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The export of the endangered Madagascar spider tortoise (Pyxis arachnoides) to support the exotic pet trade

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ABSTRACT — The endemic Madagascar spider tortoise Pyxis arachnoides, listed as 'Vulnerable' on the IUCN Red List and included on CITES Appendix II, faces threats of habitat destruction, hunting for human consumption and collection for the exotic pet market. This study reviews all available data and literature concerning the export of this species to supply the exotic pet market. CITES has recorded movements for 3984 individuals since 1980, with a considerable increases in movements since 1998. Ninety nine percent of individuals reported were recorded as being noncaptive bred specimens and 97 % were listed for 'trade' purposes, with 74% of these exported specimens sent to USA or Japan. During 2000, Madagascar exceeded its CITES export quota for the species. Problems exist with CITES reporting for P. arachnoides by both importing and exporting nations, with 66.6% of individuals failing to be reported correctly. Seizures of illegally transported specimens are few with only 50 such specimens officially recorded by CITES, and none officially recorded by TRAFFIC. Smuggling, however, is believed to almost certainly occur. Madagascar's failure in the CITES reporting system is thought to be attributed to corruption and more recently, national political instability, but improvements and conservation initiatives in recent years have been made. Over-collection for the lucrative exotic pet trade could seriously threaten the long-term survival of this species, and education and capacity building are required at both the collection and consumption ends of the industry in order to increase its chances of long-term survival.

THE international trade in live reptiles has been ongoing for many years, with the pet trade component of this enterprise a significant end-user of live tortoises (Roth & Merz, 1997, Luijif, 1997). In the United Sates alone there are estimated to be in the region of 4 million amateur herpetologists (Franke & Telecky, 2001). The herpetofuna of Madagascar includes four threatened species of endemic tortoises, including the endemic Madagascar spider tortoise *Pyxis arachnoides*, a favoured species of the exotic pet trade. This small, attractive and charismatic species' popularity has grown within the herpetological community in recent years. *Pyxis* arachnoides attains a carapace length of just 150 mm (Jesu & Schimmenti, 1995) and inhabits the narrow coastal strip (10–50 km inland) of south west Madagascar from Morombe to Amboasary. Endemism and limited range makes *P.* arachnoides important to global biodiversity. The species' range is largely dominated to the north by the Mikea forest, and spreads south of the Onilahy river through the southern dry forests, one of the most distinctive yet least protected ecosystems in Madagascar (Seddon *et al.*, 2000). This ecosystem supports characteristic coastal sandy soils covered with sparse thorny bushes of the families Euphoriaceae and Didieraceae. *Pyxis arachnoides* is divided into three subspecies, with the major distinguishing feature being the anterior plastral lobe. In the southern subspecies *P. a. matzi*, the lobe is highly mobile, but is less so (especially in adults) in the southwestern subspecies *P. a. arachnoides*, and rigid in the western form, *P. a. brygooi* (Durrell *et al.*, 1989). For the purpose of reporting, due to export and illicit seizure data not classifying specimens as far as subspecies level, all specimens reported in this work will be referred to as *P. arachnoides*.

The International Conservation Union (IUCN) Red List of Threatened Species, lists P. arachnoides as 'Vulnerable' (IUCN, 2002). The species is listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), implying that commercial trade is allowed provided a permit is obtained from the country of export. Currently CITES export quotas for P. arachnoides stand at 1000 live animals per year (CITES, 2000), but despite CITES and wildlife laws of treaty signatories, the world's exotic pet markets are in many cases poorly regulated (Behler, 1997). Pyxis arachnoides has been somewhat ignored by the scientific literature with the scarcer P. planicauda attracting much of the recent attention (Behler et al., 1993; Bloxam et al., 1993; Raxworthy & Nussbaum, 2000) since its recent re-listing from CITES Appendix II to Appendix I (Prop. 12.55; IWMC, 2002). As a result, P. arachnoides remains Madagascar's sole tortoise species to be subjected to legal trade.

The sparse literature on *Pyxis arachnoides* consistently states that the known status and biology of the species is very limited (Jesu & Schimmenti, 1995; Durrell *et al.*, 1989). Despite a relatively large potential distribution area, Durrell *et al.* (1989) state that populations are often fragmented, containing variable numbers of individuals. Only ten local populations are believed to remain (SSN, 2004). The reproductive potential of the species is thought to be low – individuals reach a reproductive state at 12 years of age and females will only produce a clutch of one egg (SSN, 2004). *Pyxis arachnoides* alongside

Madagascar's three other species of endemic tortoises are under assault from habitat destruction (Seddon *et al.*, 2000), with large scale habitat loss reducing the area of distribution by 51-80% (SSN, 2004). Behler (2000) states that some areas ten years ago that held dense populations of *P. arachnoides* have been swept clean by collectors for food markets and exotic pet export. Tortoise collectors have even been known to harvest the species within protected areas such as the Tsimanampetsotsa National Park (Behler, 2002).

Information sources

This research reviewed the available literature and trade figures for *P. arachnoides*, with data collected from CITES databases for listed legal trade and trade infractions. Information was gained from TRAFFIC and WWF publications listing details on seizures, and web based searches collecting data and information on trade and trade prices for the species.

Trade analysis

Legal trade

Through analysis of CITES export data, trade infractions data for the species, plus reviews of the available literature regarding seizures, it was possible to establish annual figures of the legally exported, and some information on illegally exported numbers of P. arachnoides between 1980 and 2001 (with 2001 being the most recently available data). Table 1 shows that CITES has been recording P. arachnoides export movements since 1980, during these 21 years 3457 individuals had been reported by importers globally. Movements had been recorded for a total of 3984 individual specimens over this time, with 3314 specimens reported to have been exported from Madagascar (Table 1). A record of exports directly from Madagascar did not start until 1990, and between 1980 and 1989 only nine animals in total were recorded by CITES. Durrell et al. (1989) state that the species had yet to breed successfully in captivity before the time of their research, therefore the six animals traded between the

				Quantity reported by importer			Quantity reported by exporter			Total animats	Total animals exported from
Year	Importer	Exporter	Origin	Quantity	/ Purpose	Source	Quantity	Purpose	Source	the year	the year
1980	Switzerland	German D R		1	personal	23	+	1.1		1	0
1986	Germany	German D.R	Madagascar	1	scientific				-	1	0
1988	USA	Netherlands	-	2	trade	captive-bred	2		captive-bred	2	0
1989	Japan	Netherlands	25	4	trade	captive-bred	4	Irade	captive-bred		
1989	Germany	Soviet Union	Madanascar	1	scientific	*****	1	200		5	0
1990	United Kingdom	Madanascar		6	-	-		6			
1990	Japan	Malaysia	-	3	trade	captive-bred	-		~		
1990	Germany	Soviet Union	Madadascar	1	scientific	-	-	-		10	6
1991	Madanascar	Germany	Madagascar	±.)	25	-	4	re-infroduction			
1991	USA	Poland	-	1	trade	captive-bred	1	200	-	5	0
1995	LISA	Madaoascar		+		-	4	scientific	wild	4	4
1996	Madapascar	France		8	re-introduction	seized	. 5				
1996	LISA	Madagascar	+1	2		wild			-	10	2
1997	Italy	Madagastar	1	6	scientific	wild	6	scientific	wild		
1997	South Africa	Netherlands	20 C	4	200	captive-bred			-		
1997	Denmark	Sweden	-	7	trade	seized			-	17	6
1998	LISA	Japan	Madanascar	32	irade	wid	36	trade	wild		
1998	Indonesia	Madanascar	iniddagasoar	4	trade	wild	4	breeding	wild		
1998	Janan	Marlanascar	81	150	trade	wild	150	trade	wild		
1998	Netherlands	South Africa		1	-	seized		-	-	191	154
1999	Switzerland	Germany		4	nersonal	cantive-bred	4	trade	captive-bred		
1000	Hong Kong	Indonesia	Madanascar	1	Itade	wild	1	trade	wild		
1999	LISA AZ	Indonesia	Madanascar	2	trade	wild	2	Trade	wild		
1000	Indanesia	Madanascar		-	-	-	1	trade	wild		
1000	Soain	Madagascar			-	+	10	trade	wild		
1999	USA	Madagascar	- 10 H	35	trade	wild	35	trade	wild	53	46
2000	Јарал	Germany		-	1		8	rade	caplive-bred		
2000	USA	Germany	+	5	Irade	captive-bred	5	rade	captive-bred		
2000	Belgium	Madagascar	10 C	55	-	*	24	rade	wild		
2000	France	Madagascar	-	-		10	2	personal	wild		
2000	Hungary	Madagasca	17 C	23			2	rade	wild		
2000	Japan	Madagasca	-	×.	-		1365	rade	bliw		
2000	South Africa	Madagasca	-	300	trade	wild	308	rade	wild		
2000	South Africa	Madagasca	÷	4	breeding	captive-bred	-		÷		
2000	Switzerland	Madagasca	-	90	trade	wild	66	tade	wi đ		
2000	USA	Madagasca		577	Irade	wild	865	tade	wi ɗ		
2000	France	Maurilius	Madagascar	-	-		110	rade	wild		
2000	Nelherlands	Maurilius	Madagascar			3	90	rade	wi d		
2000	Japan	South Africa	Madagascar	-	-		5	rade	wi d		
2000	USA	South Africa	Madagascar	74	Irade	wild	95	rade	wi d		
2000	Hong Kong	USA	Madagascar	6	trade	witd	4	rade	WI D		
2000	Japan	USA	Madagascar			-	6	rade	wi d	2985	2651
2001	USA	Bulgaria	Madagascar	54	Irade	wild	138	trade	wild		
2001	Hong Kong	Japan	Madagascar	8	trade	wild	(P)				
2001	Belgium	Madagascar	-	12	rade	captive-bred			5		
2001	Bulgaria	Madagascar		300	rade	wild		~	-		
2001	Czech Republic	Madagascar	×.	108	rade	wild					
2001	Switzerland	Madagascar		21	rade	wild	·				
2001	USA	Madagascar		12	rade	wild					
2001	Czech Republic	South Alrica	Madagascar	-			60	trade	wild		
2001	Japan	South Alrica	Madagascar	-	-		8	trade	wild		
2001	Maita	South Alrica	Madagascar	-	×		24	trade	wild		
2001	Hong Kong	USA	Madagascar	16	Irade	wild	6	Irade	wild		
2001	Swilzerland	USA	Madagascar	1	Irade	wild	1	trade	wild	700	445
	Total			1856			3457			3984	3314

Table 1. CITES recorded movements of *Pyxis arachnoides* between 1980–2001, highlighting the high number of gaps in the data.

Parties with discrepancies in	Parties with discrepancies in				
CITES reported Imports	CITES reported exports				
Madagascar (1)	German D.R. (2)				
France (1)	Madagascar (10)				
Netherlands (1)	Malaysia (1)				
Japan (3)	Soviet Union (1)				
Czech Republic (1)	Netherlands (1)				
Malta (1)	Indonesia (1)				
	Spain (1)				
	Germany (1)				
	Belgium (1)				
	France (1)				
	Hungary (1)				
	Japan (2)				
	USA (5)				

Table 2. Parties showing discrepancies within CITES reported import / export data for *P. arachnoides*. Brackets show the number occasions of incidences of data inconstancies. Figures of <10% discrepancy between the exported figure and imported figure listed were ignored to allow for possible mortality in transit.

Netherlands and the USA, and Japan in 1988/9 listed as captive bred were probably amongst the first successfully captive bred specimens (Table 1). Pre-1998, only 18 individual tortoises were directly exported from Madagascar, according to CITES. This increased to 154 tortoises during 1998; exports dipped during 1999 with 46 tortoises, followed by 2651 animals exported during 2000. Export numbers were still high during 2001 with 445 animals recorded by CITES (Fig.2).

The CITES data revealed that 99.2% (n = 3950) of the tortoises recorded in global movements were either recorded as wild caught or not specifically recorded as captive bred. Of the 3314 recorded tortoises exported directly from Madagascar since 1980 (Table 1), only 0.7% (13 in 2000 and 12 in 2001), were recorded as captive bred, with the remaining animals therefore quite possibly all wild caught. Of the total numbers of animals involved in global movements recorded by CITES 97.2% (n = 3842) were listed as being used for trade purposes. Of the wild caught specimens exported directly from Madagascar, 98.6% (n = 3842) were recorded as being exported for trade purposes. Exports of the species for trade purposes from Madagascar increased between 1996–2001 (Fig. 1) (p > 0.005). A single consignment of 150 were exported to Japan in 1998, South Africa received 300 animals in 2000, and the USA imported a total of 865 in the same year (Table 1). During 2001, 300 and 100 animals were imported into Bulgaria and the Czech Republic respectively. The primary consumer nations were USA and Japan, with 74% (n = 2780) of the total number of *P. arachnoides* imports for trade purposes received by these two nations between 1990 and 2001 (Fig. 1).

In some cases the exporting nation, which in many cases is Madagascar, have not officially registered the exportation of a consignment or consignments of the animals with CITES. For example, during 2000 1365 wild caught specimens were recorded as imported to Japan for trade purposes in a single consignment from Madagascar, but failed to be reported by the exporting nation (Table 1). Similarly, in 2000, 577 wild caught individuals were reported as exported by the authorities in Madagascar for trade purposes in another consignment, but 865 animals were reported as received by the importing nation, in this case the USA. Again, during 2000, 90 wild caught specimens were exported from Madagascar for trade purposes to Switzerland, but only 66 specimens were recorded as being received by the Swiss authorities.

Illegal trade

During 1991, four tortoises were returned to Madagascar from Germany, the result of a possible customs seizure, and 1996 saw eight seized animals returned to Madagascar from France (Table 1). Seven illegally traded tortoises from Sweden imported to the Netherlands were seized in 1997, as was one animal seized between South Africa and Netherlands in 1998 (Table. 1).

Seizures of illegally traded *P. arachnoides* have not been officially recorded by TRAFFIC, the wildlife trade-monitoring network. However, on August 6th 1998 a key smuggling ring was



Figure 1. CITES reported imports from Madagascar for *P. arachnoides*, 1990–2001 including Europe and the four highest consuming nations.

intercepted, the result of a five year investigation into reptile smuggling, many of the animals seized were rare species from Madagascar including P. arachnoides (TRAFFIC, 1999). During 1998 one of the world's most successful smugglers was intercepted, with charges dating throughout most of the 1990s, the smuggler was known to be a regular illegal trafficker of P. arachnoides (WWF, 2001). CITES secretariat policy on information dissemination has changed in recent years. Rather than producing freely available reports on alleged infractions for the Conference of the Parties (CoP) (Reeve, 2002), in the interest of efficiency and confidentiality effort is now concentrated on a computerised intelligence and information system known as the Trade Infraction and Global Recording System (TIGERS). To date, one record has been listed on TIGERS for P. arachnoides. with 50 specimens seized in a European union Member State in 2000, smuggled from an eastern European country.

During Reeve's (2002) extensive work on the policing of international wildlife trade she concluded than in many cases Parties do not report all cases of illicit trade and the databases cannot be regarded as a complete record of illicit trade.

DISCUSSION

Clearly there are problems in the reporting and tracking of *P. arachnoides* due to discrepancies of individuals reported by the importers and those reported by the exporters (Table 1). Table 2 shows that 13 counties have discrepancies of >10% in consignments of CITES recorded *P. arachnoides* transport. Madagascar accounted for ten discrepancies in CITES reported exports of >10% between 1990 and 2001 and the two nations that support the greatest trade in the species, USA and Japan recorded five and two respectively. Discrepancies with CITES reported

imports of the species is less, with six nations recording discrepancies of >10%, and Japan supporting three consignments of >10%. In total 2653 (66.6%) of all individuals traded have not been reported by either importing or exporting parties.

The high level of trade of P. arachnoides during 2000 resulted in 837 more specimens being exported from Madagascar than CITES regulations allow, and therefore constituting a 'serious overage' as described by CITES (2002), for exporting greater than 150% of the allowed quota of an Appendix II species. But in support for the system in place, 2000 was the only year that trade infractions were recorded as taking place in the form of over exportation. It is evident that misreporting and the incident of over exploitation of the species during 2000 by collectors and exporters can be attributed to certain problems with CITES implementation and enforcement in Madagascar as a whole (Reeve, 2002). The results of a field trip to research the reptile trade for the International Fund for Animal Welfare (IFAW) during December 2001 discovered the general circulation of blank permits and the uncontrolled export of species under restricted or zero quotas (Reeve, 2002). Despite claimed corruption at a national level by curtain authors (Behler, 1997; Reeve, 2002; CITES, 2003), problems have been

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identified by CITES and TRAFFIC and much work has been undertaken within the recent past to attempt to rectify the problem.

In response to this and the lax enforcement of CITES quotas, the 49th CITES Standing meeting of the Committee during April 2003 established the Intersessional Export Quota Working Group, with the goal of developing guidelines for Parties to establish, implement, monitor and report national export quotas for CITES-listed taxa (CITES, 2003). Particular issues addressed included the persistent serious overages of many reptile species, by many

party signatories. During December 2001 the World Bank included improvement in CITES implementation as a condition for improving funding for the third phase of Madagascar's Environmental Action Plan (Reeve, 2002). Following this Madagascar descended into political chaos with the newly elected government refused power by the former party. The chaos resulted in confusion over legitimacy of wildlife exports, exacerbated by an unknown number of blank CITES permits in circulation signed under the previous administration.

Since Madagascar has stabilised politically even greater conservation initiatives have been implemented. At the 18th CITES Animal meeting Madagascar's Committee new administration announced a six month moratorium on CITES exports, a much needed move, but one impossible to enforce without that is corresponding action by importing countries. The USA immediately announced a suspension of imports of all species from Madagascar (lifted on the 20th September 2002), but the European Union decided against an import ban and no action was taken under CITES. More recently TRAFFIC is leading a new program in Madagascar aimed at helping the government authorities improve the countries wildlife trade, a new, comprehensive approach to CITES listed species management is



Figure 2. Number of *P. arachnoides* exported from Madagascar for trade purposes: 1996–2001.

being undertaken for the first time at a national level (TRAFFIC, 2003). A proposal has also been put forward to CITES (CoP13 - Prop. 15) to upgrade P. arachnoides from Appendix II to Appendix I within CITES listings as it has been considered that the illegal trade of the species would be easer to control if the species was listed on Appendix I (SSN, 2004). A much needed move highlighted by anecdotal evidence (such as the Cikananga Wildlife Rescue Center in Java reporting as recently as August 2004) that half the species of as many as 2300 individual turtles and tortoises on offer in a Jakarta pet market were comprised of rare species of tortoise from Madagascar (Vazquez, pers. comm.). However, P. arachnoides and Madagascar do not stand alone with problems of reporting and quota regulation for Appendix Π species, as live reptiles have been responsible for almost 60% of the reported over quotas within CITES reports during 1999 (CITES, 2002). Madagascar is making positive steps towards conservation of endemic reptiles involved in the wildlife trade, with leaf tailed geckos Uroplatus spp., leaf-nosed snakes Langaha spp. and arboreal snakes Stenophis citrinus all under consideration for CITES Appendix II listing (CoP13 Prop. 27-29) (SSN, 2004).

The high exports to Japan and USA can be confirmed by high numbers of herpetological dealers advertising P. arachnoides for sale over the Internet in these respective countries. Specimens can fetch prices of up to US\$1200 a pair. It appears that many wild caught animals are entering this lucrative pet trade and worryingly several dealers are openly providing questionable advice on the husbandry of these animals via their web sites. This may include stating that they require high levels of humidity when their natural habitat is arid with annual temperatures in the range of 21-37.5°C, mean annual rainfall of just 344 mm and relative humidity of 30% for most of the year (Jesu & Schimmenti, 1995). Well over 80% of live reptiles entering the herpetological trade die in the first year due to poor handling or husbandry (Franke & Telecky, 2001). High mortality due to poor handling, packing and failures in compliance with the International Air Transport Association (IATA) live animal regulations for the proper air transport of chelonians (Luiijf 1997; Franke & Telecky, 2001), could be another welfare issue. Despite specific documented cases by Luiijf (1997) on other similar pet species of tortoise no data is available on transportation mortality rates for P. arachnoides.

As well as the conservation and survival implications for the species itself from over collection of P. arachnoides, Simmons & Burbridge (2002) report that pest species have been associated with imported animals. Nineteen specimens, contained within a consignment of 125 P. arachnoides imported into Florida from Madagascar were infected by 23 ticks Amblyomma chabaudi. This is the first report of A. chabaudi outside of Madagascar; and Simmons & Burbridge (2002) state that all records of A. chabaudi are from P. arachnoides, except for one male on a Radiated tortoise Geochelone radiata. The tick's distribution is limited to the range of P. arachnoides in southern Madagascar, however A. chabaudi was able to be feed in the laboratory on rabbits. Thus, in the absence of its preferred host the tick could infest other species, as infested individuals are imported and become traded amongst herpetologists.

The long-term survival of P. arachnoides depends on the effectiveness of recent conservation strategies in Madagascar, the attitude and responsibility of the importing nations of the species and the influence of customs officials and authorities at both ends of the trade. CITES is examining ways of building capacity to implement regulations and enforce CITES within Madagascar, but a sense of responsibility needs to be installed at both ends of the trade with herpetologists within the consumer countries educated on the importance of only purchasing known captive bred stock. Collectors in Madagascar need to be targeted by Environmental NGOs with well-coordinated environmental education programs, and the provision of alterative livelihood generation needs to be considered in the impoverished and marginalised south west region of Madagascar.

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FOOTNOTE: After peer review of this manuscript and just prior to going to press the status of P. *arachnoides* within the CITES system was changed from Appendix II to Appendix I, during the CoP13, Bangkok 2–14th October, 2004. Appendix I status will ensure the movements of the species are easier to police, the new status ensures a total ban on trade of the species.

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