

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Transfer of *Pyxis arachnoides* from Appendix II to Appendix I, in accordance with Resolution Conf. 9.24 (Rev. CoP12), Annex 1, paragraphs B. i), iii) and iv), and C. i).

B. Proponent

Madagascar.

C. Supporting statement

The Madagascar spider tortoise (*Pyxis arachnoides*) is endemic to south-western Madagascar. Its populations have recently been heavily damaged from excessive harvesting. As a result, a workshop on the Conservation Assessment Management Plan (CAMP) organized by IUCN in May 2001 recommended including the spider tortoise in CITES Appendix I and changing the listing of the species from Endangered to Critically Endangered (IUCN/CBSG, 2002). During its meeting of 24 February 2004, the CITES Scientific Authority for Madagascar suggested that the government submit a proposal for transfer of *Pyxis arachnoides* from CITES Appendix II to Appendix I (Durbin, 2004).

According to the IUCN Tortoise and Freshwater Turtle Specialist Group (Behler, 2000c), the Malagasy tortoises are subjected to pressure as never before because of serious degradation of the habitat and harvesting for the international pet trade. Several authors go so far as to compare the situation of the Malagasy chelonians with that of the Asian freshwater turtles (Barzyk, undated).

The harvest of *Pyxis arachnoides* for export has considerably increased since 1998 and has raised concern among scientists and the importing countries that fear overexploitation and extinction of an indigenous species at the local level (ICUN/CBSG, 2002; USFWS, 2001). Renown herpetologists, namely the members of the IUCN Reptiles and Amphibians Specialist Group and the Tortoises and Freshwater Turtles Specialist Group in Madagascar, have requested the transfer of *Pyxis arachnoides* to CITES Appendix I in order to save it from extinction (Hudson, 2000; Behler, 2000a). According to the report of the CAMP workshop, "most of the fragmented population of spider turtles will be extinct during this century if trade is not limited and if the loss of habitat is not stopped" (IUCN/CBSG, 2002). The only other species of the genus *Pyxis*, *P. planicauda*, was included in CITES Appendix I at CoP12 at the proposal of Madagascar because of heavy trade in this species during the past few years.

1. Taxonomy

1.1 Class:

Reptilia

1.2 Order:

Testudines

1.3 Family:

Testudinidae

1.4 Species:

Pyxis arachnoides (Bell, 1827)

Pyxis arachnoides arachnoides (Bell, 1827)

Pyxis arachnoides brygooi (Vullemin and Domergue, 1972)

Pyxis arachnoides oblonga (Gray, 1869)

1.5 Scientific synonyms:

Testudo arachnoides (Loveridge and Williams, 1957)

for *Pyxis arachnoides brygooi*:

Pyxoides brygooi (Vullemin and Domergue, 1972)

for *Pyxis arachnoides oblonga*:
Pyxis oblonga (Gray, 1869)
Pyxis arachnoides matzi (Bour, 1978)

1.6 Common names:

English:	(Common) spider tortoise, Madagascar spider tortoise <i>Pyxis arachnoides arachnoides</i> : Common spider tortoise <i>Pyxis arachnoides brygooi</i> : Northern spider tortoise <i>Pyxis arachnoides oblonga</i> : Southern spider tortoise
Spanish:	Tortuga de plastron articulado, Tortuga araña
French:	<i>Pyxide arachnoides</i> : Tortue-araignée <i>Pyxis arachnoides arachnoides</i> : Pyxide arachnoïde commune <i>Pyxis arachnoides brygooi</i> : Pyxide arachnoïde du Nord <i>Pyxis arachnoides oblonga</i> : Pyxide arachnoïde du Sud
German:	Madagaskar-Spinnenschildkröte, Gemeine Büchsenschildkröte <i>Pyxis arachnoides arachnoides</i> : Onilahy-Spinnenschildkröte <i>Pyxis arachnoides brygooi</i> : Morombe-Spinnenschildkröte <i>Pyxis arachnoides oblonga</i> : Anony-Spinnenschildkröte
Dutch:	Spinschildpad
Italian:	Pisside
Malagasy:	Tsakafy, Kapika, Zakapy
Russian:	Pautschi tscherepachi
Swedish:	(madagaskar) spindelsköldpadda

2. Biological parameters

Specimens of *Pyxis arachnoides* are small in size. The maximum length of their shell is 15 cm, with an average of 12.2 cm for the females and 11.6 cm for the males (Vetter, 2001a).

The oblong carapace is highly curved and widens towards the rear (Rogner, 1996). The brown or black scales form a spider-web design composed of five to eight yellow lines radiating from a yellow centre (Durrel *et al.*, 1989; Testudo, 2000), which has given the common name to the species. This design constitutes perfect camouflage in the animal's natural habitat. The marginal scales are clearly separated by a yellow band along the rim of the shell (Henkel and Schmidt, 2000).

The plastron of the *Pyxis arachnoides* is well developed. It is uniformly yellow over the whole surface, with a hinge that allows the turtle to close its shell. This gave the scientific name to this species ('pyxis' meaning box in Greek) (Vetter, 2001b). However, the hinge is absent in the sub-species *P. a. brygooi*. The head of the spider tortoise is of average size and yellow with several dark spots. The legs, with five toes each, and the tail are brown. The tail of the males is longer and thicker, and the tip of the tail is harder.

Pyxis arachnoides arachnoides: The plastron of the main species is uniformly yellow over the whole surface and has a hinge but no mark. The forward lobe can completely close until touching the shell (Zovickian, 2002).

Pyxis arachnoides brygooi: Contrary to what is seen in the reference species, this plastron does not have a hinge. This sub-species is the smallest of this genus (Testudo, 2000).

Pyxis arachnoides oblonga: The plastron of this species has black marks on the scales and a forward hinge, which gives great mobility to the frontal plastron (Durrel *et al.*, 1989). The shell is more curved and oblong than with the two other sub-species, which has given the name to the sub-species (Huber, 2001; Vetter, 2001a).

The life span of *Pyxis arachnoides* is more than 50 years according to reports (Testudo, 2000). The species reaches maturity at two years (IUCN/CBSG 2002). The spider tortoise mates at the beginning of the rainy season. The incubation period varies from 220 to 250 days (Vetter, 2001a). A single egg is laid (Glaw and Vence, 1994). There is no information on how many times per year an egg is laid under natural conditions. In captivity, certain females have laid an egg up to three times a

year (Mähn, 1998). At the time of hatching, the newborn turtles are about 4.5 cm long and weigh 16 grams (Vetter, 2001a).

2.1 Distribution

Country of origin: endemic to Madagascar

The spider tortoise is found only in the arid part of the coastal areas of south-western Madagascar, from the coast up to 15 kilometres inland (Henkel and Schimdt, 2000).

Pyxis arachnoides arachnoides: The reference species lives in the region of the Onilahy River in south-western Madagascar near Toliara. Its area of distribution is limited to north of Manambo River and south of Lake Tsimanapetsotsa (Vetter, 2001a). According to reports, Soalara (Baie de Saint-Augustin) in Southwest Madagascar would be *terra typica designata* (Vetter 2001a). However, a field survey recently carried out by John Behler and Herilala Randriamahazo has shown that the area of distribution of the sub-species extends up to north of the Menarandra River (Randriamahazo, 2002).

Pyxis arachnoides brygooi: The sub-species lives north of Artareal. Specimens have been found in the region between Morombe, Lake Ihotry and the Baie de Fanemotra (Vetter, 2001a). The area of distribution can overlap with that of the reference species, which is found more frequently in the south (Huber, 2001). The Mikea forests around Lake Ihotry between Morombe and Toliara, in the province of Toliara, have been reported to be *terra typica* (Vetter, 2001a).

Pyxis arachnoides oblonga: Specimens are found from the southern coast between the Menarandra River to the west and Lake Anony near Amboasary to the east. Most of the specimens have been found between Ambovombe and Lavanono. Cap Sainte-Marie in the province of Toliara was reported as being *terra typica restricta* (Vetter, 2001a).

2.2 Habitat availability

Pyxis arachnoides lives in arid to semi-arid areas or in areas of thorny bushes and sandy soil. It is sometimes found among the sand dunes near the sea that have very little vegetation. This habitat is extremely dry. The rainy season lasts from one to four months, and precipitation is less than 500 mm. The vegetation is dominated by succulents and thorny shrubs (Vetter, 2001a; Rogner, 1996). The three sub-species bury themselves in deep burrows in the sand and rest there during the cold and dry season from April to December (Henkel and Schimdt, 2000; Huber, 2001).

According to field observations, the habitats of the tortoises in the thorny deserts and the dry forests have been seriously degraded (Behler, 2002). According to Mitchell and Klemens (2000), the destruction of xerophytic forests of Madagascar by fire, the conversion to pasture-land and exploitation for the production of construction materials and firewood have seriously reduced the distribution of the spider tortoise. According to estimates, reduction of the habitat has reached between 51 and 80 per cent because of the production of charcoal and conversion to agriculture (IUCN/CBSG 2002; Mähn 1996). There is concern that a large increase in the human population in Madagascar, where 80 per cent of the population is less than 20 years old, will only worsen destruction of thorny bushes and succulents. Destruction of natural habitats and the impact of forest exploitation on water supply would cause enormous changes in the microclimates within the habitats of the spider tortoise (Mähn 1998).

2.3 Population status

Pyxis arachnoides is currently classified as Endangered on the IUCN Red List (2003) on the basis of criteria B1 and 2abcd. This corresponds to the following facts: its extent of occurrence is less than 2,000 km², populations are highly fragmented or only exist at fewer than 10 locations, according to estimates, observations and projections. One of the following elements is undergoing a continuous decline: extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of sites or sub-populations (IUCN, 1994). If Raxworthy and Nussbaum (2000) estimate that there are more than 10 populations and that the area of

distribution could cover more than 2,000 km², other authors emphasize that it would be appropriate to change the status of species on the IUCN Red List. For example, participants in a CAMP workshop organized in 2002 by the IUCN Conservation Breeding Specialist Group in Madagascar (IUCN/CBSG 2002) proposed that the species be classified as Critically endangered on the IUCN Red List. According to Behler (2000b), because of the excessive harvesting for the international pet trade, the population status of *Pyxis arachnoides* does not differ largely from that of *P. planicauda*, and for this reason its classification is recommended as Critically endangered. The remaining populations are often dispersed (Caccone *et al.* 1999) and cannot be viable over the long term. There are no precise data on populations. Although the total number can be more than 10,000, the intensity of harvesting and the continuous loss of habitat have very certainly reduced the size of the population and could lead to the extinction of certain sub-populations for commercial reasons. At the national level, the spider tortoise is, therefore, listed as Endangered (IUCN/CBSG, 2002).

A high population density of at least three specimens per hectare has been reported in certain areas (Jesu and Schimenti, 1995). However, these figures could be unreliable because seasonal migrations and feeding habits (especially in disturbed habitats) can lead to overestimates. In certain potentially appropriate habitats, the species is apparently absent (Vetter, 2001a). Based on this, IUCN/CBSG (in preparation) declares that the species is found in low density.

2.4 Population trends

Several authors (IUCN/CBSG, 2002; Behler, 1996) recorded an important drop in the population of *Pyxis arachnoides*. This drop led to the recommendation of the CAMP workshop to classify the species as Critically endangered (IUCN/CBSG 2002). Apparently, the area of distribution and the size of the population have been reduced in recent years. It is estimated that there are 10 remaining populations (Vetter, 2001a). The number of populations for each sub-species should be even fewer than that.

2.5 Geographic trends

Several specimens have been found in northern Madagascar, quite far from their natural zone. It can be supposed that these animals have escaped from captivity but it is also possible that the area of distribution once covered the whole island (Testudo, 2000).

2.6 Role of the species in its ecosystem

Pyxis arachnoides feeds on grasses, roots of succulents and insects (Vetter, 2001a). On this basis, the species could influence the composition of the plant community and the structure of the vegetation within its habitat. However, data on its ecological role are rather scarce.

2.7 Threats

In addition to degradation of the habitat, the excessive harvesting for the international pet trade constitutes by far the most serious threat to *Pyxis arachnoides* (Behler, 2002; IUCN/CBSG, 2002). These two threats had already been identified in the 1970s (Blanc, 1979, cited by Durrel *et al.*, 1989). Recent harvesting of several thousand specimens for export has aggravated the problem (IUCN/CBSG, 2002). One trader in the Comoros is reported to have ordered 10,000 specimens for the autumn of 2001, which shows to which point demand for the species is enormous. Loss of habitat owing to the production of charcoal and agriculture, and changes in water supply create additional threats to the species. There is concern that the increased population and demographic trends in Madagascar will only aggravate the destruction of thorny bushes and succulents (Mähn, 1998). Harvesting for local consumption plays only a small role.

3. Utilization and trade

By far, most of the specimens harvested are for the international pet trade. Exports increased greatly over recent years. In comparison with the international trade, local consumption is low. According to certain reports, members of the Vezo tribe harvest specimens of *Pyxis arachnoides* and sell them to tourists as souvenirs (Vetter, 2001a). In many places frequented by travellers and tourists, live

specimens of *Pyxis arachnoides* are being sold (Barzyk, undated). Furthermore, according to certain reports, specimens of *Pyxis arachnoides* were killed in the region of Androka and Linta River in order to sell them as products made from tortoise liver in Japan (Behler, 2002).

3.1 National utilization

Until now, *Pyxis arachnoides* seems to be rarely used for food (Huber, 2001; McDougal, 2000). Local inhabitants occasionally eat some but an increase in consumption is feared because *Pyxis arachnoides* could be used as a replacement for the radiated tortoise (*Geochelone radiata*), which is extinct at the local level. At markets, for example at Toliara and Tolagnaro, specimens of spider turtles have been sold for USD 0.2 to 4 (Vetter, 2001a; Barzyk, undated). In 1999 and 2000, six sales were authorized, each for the harvesting of 200 *Pyxis arachnoides*. In each lot, 100 specimens were to be used for raising in captivity and 100 for export. A seventh trader was authorized to harvest 180 specimens of which 80 were destined for export and 100 for raising in captivity.

3.2 Legal international trade

Because of its small size as an adult and the design on its carapace, *Pyxis arachnoides* constitutes one of the tortoise species in greatest demand on the international pet market (Testudo, 2000). Between 1990 and 1997, only 19 imports were recorded (UNEP/WCMC, 2003), but trade in *Pyxis arachnoides* increased sharply at the end of the 1990s. There was heavy trade in this species in 2000 and 2001. According to the records of the Management Authority, Madagascar granted permits for the export of 2,569 specimens in 2000 and 1,072 specimens in 2001 (see figure 1) (Reeve/IFAW, in preparation). However, these data do not agree with those of UNEP/WCMC. According to UNEP/WCMC (2003), Madagascar reported the export of 2,634 specimens of *Pyxis arachnoides* in 2000 and no exports in 2001. Importing countries have recorded the import of 881 *Pyxis arachnoides* in 2000. In 2001, their imports were 254 *P. arachnoides*, 100 *P. arachnoides oblonga* and 100 *P. arachnoides brygooi* (UNEP/WCMC, 2003). In addition, imports of 110 specimens of the species over those two years by the United States of America should be taken into account. The figures compiled by UNEP/WCMC are presented as an annex.

Figure 1: Export permits for *Pyxis arachnoides* in 2000-2001 according to the records of the Management Authority of Madagascar (based on Reeve/IFAW, in preparation).

Importing country	Export permits 2000	Export permits 2001
Belgium	24	
France	2	
Guinea Bissau		4
Hungary	2	
Japan	1365	433
South Africa	208	
Switzerland	66	5
Uruguay		
United States	902	
Yugoslavia		30
Unknown		600
Total	2569	1072

In June 2000, Madagascar established a voluntary export quota of 25 specimens (CITES, 2000a), which was increased to 1,000 specimens in August of that year (CITES, 2000b). In March 2001, the export quota was fixed at zero (CITES, 2001). However, the quotas have been exceeded considerably because of the granting of export permits for 1,072 specimens to seven traders (Reeve/IFAW, in preparation 2002). The names of the countries of destination are given in Figure 1.

The price of specimens has dropped in the United States because of large imports of *Pyxis arachnoides* (Zovickian, 2002; Hudson, 2000; Behler, 2000b). The species remained widely available in the United States in 2002 as shown by publicity posted on the Internet and sent by e-mail (Pro Wildlife, unpublished; Behler, 2000a). In South Africa, specimens of the three subspecies have been sold for USD 600 each (Cairncross, 2000).

3.3 Illegal trade

In May 1999, more than 330 spider tortoises were confiscated at the Roissy airport in France following the suspension of imports of *Pyxis arachnoides* by the European Union (see section 4.1.2) (Vetter, 2001a). According to reliable reports, blank CITES export permits were circulating in Madagascar in 2001 (OSF, 2001). In 2000 and 2001, two shipments of 12 and 230 specimens respectively were shipped through South Africa for which no corresponding export permit could be found with the Management Authority for Madagascar (Reeve/IFAW in preparation). In addition, certain facts indicate that specimens are passed as contraband to foreign fishing boats – especially Japanese – off Madagascar (Reeve/IFAW, in preparation). Furthermore, there are reports of illegal exports of *Pyxis arachnoides* from Toliara towards the Comoros (R. Lewis, personal communication, 2004). During the 18 months before November 2001, three cases of confiscation of spider tortoises were recorded at Durban, South Africa, all on fishing boats from the Far East and totalling 23 specimens (Reeve/IFAW, in preparation). The species has also been found on the food markets in China with 126 specimens recorded in a market survey from 2000 to 2001 (Ades, 2002).

3.4 Actual or potential trade impacts

The collection of spider tortoises for the international pet trade has become more and more of a serious problem lately (1998 to 2000). Bloxam (2000) emphasizes that the gatherers are exhausting the stocks of wild population of *Pyxis arachnoides*. Because of this heavy exploitation, the viability of populations is endangered, and the low rate of reproduction of the species cannot compensate harvesting (IUCN/CBSG 2002). The harvesting of 5,000 specimens for an order for 10,000 specimens by a trader in the Comoros in 2001 (Reeve/IFAW, in preparation) gives an idea of the persistence of the demand for the international pet trade. In December 2001, at least four traders in Madagascar held specimens of *Pyxis* in the hope of being able to export them (Reeve/IFAW, in preparation). Participants in a recent CAMP workshop (IUCN/CBSG, 2002) stressed the following: "Important losses of adult specimens directly affect the integrity of populations and can considerably delay their reconstitution even under the best post-harvest scenarios".

3.5 Captive breeding for commercial purposes (outside country of origin)

Nothing is known about breeding in captivity on a commercial scale for the time being. The highly seasonal cycle of *Pyxis arachnoides* makes it very difficult to raise and reproduce in private breeding. According to the recommendations of several authors, the species should be raised only by specialists (Zovickian, 2002; GAM, 1997). The chances of successful reproduction in captivity are slight (Mähn and Wilms, 2001; Vetter, 2001a). According to the International Species Information System (ISIS, 2002), 40 specimens of *Pyxis arachnoides*, three of *P. a. brygooi* and seven of *P. a. oblonga* were kept in zoos throughout the world in 2002. However, according to the draft report of a recent CAMP workshop, zoos reportedly hold more than 200 specimens including males, females and specimens of undetermined gender (IUCN/CBSG, 2002). According to the annual report of the reproduction programme for *Pyxis arachnoides* no specimen was produced in 2000 and only three hatchlings were registered in 1999 (Loehr, 2000 and 1999). Furthermore, several specialists agree that

many of the hatchings in captivity have been obtained from females that were pregnant at the time of their importation rather than from reproduction in captivity.

4. Conservation and management

4.1 Legal status

4.1.1 National

Consumption of *Pyxis arachnoides* is prohibited in Madagascar. However, application of the law remains lax in remote areas (Vetter 2001). Collection and export are regulated by a system of permits. This species is protected by national law (IUCN/CBSG, 2002).

4.1.2 International

Pyxis arachnoides has been listed in CITES Appendix II since 1975. The European Union prohibited the import of the species in December 1999 because its conservation status raised concern. This decision was confirmed in July 2001. Despite the suspension of imports, Belgium reported having imported 12 *Pyxis arachnoides* for trade in 2001. Switzerland prohibited the import of *Pyxis arachnoides* from Madagascar in 2001 (Althaus, *in litt.*, to Pro Wildlife, 2002).

4.2 Species management

4.2.1 Population monitoring

Since 1991, the action plan of the IUCN Tortoise and Freshwater Turtle Specialist Group (IUCN/SSC) has considered *Pyxis arachnoides* to be a "species that requires conservation projects and study of its status" (IUCN/SSC/TFTSG, 1991). However, there are no studies or projects for conservation to our knowledge.

4.2.2 Habitat conservation

This species is found in protected areas of Lake Tsimanampetsotsa and at Cap Sainte-Marie. Beginning in 1990, the environmental action plan, among other aspects, increased the number of protected areas in Madagascar (Reeve/IFAW, *in preparation*). However, it is not known whether this environmental action plan was implemented effectively and whether *Pyxis arachnoides* benefits from measures contained in it. A large part of the species's habitat is located outside protected areas.

4.2.3 Management measures

To our best knowledge, there is no national or regional conservation plan for the species (IUCN/CBSG, 2002). According to Vetter (2000a), the *Station d'Observation et de Protection des Tortues dans le Monde* (SOPTOM) had planned to begin a breeding centre near Toliara in 2003. No work on the centre has been reported so far.

4.3 Control measures

4.3.1 International trade

In June 2000, Madagascar established a voluntary export quota of 25 specimens (CITES, 2000a). However, in August of that year that quota was raised to 1,000 specimens for the year 2000 (CITES 2000b). In March 2001, the Parties were notified that the quota had been set to zero (CITES, 2001). However, reports on exports show that the quota was greatly exceeded (see section 3.2). Preparation of the quota for 2002 was announced in the spring of 2002 (CITES, April 2002). No export quota was published for the species in 2003. The European Union suspended imports of the species in 1999 and confirmed this suspension in 2001.

4.3.2 Domestic measures

No information.

5. Information on similar species

Non-specialists could have difficulties in distinguishing *Pyxis arachnoides* from other tortoises with similar designs on their carapace, such as *Geochelone elegans*, *Geochelone platynota* and *Psammobates* spp. (Testudo, 2000).

6. Other comments

Participants in the CAMP workshop organized by the IUCN Conservation Breeding Specialist Group in Madagascar in 2001 recommended transfer of *Pyxis arachnoides* from Appendix II to Appendix I. Behler (2000a) emphasizes that specialists who have worked in Madagascar had already concluded that *Pyxis* should be included in Appendix I. Hudson (2000) also stressed the need for CITES to take measures for conservation of *Pyxis* spp. A large part of the spider tortoise population fragments is headed for extinction during this century if trade is not limited and loss of habitat is not stopped (IUCN/CBSG 2002).

7. Additional remarks

8. References

- Ades, G. (2002): "Turtle Trade Monitoring in South China", presentation to the Technical Workshop on Conservation of and Trade in Freshwater Turtles and Tortoises, Kunming, China (March 2002).
- Althaus, T. (2002): communication to Pro Wildlife dated 1 May 2002.
- Barzyk (undated): "Turtles in crisis: The Asian food markets", www.tortoisetrust.org/articles/asia.html, viewed 17 April 2002.
- Behler, J. (2002): "Madagascar Tortoise Crisis" Report of a visit to Southern Madagascar November / December 2001, submitted to the CITES Animals Committee and Concerned Parties dated 9 January 2002.
- Behler, J. (2000a): Letter by the IUCN Tortoise and Freshwater Turtle Specialist Group to the CITES Secretariat, dated 1 December 2000.
- Behler, J. (2000b): Personal communication to Thomas Althaus, CITES Management Authority for Switzerland dated 27 November.
- Behler, J. (2000c): "Letter from the IUCN Tortoise and Freshwater Turtle Specialist Group", Turtle and Tortoise Newsletter 1: 4-5.
- Behler, J. (1996): "Observation status of Madagascan tortoises", In: *Abstracts from the 20th Annual Meeting of the International Herpetological Symposium*, 27–29 June 1996.
- Bloxam, Q. (2000): E-mail to the German SCITES Scientific Authority, 31 May 2000.
- Caccone, A., Amato, G., Gratrix, O., Behler, J., Powell, J. (1999): "A Molecular Phylogeny of Four Endangered Madagascar Tortoises Based on MtDNA Sequences". Molecular Phylogenetics and Evolution, Vol. 12.
- Cairncross (2000): Price list, www.allpets.co.za/cairncross/internareptiles.htm, viewed 17 August 2000.
- CITES (2000a): Notification 2000/035, 15.06.2000.
- CITES (2000b): Notification 2000/053, 31.08.2000.
- CITES (2001): Notification 2001/019, 16.03.2001.
- CITES (2002): www.cites.org viewed 19 April 2002.

- Durbin, J. (2004) Communication to Pro Wildlife, 27 February 2004.
- Durrell, L.; Groombridge, B.; Tonge, S. and Bloxam, Q. (1989): "Pyxis arachnoides: Madagascar Spider Tortoise; Tsakafy, Kapila", In: *The conservation biology of tortoises*, Swingland and Klemens (eds.), Occasional Paper of the IUCN SSC No. 5, IUCN.
- GAM (1997): "Gutachten über Mindestanforderungen an die Haltung von Reptilien", German Agricultural Ministry, Bonn, Germany.
- Glaw, F. and Vences, M. (1994): "A Fieldguide to the Amphibians and Reptiles of Madagascar", 2nd edition, Vences & Glaw Verlags GbR, Germany.
- Henkel, F. and Schmidt, W. (2000): "Amphibians and reptiles of Madagascar and the Mascarene, Seychelles, and Comoro Islands", Krieger Publishing Company, Malabar, Florida.
- Huber, A. (2001): "Schildkröten in Madagaskar", RADIATA 10 (2), p. 20 ff.
- Hudson, R. (2000): letter from the IUCN Madagascar Reptile and Amphibian Specialist Group to the CITES Secretariat dated 27 November 2000.
- ISIS (2002): "Abstracts on *Pyxis* sp.", www.isis.org/abstracts/Abs47874.asp, viewed 24 April 2002.
- IUCN (2003): "IUCN Red List of Threatened Species", IUCN Species Survival Commission, Gland, Switzerland.
- IUCN (1994): "IUCN Red List Categories", as approved by the 40th meeting of the IUCN Council, Gland, Switzerland.
- IUCN Conservation Breeding Specialist Group (2002): Evaluation et Plans de Gestion pour la Conversation (CAMP) de la Faune de Madagascar: Lémuriens, Autres Mammifères, Reptiles et Amphibiens, Poissons d'eau douce; 20–25 May 2001, Mantasoa, Madagascar.
- IUCN/SSC/TFTSG (1991): "Tortoises and Freshwater Turtles—An Action Plan for Their Conservation", IUCN, Gland, Switzerland.
- Jesu and Schimenti (1995): "A preliminary study on the status of a population of Malagasy spider tortoises from SW Madagascar", In: SOPTOM (eds.), International Congress on Chelonian Conservation—Proceedings, Editions SOPTOM, Gonfaron: 144–150.
- Lewis, R. (2004): personal communication.
- Loehr, V. (2000): "Studbook Breeding Programme *Pyxis arachnoides*—Annual Report 2000", Germany.
- Loehr, V. (1999): "Studbook Breeding Programme *Pyxis arachnoides*—Annual Report 1999", Germany.
- McDougal, J. (2000): "Conservation of tortoises and terrestrial turtles", In: *Turtle Conservation*, Klemens (ed.), Smithsonian Institution Press, Washington and London, pp. 180–206.
- Mitchell, J. and Klemens, W. (2000): "Primary and secondary effects of habitat alteration". In: *Turtle Conservation*, Klemens (ed.), Smithsonian Institution Press, Washington and London.
- Observatoire National du Secteur Forestier (OSF) (2001): Projet de rapport d'activité semestriel, November 2001.
- Pro Wildlife (unpublished): "Internet survey on chelonians on sale", April 2002, Munich, Germany.
- Randriamahazo, H. (2000): Communication to Pro Wildlife, dated 13 May 2002.
- Raxworthy, C. and Nussbaum, R. (2000): "Extinction and extinction vulnerability of amphibians and reptiles in Madagascar", *Amphibian and Reptile Conservation* 2(1): 15–23.
- Reeve, R. (in preparation): "Report on international trade in African reptiles", IFAW/International Fund for Animal Welfare (ed.).
- Rogner, M. (1996): "Schildkröten 2", Heidi-Rogner-Verlag, Hürtgenwald, Germany.
- Testudo (2000): "*Pyxis arachnoides*", www.landschildkroeten.com/Pyxis_arachnoides.html.
- UNEP/WCMC (2003): All imports and exports of CITES-listed species from Madagascar (until 2002).

- USFWS (2001): "Exports of live reptiles from Madagascar: Adherence to reported quotas and recommendations of the Standing Committee", Information document by the United States to the 17th Meeting of the CITES Animals Committee.
- Vetter, H. (2001a): "Gewöhnliche Spinnenschildkröte, *Pyxis arachnoides* (Bell 1827)",
<http://home.hetnet.nl/~homopus/publ2.htm>.
- Vetter, H. (2001b): "Spinnenschildkröten, *Pyxis* (Bell 1827)",
<http://home.hetnet.nl/~homopus/publ1.htm>.
- Zovickian, W. (2002): "Spider tortoises", www.tortoisetrust.org/care/pyxis.html.

Comparison of trade in *Pyxis arachnoides* 1996-2002 based on annual reports for CITES gathered by UNEP/WCMC (2003)

* P = purpose, S = source

Year	Taxon	Imports reported					Exports reported					
		Imp.	Exp.	Quantity	Term	P	S	Quantity	Unit	Term	P	S
1996	<i>Pyxis arachnoides</i>	US	MG	2	live			W				
1996	<i>Pyxis arachnoides</i>	US	MG	1	specimens	S	W					
1997	<i>Pyxis arachnoides</i>	IT	MG	6	live	S	W	6		live	S	W
1998	<i>Pyxis arachnoides</i>	ID	MG					4		live	B	W
1998	<i>Pyxis arachnoides</i>	ID	MG	4	live	T	W					
1998	<i>Pyxis arachnoides</i>	JP	MG	150	live	T	W	150		live	T	W
1999	<i>Pyxis arachnoides</i>	ES	MG					10		live	T	W
1999	<i>Pyxis arachnoides</i>	ID	MG					1		live	T	W
1999	<i>Pyxis arachnoides</i>	US	MG	35	live	T	W	35		live	T	W
2000	<i>Pyxis arachnoides</i>	BE	MG					24		live	T	W
2000	<i>Pyxis arachnoides</i>	CH	MG	90	live	T	W	66		live	T	W
2000	<i>Pyxis arachnoides</i>	FR	MG					2		live	P	W
2000	<i>Pyxis arachnoides</i>	HU	MG					2		live	T	W
2000	<i>Pyxis arachnoides</i>	JP	MG					1365		live	T	W
2000	<i>Pyxis arachnoides</i>	US	MG	577	live	T	W	865		live	T	W
2000	<i>Pyxis arachnoides</i>	US	MG	10	specimens	S	W					
2000	<i>Pyxis arachnoides</i>	US	MG					2	ml	specimens	S	W
2000	<i>Pyxis arachnoides</i>	ZA	MG	4	live	B	C					
2000	<i>Pyxis arachnoides</i>	ZA	MG	200	live	T	W	308		live	T	W

Year	Taxon	Imp.	Exp.	Quantity	Term	P	S	Quantity	Unit	Term	P	S
2001	<i>Pyxis arachnoides</i>	BE	MG	12	live	T	C					
2001	<i>Pyxis arachnoides</i>	BG	MG	100	live	T	W					
2001	<i>Pyxis arachnoides</i>	CH	MG	21	live	T	W					
2001	<i>Pyxis arachnoides</i>	CZ	MG	100	live	T	W					
2001	<i>Pyxis arachnoides</i>	US	MG	12	live	T	W					
2001	<i>Pyxis arachnoides brygoor</i>	BG	MG	100	live	T	W					
2001	<i>Pyxis arachnoides oblonga</i>	BG	MG	100	live	T	W					
2000	<i>Pyxis</i> spp.	US	MG	30	live	T	W					
2001	<i>Pyxis</i> spp.	US	MG	80	live	T	W					