution and range survey.

- Results suggest that *P. a. arachnoides* is likely to be extinct between the Onilahy River and the Fiherenana Rivers, probably due to habitat removal to the north and east of Toliara and ease of collection for poachers from Toliara to the south (Fig. 4(b)-1).

- A reasonably un-fragmented population of *P. a. arachnoides* still inhabits the coastal dry forests south of the Onilahy River, within the narrow coastal strip west of the Mahafaly Plateau (Fig. 4 (b)-2) to the Linta River.

- A zone of intergradation was recorded south of the Linta River, stretching south for approximately 26km of coastline, whereby tortoises could be found displaying morphological characteristics consistent with intergradation between *P. a. arachnoides* x *P. a. oblonga* (Fig. 1(b)-3).

- The area of approximately 72km of coastline south of Ampalaza, through the Marolinta and Menarandra regions appears to be devoid of spider tortoises (Fig. 4(b)-4).

- A small isolated population of southern spider tortoises'; *P. a. oblonga* were discovered approximately 40km north of Cap Sainte Marie.

- A moderate populations of *P. a. oblonga* were recorded at Cap Sainte Marie Special Reserve (Fig. 4(b)-5).

- Spider tortoises are present at moderate levels in both of the regions protected areas; Tsimanampetsotsa National Park and Cap Sainte Marie Special Reserve. However, the protected areas fail to encompass the healthiest population for the region. For example, populations of spider tortoises inhabiting the dunes 5km to the west of Tsimanampetsotsa National Park occur at levels of approximately 2-3 times the densities of those populations within the National Park.

Figure 5. (clockwise) hatchling *P. a. arachnoides* in the hand. Sub adult *P. a. arachnoides*. Camping at Cap Sainte Marie Special Reserve. Juln Bruchard and Tsilavo Rafeliarisoa on top of the Mahafaly Plateau south of Toliara.

Range wide distribution and poaching pressure survey of *Astrochelys radiata*

Introduction

A. radiata is sympatric in much of its range with *P. a. arachnoides*, therefore this study lent itself well to collecting additional data on range and distribution of southern Madagascar's other Critically Endangered species of tortoises. Data on *A. radiata* distribution was collected concurrently during the *P. a. arachnoides* survey, using the same Distance Sampling and timed search methodology as described above. Early on in the field work it became apparent that *A. radiata* is suffering from high levels of poaching in some regions to support the local tortoise meat trade. As a result, additional data were recorded on the numbers of slaughtered tortoise carcases encountered across each transect.

Results

(a) (b)

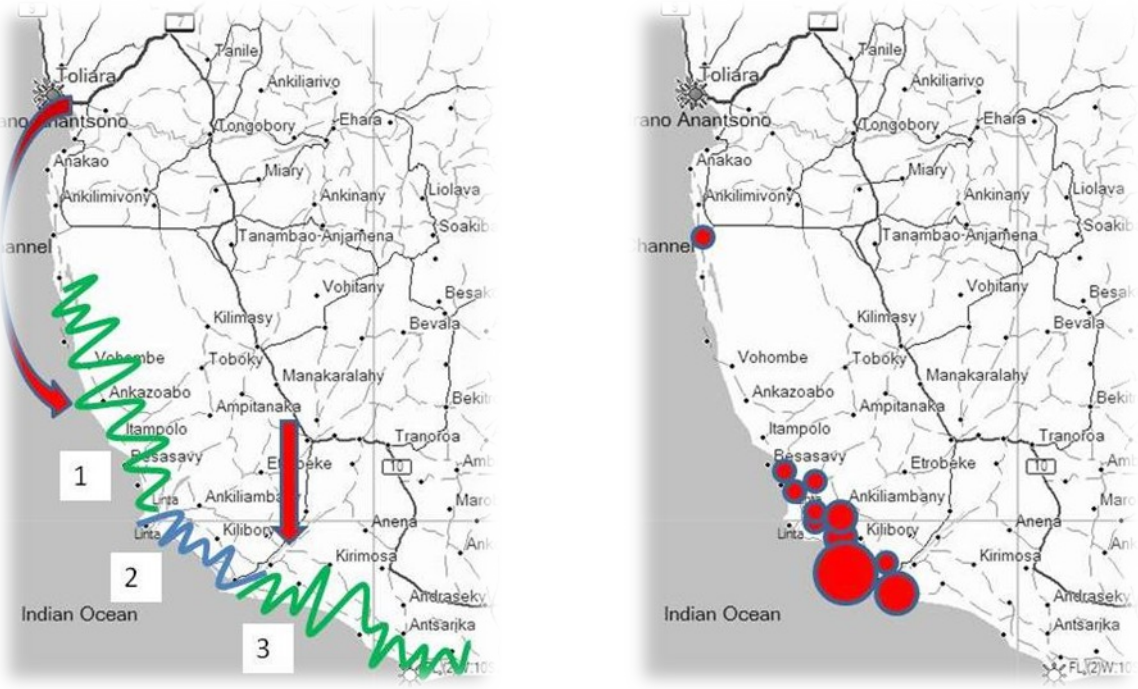


Figure 6. (a) Results of the *A. radiata* distribution survey, plus suspected routes of poachers. (b) A visual representation of the number of poached *A. radiata* carcases encountered upon each transect.

- The most northerly area of occurrence of radiated tortoises appears to be just north of Tsimanampetsotsa National Park. Moderate to high populations can be found south of this region to north of the Linta River (Fig. 6(a)-1).

- The area between the Linta and Menarandra Rivers appears to be suffering from moderate to high levels of poaching with radiated tortoise occurring in lower population densities than the north and south of this region (Fig. 6(a)-2); (Fig. 6(b)) (Fig. 7).

- The highest concentrations of radiated tortoises within our area of surveying now occur in the region south of the Menarandra River to Cap Sainte Marie Special Reserve (Fig. 6(a)-3).

- The survey revealed numbers of between 1-47 slaughtered tortoise carcases per 1km of transect, mostly within the region between the Linta and Menarandra Rivers (Fig. 6(b); Fig. 7).

- Local communities reported poaching pressure around the Itampolo region, whereby poachers would arrive by boat from Toliara. The heaviest levels of poaching occurred in the region between the two rivers (Linta and Menarandra), whereby poachers can gain easy access to the region as a result of the quality of the road from Ampanihy (Fig. 6(a). In both areas, communities report that poaching gangs have resorted to arming themselves and as a result local communities are powerless to stop the poaching. Poaching was reported to increase in the weeks prior to the Christmas and Easter holiday period, as a result of the demand for tortoise meat as a seasonal favourite amongst people living in the large population centres of southern Madagascar.

Figure 7. (Left) carapaces of recently slaughtered and butchered radiated tortoises discarded in the forest within the Itampolo region. (Right) discarded carapace split by a poachers axe within the Itampolo region.

Assessment of anthroprogenic disturbance on populations of *P. arachnoides*

Introduction

This project is undertaking a long term, ongoing capture-recapture survey within a population of spider tortoises *P. a. arachnoides* in the Anakoa region (30km south of Toliara). This area is suffering from moderate habitat alteration as a result of grazing and charcoal production pressure. The study is relating the effects of habitat loss to the tortoise's population dynamics. Habitat loss is assessed using time series, high resolution GIS data, donated through a GeoEye Foundation Grant. The area was originally surveyed for tortoises during 2003, again in 2009 and then this year in 2010.

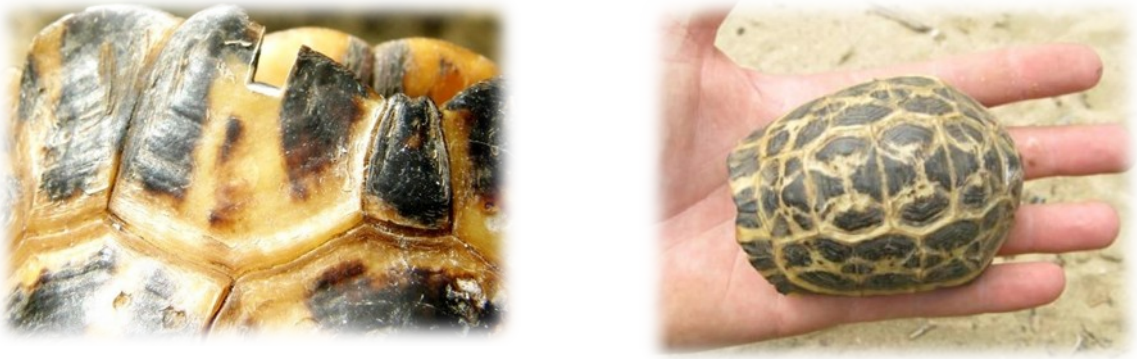


Figure 8. Unique identifying notch code on the marginal scute of *P. a. arachnoides*; a technique described by Cagle (1939): adult *P. a. oblonga* Cap Sainte Marie.

Results

- There has been a steady decline in tortoises recorded during the three field trips in 2003, 2009 and 2010, however detailed analysis using GIS data is yet to have been undertaken.

P. arachnoides genetics study

Introduction

Current published literature suggests that there are three genetically distinct sub species of spider tortoise (Chiari, 2005), with the distinguishing characteristic being the mobile plastron hinge (Bour, 1981). However it was noted that during phase one of this project there appeared to be a zone of intergradation between the south of *P. a. brygooi's* range and the north of *P. a. arachnoides* range.

Results

Figure 9. (Left) Richard Razatimanatsoa holding a juvinle *A. radtata*. (Right) survey vehicle Tsimanampetsotsa National Park.

Results

- A zone of intergradations was recorded south of the Linta River, stretching south for approximately 26km of coastline, whereby tortoises could be found displaying morphological characteristics consistent with intergradation between *P. a. arachnoides* x *P. a. oblonga* (Fig. 1(b)-3).

- Approximately three hundred blood samples were taken from spider tortoises across the whole of the species range, to include *P. a. brygooi, P. a. arachnoides, P. a. oblonga, P. a. brygooi x P. a. arachnoides, P. a. arachnoides x P. a. oblonga*. These samples will be analysed to confirm subspecies grouping for the intergrade individuals and also to establish the range and boundaries of genetically distinct populations within sub species cohorts i.e. conservation management units.

Figure 10. (Left) Tsilavo Rafeliarisoa Richard Razatimanatsoa and Ryan Walker taking blood samples from *P. arachnoides.* (Right) Tsilavo Rafeliarisoa taking blood samples from *P. arachnoides*.

Local counterpart training support

Introduction

During this second phase, the project supported field data collection for one of the team (Tsilavo Rafeliarisoa) who is undertaking a PhD through the University of Antananarivo (Dept of Animal Biology).

Results

- Tsilavo Rafeliarisoa collected approximately 100 *A. radiata* blood samples across the species' range as part of his PhD study into radiated tortoise biogeography and genetics.

- During phase two of the field work a collaborative training exercise between the San Diego Zoo Institute for Conservation Research and the Madagascar Biodiversity and Biogeography Project was undertaken. Brain Horne provided Tsilavo Rafeliarisoa with training in endoscope sexing of Juveniles *A. radiata* and *P. arachnoides*, a method that will aid in data collection for his PhD studies (Fig. 11).

Figure 11. Brain Horne demonstrating endoscopy sexing of a juvenile *A. radiata,* in the field to Tsilavo Rafeliarisoa.

Preliminary results from phase one (2009)

Range wide distribution survey of *Pyxis arachnoides brygooi*

Introduction

Phase one of this project (January-March 2009) undertook a comprehensive survey of the northern spider tortoise sub species; *P. a. brygooi* (Fig. 12 (a)), using a Distance sampling methodology within the range between Toliara and Morombe

Results

- Results showing that the range had become fragmented in to four main areas (Fig. 12 (b).
- Tortoises now inhabited less than 50% of what was thought to be the suspected range (Fig. 12 (b).

(a) (b)

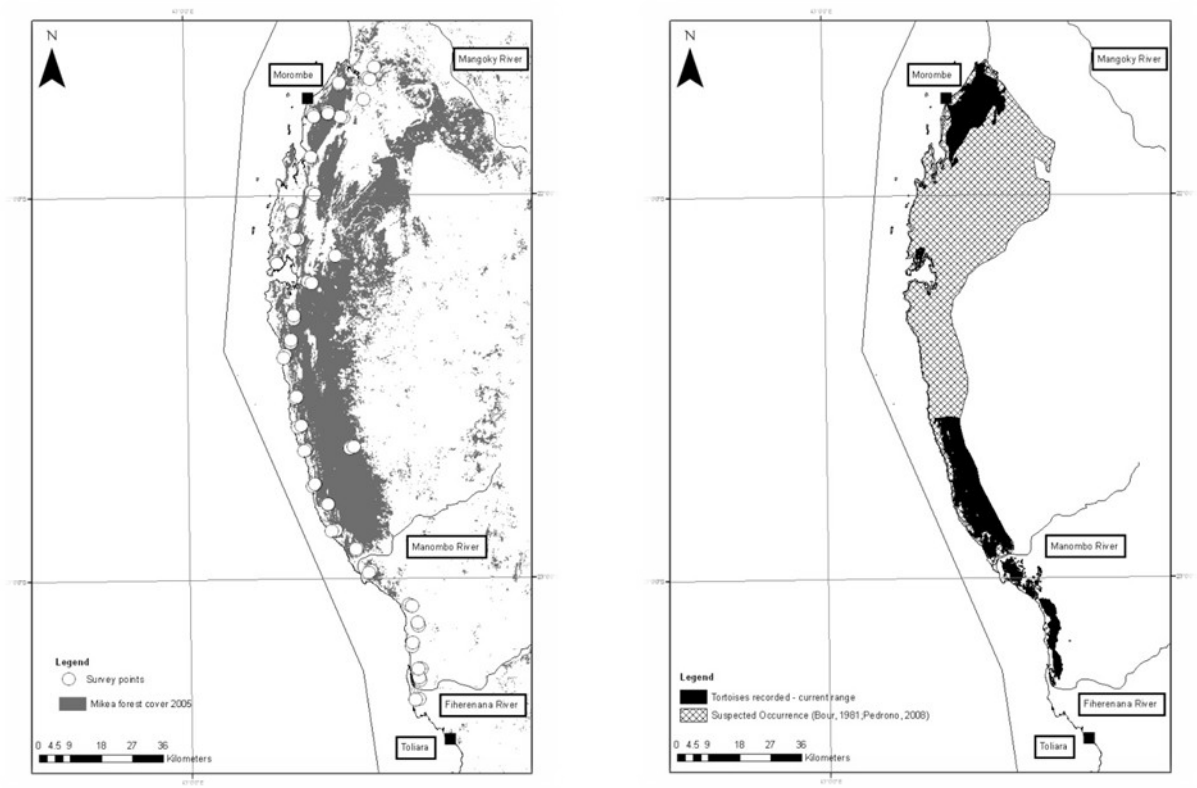


Figure. 12. (a) Current extent of the southern Mikea forest north of Toliara, with 2009 survey points marked. (b) Suspected historical area of occurrence of *P. a. brygooi* (Bour, 1981; Pedrono, 2008) (hatched), with current range data from the phase one 2009 survey (black).

P. arachnoides genetics study

Introduction

Phase one of this study recorded a previously undocumented geographical area of intergradation between the two subspecies; *P. a. brygooi* and *P. a. arachnoides*. The standard Distance sampling method adopted for the population density aspect of this work was applied to establish the range of this zone.

Results

- This geographical area of intergradation between the two subspecies; *P. a. brygooi* and *P. a. arachnoides,* lies between the Manombo and Fiherenana Rivers within southwest Madagascar.
- The population occupies approximately 2,100km^2 of coastal forest habitat within this region (Fig. 13).
- Twenty percent of the population displayed plastral morphological traits consistent with a mixture of *P. a. brygooi* or *P. a. arachnoides*. Tortoises recorded within this region displayed significantly greater amounts of dark carapace pigmentation and variation in plastral kinesis when compared to two control cohorts for each of the subspecies outside of this region (Fig. 14).
- There was no detectable variation in broad scale carapace morphology between the three cohorts.
- It is speculated that secondary intergradation between these two subspecies took place within the last ~12,000 years allowing for intraspecific hybridization. Mixing was thought to have come about as a result of climatic induced change to river flow.

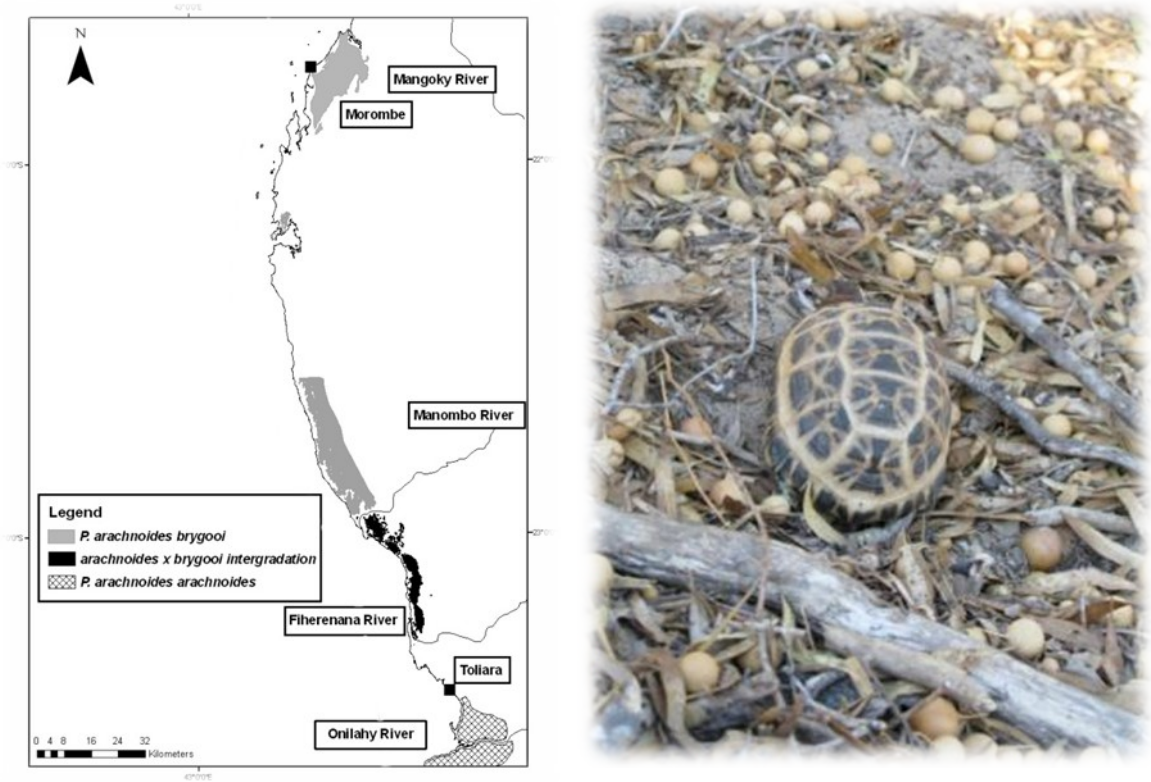


Figure 13. (Left) extent of the northern parts of *Pyxis arachnoides* 's range from the Mangoky River to south of the Onilahy River. The zone of intergadation for *P. a. brygooi* and *P. a. arachnoides* lies between the Fiherenana and Manombo Rivers with the range marked in black. *P. a. brygooi* range data reproduced from Walker (2009b) and Walker in press. Suspected northern parts of *P.a. arachnoides* range reproduced from Pedrono (2008) and Walker et al, (2007). (Right) *P. arachnoides*.

Figure 14. Images showing plastral hindge morphology; (left) *P. a. brygooi* displaying no disernable hindge, (centre) *brygooi x arachnoides* displaying very slightly moveable hinge, (right) *P. a. arachnoides* displaying moveable hindge.

Monitoring of internet based trade in Madagascar's Critically Endangered tortoise species

Introduction

This project has also embarked on an internet based trade study, whereby with the use of key words the internet is monitored for all of Madagascar's four Critically Endangered tortoise species (*P. arachnoides, A. radiata, Pyxis planiclauda* and *Astrochelys yniphora*) offered for sale globally.

Results

- The preliminary results for monitored trade during September 2009 revealed that pet dealers from 10 countries were openly trading these four CITES Appendix I species, with Japanese and North American dealers supporting most of the trade.
- *P. arachnoides* was the most popular species traded.
- Prices were highest in Japan with *A. radiata* selling for up to $28,839.65.
- Establishing the legality of transactions and the exact number of tortoises currently being traded was difficult, with many dealers not stating the exact number of individuals for sale or if animals are accompanied by legal documentation (Fig. 15).
- Evidence of suspicious trade activity is passed on to in-country wildlife trade enforcement agencies as and when it is monitored occurring.

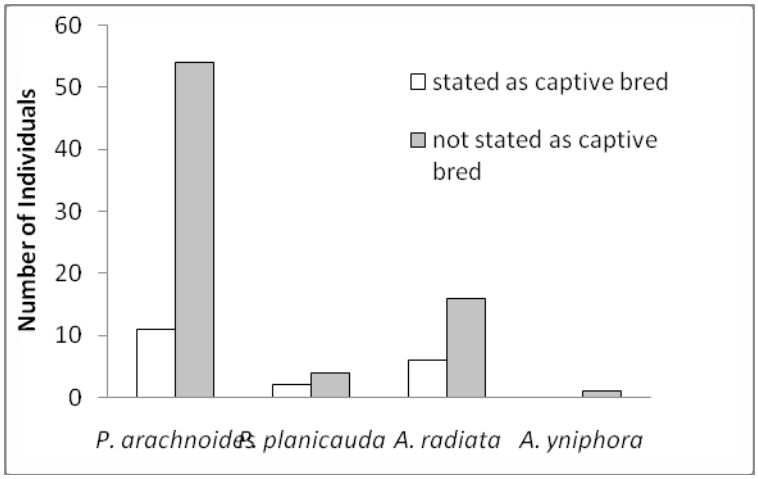


Figure 15. Number of individual tortoises advertised for sale over the internet during September 2009, divided into two groups; (1) individuals advertised as captive bred. (2) Individuals not stated as captive bred.

Local counterpart training support

Introduction

Phase one the project supported Solonombana Vitantsoa a DEA (masters) botany student from the University of Antananarivo (Dept of Plant Biology) in undertaking field based data collection for her thesis.

Results

- Solonombana undertook a study into the botanical micro habitat preferences of *P. arachnoides.*
- Her thesis was completed at the end of 2009 and she has a view to graduating with her DEA in botany in 2010.

Outputs resulting from phase one (2009)

Peer review publications

To date five articles have been submitted to peer review journals reporting data collected during phase one of this project. Articles are as follows:

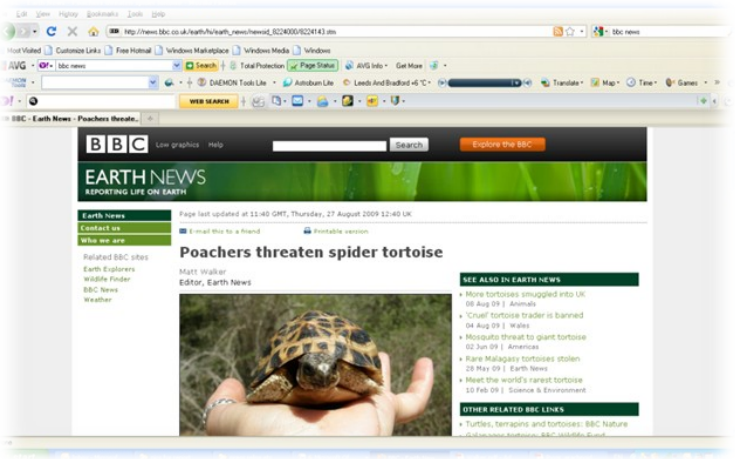
Title	Journal	Stage
• Current global population status of the Critically Endangered northern Madagascar spider tortoise *Pyxis arachnoides brygooi*	Herpetologica	Under peer review
• An analysis of population density and morphology within the region of intergradation between the northern spider tortoise *Pyxis arachnoides brygooi* and the common spider tortoise *P. a. arachnoides*	The Journal of Herpetology	Reviewed and returned for significant revision
• The development of a cost effective method of assessing variation of scute pigmentation in Chelonians	The Herpetological Journal	Reviewed and returned for minor revisions
• The spider tortoise (*Pyxis arachnoides*) - Madagascar's forgotten species?	Testudo	Published (Vol. 7(1). p77-84
• The internet based trade in Madagascar's Critically Endangered tortoise species	Chelonian Conservation and Biology	Under peer review

Other outputs

The results of phase one of this work gained exposure through a number of outlets including the international web based media and newsletters. The results were also used to contribute to online species data bases and disseminated at international symposia.

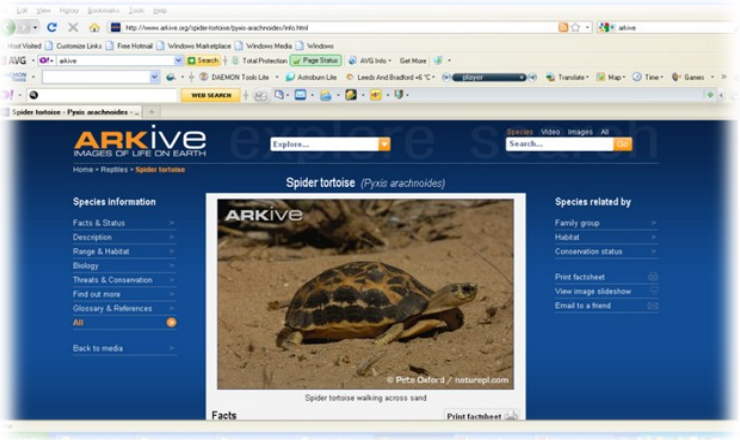
The results of the 2009 field season were documented in an article for the BBC Earth News website which detailed the plight of the spider tortoises and the conservation issues facing the species

http://news.bbc.co.uk/earth/hi/earth_news/newsid_8224000/8224143.stm

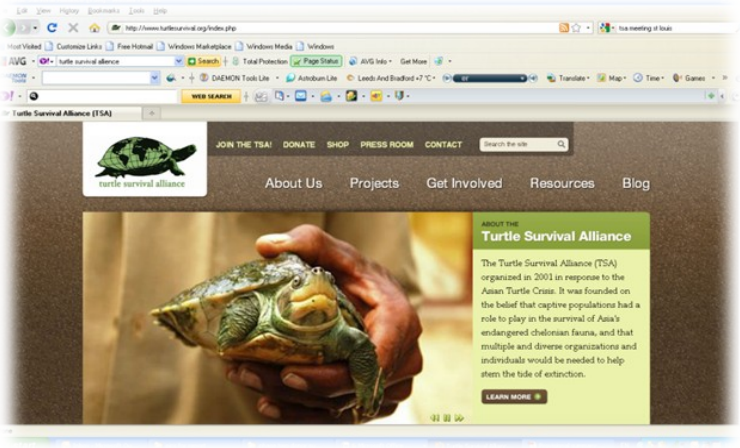


Ryan Walker was invited to review and update the species account for *P. arachnoides* for the online species database arKive.org

http://www.arkive.org/spider-tortoise/pyxis-arachnoides/info.html



Ryan Walker presented the results of the 2009 population and distribution survey for the northern spider tortoise *P. a. brygooi* at; 7th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles, hosted by the Turtle Survival Alliance and held at St Louis, Missouri in July 2009.



An article documenting the work undertaken during phase one of the project was featured as the cover story and published in the annual Turtle Survival Alliance Magazine.

http://www.turtlesurvival.org/blog/1/55

An article was published as part of the TurtleLog series; the online newsletter of the IUCN Tortoise and Freshwater Turtle Specialist Group. The article documented the preliminary results of the *P. a. brygooi* population range survey.

http://www.iucn-tftsg.org/wp-content/uploads/file/TurtleLog/10_3854-tln_002_2009.pdf

TurtleLog:

Preliminary Results of a Population Range and Density Survey for *Pyxis arachnoides brygooi* in Madagascar

Ryan C.J. Walker[1]

Budget and accounting

At the time of receiving the funds, phase two of this project secured £11,065.55 of financial backing (given the exchange rates) from the Turtle Conservation Fund ($5,000.00), The Turtle Survival Alliance ($4,000.00), Royal Geographical Society (£1,500.00), The British Chelonia Group (£1,000.00), The Mohamed bin Zayed Species Conservation Fund ($5,000.00) and the Leicester Tortoise Society (£150.00) (Table. 1). Support in-kind and logistical support was provided by Blue Ventures, Madagascar National

Parks, Nautilus Ecology, Darwin Ecology, Conservation International Madagascar, The GeoEye Foundation and the Madagascar Biodiversity and Biogeography Project and the turtle Survival Alliance (Table 2).

Funding body	**US Dollars**	**Pounds sterling**
EZA Shell Shock Turtle Conservation Fund	$5,000.00	
Turtle Survival Alliance seed funding	$4,000.00	
Leicester Tortoise Society		£150.00
The Mohamed Bin Zayed Species Conservation Fund	$5,000.00	
Royal Geographical Society Fieldwork Grant		£1,500.00
British Chelonia Group Conservation Grant		£1,000.00
Total funds received in USD and UK£	**$16,909.46**	**£11,065.55**[1]

Table 1. Total sums donated by funding bodies to the project

Supporting agency	**Support in kind**
Madagascar National Parks	• Waving of National Park Research fees
Madagascar Biodiversity and Biogeography Project	• Provision of 4x4, driver (one month) • Camping equipment • Blood storage and extraction for genetics study • Genetic analysis of blood samples
Darwin Ecology	• Provision of personnel • Items of field equipment
GeoEye Foundation	• Provision of high resolution GIS imagery
Nautilus Ecology	• Provision of camping equipment
Conservation International	• Provision of LandSat TM derived shapefiles
The Turtle Survival Alliance	• Travel bursary to the 7th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles.

Table 2. Support in kind provided to the project

Expense	**UK Pounds sterling**	**US Dollar**
Field and survey equipment	2,134.00	3,261.00
Equipment repair	1,002.00	1,531.17
Insurance	509.00	777.81
Safety equipment	213.00	325.49
In country travel expenses, fuel, vehicle hire	1,355.00	2,070.60
International travel expenses	1,264.50	1,932.30
Accommodation, camping fees and payments to communities	342.00	522.61
Food	341.00	521.08
Communications	101.00	153.34
Permissions and permits	278.00	424.81
Local staff wages and per diems	903.58	1,380.78
2009 budget deficit	646.74	988.24
GIS software	1,800.00	2,750.61
Total	**10,889.82**	**16,793.18**[2]

[1] Based on exchange rates from US$ to UK£ on the date of the funds being received

[2] Based on exchange rates from UK£ to US$ on 01-05-10.

Table 3. Breakdown of funds allocated to various aspects of phase two of the project.

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