Turtles on the Brink in Madagascar: Proceedings of Two Workshops on the Status, Conservation, and Biology of Malagasy Tortoises and Freshwater Turtles
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Pyxis arachnoides

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Taxonomy:
Kingdom ANIMALIA Phylum CHORDATA
Class REPTILIA Order TESTUDINES
Family TESTUDINIDAE
Scientific Name: *Pyxis arachnoides*
Species Authority: Bell, 1827
Common Name/s:
English – Spider Tortoise
French – Pyxide Arachnoide, Tortue-araignée
Spanish – Tortuga Araña, Tortuga De Plastrón Articulado

Synonym/s:
Bellemys arachnoides (Bell, 1827)
Pyxis aranoides Gray, 1831
Pyxis madagascariensis Lesson, 1831
Testudo arachnoides (Bell, 1827)

Taxonomic Notes:
Three subspecies are recognized:
Pyxis arachnoides arachnoides Bell, 1827
Pyxis arachnoides brygooi (Vuillemin & Domergue, 1972)
Pyxis arachnoides oblonga Gray, 1869

Assessment Information:
Red List Category & Criteria:
Critically Endangered A4cd; E ver 3.1
Year Published: 2008
Date Assessed: 2008-01-15
Assessor/s: Leuteritz, T. & Walker, R. (Madagascar Tortoise and Freshwater Turtle Red List Workshop)
Reviewer/s: Rhodin, A. & Mittermeier, R.A. (IUCN SSC Tortoise & Turtle Freshwater Turtle Red List Authority)

Justification:
Based on habitat loss of this habitat-specific species, it has lost about 40% of suitable habitat in the period 1970-2000; habitat loss is accelerating and exacerbated by progressive fragmentation of remaining habitat, leading to an estimate of over 50% loss of remaining habitat in the next generation if current trends continue. Thus the species appears to meet the criteria for Critically Endangered (CR) under criterion A4c (90% habitat loss in three generations).
In addition, the species has come under increasing direct exploitation for consumption in the past decade, mainly to meet the void created by declining populations of radiated tortoises (a larger and preferred species for consumption. This may amount to meeting the criteria for CR under criterion A4d.
These factors combine to an estimated population reduction of at least 80% over the past two plus one future generation. In parallel, population modeling predicts the species' extinction in 60 to 80 years, thus meeting CR under criterion E. The northern subspecies, *P. a. brygooi*, is under most severe pressures and requires priority conservation action.

History:
1996 – Vulnerable
1994 – Indeterminate (Groombridge 1994)
1990 – Indeterminate (IUCN 1990)
1988 – Indeterminate (IUCN Conservation Monitoring Centre 1988)
1986 – Indeterminate (IUCN Conservation Monitoring Centre 1986)

Geographic Range:
Range Description: The Spider Tortoise is found only in the arid region of the coastal areas of southwestern Madagascar, from the coast up to 10-50 kilometres inland going as far north as Morombe (Glaw and Vences 1994, Henkel and Schmidt 2000). It is sympatric with the Radiated Tortoise except for the northern extent of its range.
Pyxis arachnoides arachnoides: This subspecies occurs in the region of the Onilahy River in southwestern Madagascar near Toliara. Its area of distribution is limited to north of the Manambo River and south of Lake Tsimanapetsotsa. A field survey carried out in 2001 by Behler and Randriamahazo has shown that the area of distribution of the sub-species extends up to north of the Menarandra River (H. Randriamahazo pers. comm.).
Pyxis arachnoides brygooi: This subspecies occurs south of the Mangoky River. Tortoises are commonly found in the region between Morombe and Lake Ihotry (Ernst et al. 2000).
Pyxis arachnoides oblonga: This subspecies (the southern subspecies) is found along the southern coast between the Menarandra River to the west and Lake Anony near Amboasary to the east. The majority of animals have been found between Ambovombe and Lavanono (Glaw and Vences 1994, Ernst et al. 2000).
Participants at the 2001 Conservation Assessment and Management Plan (CAMP) workshop (CBSG 2001) estimated the extent of occurrence as between 5,000 and 20,000 sq. km, and the area of occupancy as less than 500 sq. km.

Countries: Native: Madagascar
Range Map: See Figure.

Population:

The earliest information on populations comes from Bour (1981), who anecdotally stated that *P. arachnoides* was localized but not rare. Raxworthy and Nussbaum (2000) estimate that there were more than ten populations and that the area of distribution could cover more than 2,000 km². Jesu and Schimmenti (1995) who undertook the first quantitative estimate of population density reported approximately three individuals per ha. Walker et al. (2008) report densities of 4.63 and 2.08 tortoises per ha in the wet and dry seasons respectively. Both these studies were on *P. a. arachnoides*. A rough total estimate of 2-3 million animals was recorded by Pedrono (2008).

Hinge mobility of the three subspecies decreases from south to north (Glaw and Vences 1994, Walker et al. 2008):

P. a. oblonga - plastron with black markings on scutes and anterior lobe will close completely to touch carapace (mobile).

P. a. arachnoides - plastron totally devoid of markings and anterior lobe will close partially but not touch carapace (less mobile).

P. a. brygooi - plastron totally devoid of markings but anterior lobe will not close fully to touch carapace (rigid).

Population Trend: Decreasing.

Habitat and Ecology:

The Spider Tortoise is found in Mikea forest habitat in the north and in communities of xerophytic spiny vegetation with low irregular rainfall dominated by Didiereaceae and Ephorbia in the south (Durrell et al. 1989, Walker et al. 2007). Their habitat consists of sandy areas with spiny vegetation close to the coast. They do not tend to utilize rocky areas like *A. radiata* does (T. Leuteritz pers. obs.). Acccording to Walker et al. (2008) P. a. arachnoides was only recorded as feeding during the wet months, a period of increased activity. Tortoises are known to eat young leaves and cow dung with insect larva (Glaw and Vences 1994). Spider Tortoises reach a curved carapace length of up to 200 mm.

Very little is known about the reproduction of this species but it is believed to produce single egg clutches although the number of clutches per year are unknown (Durrell et al. 1989). Reproductive age is thought to be at about 12 years (Walker et al. 2004), and average reproductive age (=generation time) was conservatively estimated at 20 years at the 2008 Red List workshop. No solid data exists on longevity but estimated life span is believed to be up to 70 yrs (Randriamahazo et al. 2007).

Systems: Terrestrial.

Major Threat(s):

Pyxis arachnoides faces threats from habitat destruction and fragmentation (through conversion for agriculture, charcoal prduction, human-induced wildfires, and alien invasive plants). Recent analyses by Conservation International (May, 2007) of the state of the spiny forest biome, using aerial imagery, indicate that deforestation rates have significantly increased over the last five years (compared with the period 1990-2000) (H. Crowley pers. comm.). A loss of 21-50% was estimated to have occurred over the period 1970-2000 (an average annual rate of 1.2% spiny forest loss; Harper et al. 2007), and a further loss of 51-80% of remaining habitat was projected for the period 2002-2012 (CBSG 2001). Invasive plant species affecting habitat suitability were considered a significant threat at the 2001 CAMP workshop (CBSG 2001).

In addition, the species has increasingly become subject to collection for the local food trade as Radiated Tortoise populations have been depleted, and exploitation has recently included harvesting for livers for export to Asia (Behler 2000). A pulse of legal export trade occurred during the period 2000-2004; CITES trade records show that about 4,000 animals were exported for the international pet trade in that time (Walker et al. 2005).

Pyxis arachnoides was recommended to be listed as Endangered (A3acd, B1b) at the 2001 CAMP workshop (CBSG, 2001).

Overall, the northern subspecies *P. a. brygooi* is under more severe habitat loss and exploitation pressures than the other two subspecies, with some *brygooi* subpopulations already extirpated and others declining.

The 2005 Population and Habitat Viability Analysis (PHVA) workshop (Randriamahazo et al. 2007) evaluated different threat and population scenarios, which

variously yielded estimates of about 60 to 80 years of decline into extinction based on harvest rates of 2005. With increasing exploitation and accelerating loss of remaining habitat, this may be a conservative set of estimates.

Conservation Actions:

This species is nationally protected under Malagasy law (Decree 60126; October, 1960). Internationally, the tortoise, since 1975, has been listed in Appendix II of CITES. In 2005 P. arachnoides was uplisted to CITES Appendix I. It is included on Schedule B of EU wildlife regulations, and imports are suspended.

Two protected areas and three additional sites (Lac Tsimanampetsotsa National Park 43,200 ha, Cap Sainte Marie Special Reserve 1,750 ha and Berenty Private Reserve 250 ha, Site of Biological Interest – (1) Hatokaliotsy 21,850 ha and (2) PK3 north of Tulear 12,500 ha) fall within the range of this species (CITES 2005, Randriamahazo et al. 2007). A captive breeding centre (Village de Tortues de Mangily) was established in Ifaty.

Since 1991, the action plan of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group has considered Pyxis arachnoides to be a "species that requires conservation projects and study of its status" (IUCN/SSC/TFTSG 1991, CITES 2005). In August 2005, an international meeting of the Population and Habitat Viability Assessment (PHVA) group produced a report that addressed the conservation status and recommended conservation actions for this species, these included the need to start a national conservation plan (Randriamahazo et al. 2007). Walker et al. (2004, 2007) call for more stringent conservation measures to ensure habitat protection and a widespread, region wide education programme to try and protect *P. a. arachnoides* from food and pet-trade hunting.

Additionally, ensuring adequate coverage of populations of the different Spider Tortoise taxa, particularly the subspecies *brygooi*, is very important as Madagascar expands its Protected Area network.

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