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The impacts of international and national governance changes on a traded resource: a case study of Madagascar and its chameleon trade

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Abstract

Trade in wildlife resources is permitted and regulated by national and international governance. Focussing on the trade in chameleons from Madagascar, our objective was to investigate the consequences of changes in governance on the number of individuals and species traded together with the prices paid to collectors, intermediaries and exporters. As a result of the liberalisation of export controls in 1988, exports of chameleons grew exponentially at an average rate of 62% per annum, the trade in *Calumma* spp. increasing at 91% per annum. The intervention of CITES in 1994, as a result of concerns over the trade, capped official exports at approximately 20,000 per annum and also restricted the trade to four species of *Furcifer*. The consequence of the CITES intervention was a shift in the species exported from a mix of *Calumma* harvested in the east and *Furcifer* harvested in the west to a trade in *Furcifer* alone, alongside an increase in the number of *Furcifer* exports. Consequently there was a shift in the distribution of local benefits gained from the trade away from the rainforests in the east, the centre of conservation concern. At the same time there was also a fall in the prices paid to collectors and intermediaries involved in the trade and a widening of the gap with the prices paid to exporters. The creation of an Experimental Management Programme within Madagascar to address the concerns of CITES in 1998/1999 and lobby for some expansion of the trade, led to an initial fall in the number of chameleons traded. Failure to achieve the latter objective has more recently led to an increase in the number of species traded and a further widening of the prices paid to collectors and exporters. These results highlight the need to consider carefully the consequences of changes in governance on the wildlife trade if conservation and local people are to benefit from the trade in wildlife resources.

Keywords: Wildlife trade; Governance; CITES; Conservation; Benefit allocation; Madagascar; Chameleon

1. Introduction

Madagascar has one of the highest levels of endemic flora and fauna in the world, but conservation concerns are increasing regarding its protection (Myers et al., 2000; Ganzhorn et al., 2001). These increased concerns are due, primarily, to continued deforestation but also to species being targeted by an increasingly diverse trade in wildlife (Green and Sussman, 1990; JNCC, 1993).

Trade in wildlife resources can potentially provide direct use value to local people (Norman, 1987; Bodmer and Lozano, 2001) and have conservation benefits, if the trade occurs within a sustainable management framework (Iriarte et al., 1997; Roe et al., 2002). However, if the trade is carried out without reference to sustainable exploitation then the resource may potentially

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be endangered (Laurance, 1991; Wolf and Konings, 2001). Therefore, trade in wildlife products is monitored through the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which was established in July 1975 (Rosser et al., 2001) and is supported by 166 party members (CITES, 2004). Essentially CITES operates as a world wide trade regulation regime acting through norms (non-legislative regularities of trade behaviour) and regulating trade via the issue of permits; its most potent power to enforce regulations is said to be by public embarrassment before the international community (Danaher, 1999).

The effectiveness of CITES in regulating the wildlife trade cannot be viewed in isolation from other forms of governance or events (Rodriguez, 2000). However, very few studies have investigated the consequences and effectiveness of different forms of governance on the trade in wildlife (e.g. Iriarte et al., 1997; Danaher, 1999). Even fewer studies have also examined the impact of legislation on trade revenues, essential if these are to provide the positive, financial feedback to local people and ensure conservation of the target species (Allen and Edwards, 1995; Stoett, 2002).

The aim of this paper is to report on the effectiveness and impacts of international and national governance changes or actions using the case study of the trade in chameleons from Madagascar.

2. Legislation and policy changes impacting on the trade in chameleons

Prior to 2002, there were two national and one international policy change that had direct impacts upon the trade of chameleons from Madagascar. The first stemmed from a national shift in policy during the early 1980s from a socialist to a market-orientated economy (Azam, 2000). This transition culminated in Ordonnance No. 88-015 enacted in September 1988. This national legislation liberalized export controls and suppressed export duties on all exported products from Madagascar, except vanilla, coffee and cloves (Jenkins, 1994). The national legislation created an environment of open trade between 1989 and 1994, favourable to exporters and the expansion of trade, steadily increasing GDP at a rate of 4.1% (Cadot and Nasir, 2002). Essentially, no restrictions existed on exporters of wildlife during this period, a ceiling being created only by the levels of demand.

The second policy change was an international initiative orchestrated by CITES following communications between the institution and State regarding compliance with Resolution of the Conference of the Parties 8.9, which refers to trade in wild-caught species (Wijnstekers, 1995). CITES Notification No. 785 (March 1994) reported that, in 1993, the World Conservation Monitoring Centre (WCMC) and IUCN had reviewed information on species that the Animals Committee of CITES considered subject to significant levels of trade. This included six Malagasy chameleon species. A report was drafted and submitted to the Animals Committee in June 1993, which became a working document and provided the basis for future recommendations. CITES Notification No. 784 (March 1994) reported that the Animals Committee had adopted recommendations in the report regarding Madagascar's trade in chameleons, specifically a stipulation that Parties were urged not to accept export documents from Madagascar that did not accurately indicate the species being traded. CITES Notification No. 833 (January 1995) deals with three points concerning: (1) recommendations that had been made about the trade in chameleons; (2) the response of Madagascar to these recommendations; (3) subsequent actions by the Parties.

Firstly (Notification No. 833 point 4), CITES reported that the 9th meeting of the Animals Committee had adopted further primary and secondary recommendations. These had been sent to Madagascar by the Secretariat of CITES on 12 January 1994 with a deadline for implementing primary recommendations 90 days after receiving notice. The recommendations were that Madagascar should: (1) suspend exports of *Chamaeleo* (now *Furcifer* and *Calumma*) species (except *Furcifer oustaleti*, *Furcifer lateralis*, *Furcifer pardalis* and *Furcifer verrucosus*) pending the establishment of scientifically based sustainable harvest quotas; (2) improve the effectiveness of its implementation of the convention by regularly submitting copies of all export permits; (3) cease to issue export permits that do not indicate the species involved; (4) implement a system to verify the identification of specimens before they are exported; (5) inform the CITES Secretariat of the biological basis for determining that exports of chameleons will not be detrimental to the survival of individual species (Jenkins, 2000). Secondly (Notification No. 833 point 5), the CITES Secretariat reported to the Standing Committee of CITES (5th November 1994) on the state of implementation of the primary recommendations. Following this information, Parties agreed actions and Madagascar was informed that it had to comply with conditions (either establish a cautious export quota for species concerned or implement the recommendations of the Animals Committee) by 23rd December 1994. If it did not, the Standing Committee would recommend that Parties should not accept imports from that country until it had implemented the primary recommendations of the Animals Committee. Madagascar failed to comply and was subsequently added to a list of countries contravening CITES in Notification to the Parties No. 800. Thirdly (Notification No. 833 point 6), due to Madagascar's failure to comply, the Standing Committee recommended to all Parties that they suspend imports until

Madagascar had implemented the relevant primary and secondary recommendations of the Animals Committee. This resulted in all *Furcifer* and *Calumma* species, except the four species stated earlier, being suspended from the trade (Carpenter, 2002, 2003; CITES, 2004).

CITES began communications with Madagascar on 12th January 1994, a process culminating in the notification of the trade suspension to all Parties in January 1995. CITES utilises trade suspensions as a means to aid compliance, as witnessed with Fiji, Yemen and Vietnam (Anon, 2002). Implementation of the trade suspension was attained only a year after the initial correspondence. During that time there was, and still remains, a lack of information regarding chameleon biology (Carpenter, 2003). Therefore, the failure of Madagascar to respond suitably to CITES must not be viewed simply as a disregard for CITES.

The third policy change, in 1999, was a national initiative produced in response to the actions and concerns of CITES, and resulted in 'The Experimental Management Program (EMP) for the sustainable use and commercial export of Chamaeleonid and Phelsumid lizards in Madagascar'. It was developed by the Ministère des Eaux et Forêts, in collaboration with participating partners, in an effort to address the CITES suspension and was underpinned by a Convention of Collaboration signed by the partners in July 1998 (Jenkins, 2000). Just three exporters (all partners of the EMP) were registered in the program when it was officially implemented in 1999, and it established an export quota of 2000 individuals per species on the four legally traded species (Jenkins, 2000). The willingness of the exporters to comply was generated through a proposal to CITES to increase permitted species, from 'the four' to nine (Jenkins, 2000).

These governance changes generate four periods in time from the entry of Madagascar to the trade (1985–1988, 1989–1994, 1995–1998 and 1999–2001), which will be used for the remainder of the analysis.

3. Responses of the trade volumes to changes in governance

Data on the number of animals traded were supplied by UNEP-WCMC, Cambridge, UK in the form of a compiled, comparative tabulation table (see Carpenter, 2003, for further detail). The data detail the volume of exports from Madagascar recorded by importing countries.

Between 1985 and 2001, a total of 193,768 chameleons were exported from Madagascar, with considerable variation between the different time periods (Table 1). From an initial export volume of approximately 1000 individuals year^{-1} prior to 1988, the number of individuals exported increased rapidly (62% per annum) following the first policy change to approximately 27,000 in 1994 when the CITES policy was introduced (Fig. 1). Numbers exported then fluctuated around this level for four years until the introduction of the EMP when the numbers declined by an order of magnitude in two years to increase again to over 7000 in the last year for which data were available.

Over 63% of the total export volume between 1985 and 2001 was exported between 1994 and 1998 with nearly 30,000 individuals being exported in 1998, the highest value for a single year. Over 75% of the total trade volume was accounted for by only three species (*F. lateralis*, *F. pardalis* and *F. oustaleti*), the export curves (Fig. 2) indicating that the supply or demand may have plateaued earlier for *F. oustaleti*, than for *F. lateralis*, *F. pardalis* or *F. verrucosus*. CITES policy

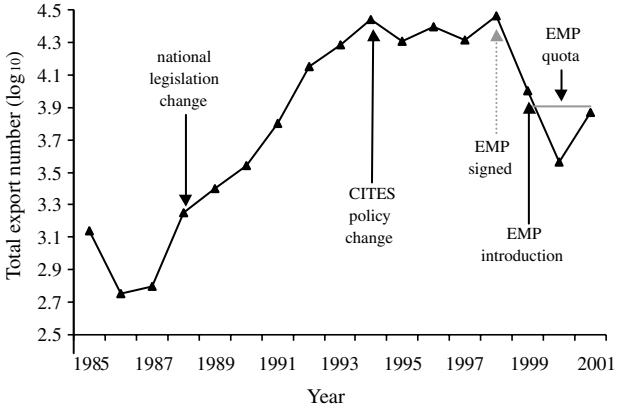

Fig. 1. The yearly number of chameleon individuals exported from Madagascar between 1985 and 2001. The rapid linear increase in the number of chameleons exported between 1988 and 1994 was best described by the equation $\log y = 0.21x + 2.99$ when 1988 is taken as year 0 (adjusted $R^2 = 0.90$, $n = 7$, $p < 0.001$). Details of the legislation and policy change are provided in the text.

Table 1
The number of individuals and species of chameleon exported from Madagascar between 1985 and 2001 during the four legislation/policy periods and over the period as a whole

Period	Length of period (yr)	Number of individuals	Mean number year^{-1} ± standard error
1985–1988	4	4361	1090 ± 298
1989–1994	6	73,461	12,244 ± 4050
1995–1998	4	94,770	23,692 ± 2082
1999–2001	3	21,176	7058 ± 1883
1985–2001	17	193,768	11,398 ± 2468

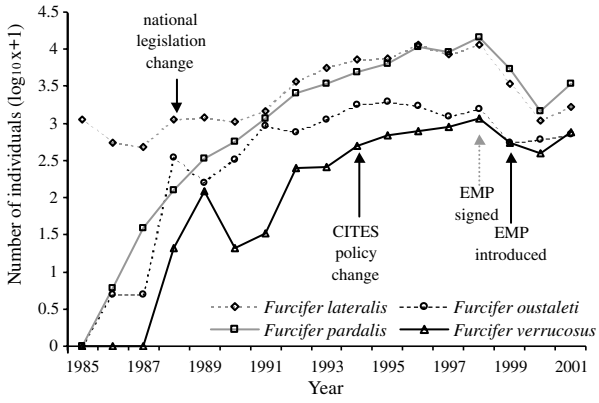

Fig. 2. Export numbers for the four official Malagasy chameleon species involved in the trade from Madagascar between 1985 and 2001. Details of the legislation and policy changes are provided in the text.

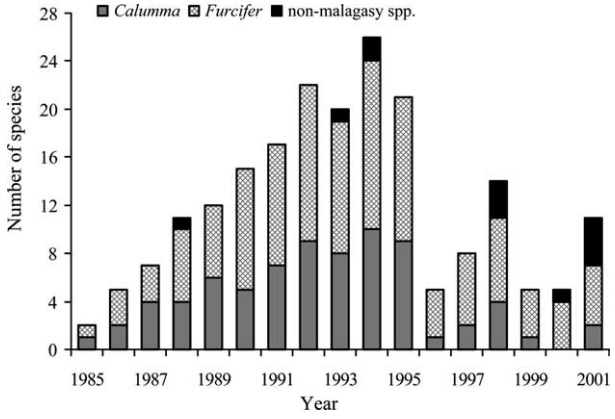

Fig. 3. The yearly number of chameleon species exported from Madagascar between 1985 and 2001. Species belonging to the *Furcifer* and *Calumma* genera are indicated separately together with non-Malagasy species.

artificially concentrated demand on these species from 1995 to 1999, after which the EMP then limited the volumes to an arbitrarily set 2000 individuals in each species, without any biological justification. A reduction in volume is seen from 1998 due to the activation of the EMP, and with exporters' willingness to comply from that year even though officially it did not come into force until 1999 (Fig. 1).

Contributing to the total volume of trade from Madagascar were a small number of non-Malagasy chameleons (0.6% of total volume). Only 50 (4% of non-Malagasy total volume) individuals were exported between 1985 and 1988 when the first national legislation change was enacted. Exports then increased to 307 individuals between 1989 and 1994 when CITES intervened. Volumes then decreased between 1995 and 1998 to 37 when the EMP was introduced before increasing again to 870 individuals between 1999 and 2001. The origin of these non-Malagasy species was Europe and mainland Africa.

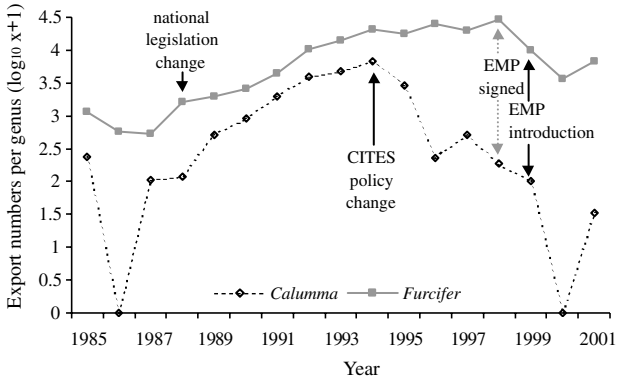

Fig. 4. The numbers of *Furcifer* and *Calumma* chameleons exported from Madagascar between 1985 and 2001. The rapid linear increase in the number of *Furcifer* and *Calumma* exported between 1988 and 1994 are best described, respectively, by the equation $\log(y+1) = 0.20x + 2.92$ (adjusted $R^2 = 0.96$, $n = 7$, $p < 0.001$) and the equation $\log(y+1) = 0.28x + 2.05$ (adjusted $R^2 = 0.92$, $n = 7$, $p < 0.001$) when 1988 is set at zero. Details of the legislation and policy changes are provided in the text.

4. Responses of the species composition to changes in governance

While only two species (*Calumma parsonii* and *F. lateralis*) were traded initially in 1985, 11 (all Malagasy) in total were traded internationally prior to 1988 when the first national legislation change was implemented (Fig. 3). Thirty species were traded between 1989 and 1994 (90% Malagasy) with a maximum of 26 species in any one year, 1994, when the CITES' policy was introduced. The number of species exported per annum then declined to five in 1996 but rose to 14 in 1998, with 25 species traded between 1995 and 1998 in total (88% Malagasy). With the introduction of the EMP the number of species exported dropped to five, respectively, in both 1999 and 2000 but increased to 11 in 2001; 11 species in total (64% Malagasy) were traded between 1999 and 2001.

Two genera of 'true' chameleons have been historically traded from Madagascar (Fig. 4): *Calumma* spp. from the rainforests located in the east and *Furcifer* spp. from the dry forests of the west and anthropogenically altered landscapes (Carpenter, 2003). Collection sites vary according to the species. Collection of *F. oustaleti* and *F. lateralis* is carried out in the countryside surrounding the capital, Antananarivo. *F. pardalis* is collected from many localities around Ambanja, Toamasina, Nosy Be and Sambava, while *F. verrucosus* is said to be collected around Tulear (Carpenter, 2003). Collection sites for other species are not known due to a lack of records during the periods when these species were traded. Note that the rapid increase in chameleons

exported in the late 1980s and early 1990s (Fig. 4) was higher for *Calumma* (91% per annum) than for *Furcifer* (58%), but that the trade in *Calumma* collapsed over a five year period following the CITES cessation in their trade.

Although only four Malagasy species could be legally imported from Madagascar after 1994, it was only in 2000 (Fig. 3) that the CITES database indicates trade was only in those four species. However, there has only been one account of a consignment being seized because it contained non-permitted species, highlighting possible concerns regarding the enforcement of CITES (Carpenter, 2003).

Seven known species of non-Malagasy chameleons, together with unknown species, were exported from Madagascar. These originated from Comoros (*Furcifer cephalolepis*), Europe (*Chamaeleo chamaeleon*) and eastern (*Bradypodion fischeri*, *Chamaeleo bitaeniatus*, *C. fuelleborni*), western (*Chamaeleo cristatus*) and central (*Chamaeleo chapini*) Africa. One non-Malagasy species was exported after the first national policy change was enacted, between 1985 and 1988, after which trade increased to three species between 1989 and 1994. After the CITES restrictions were introduced three species were traded between 1995 and 1998. The introduction of the EMP reduced the number of non-Malagasy species traded to two known and one unknown species between 1999 and 2001.

5. Effect of legislation on network and economic trade structures

Stakeholder interviews were conducted on Madagascar from which trade structures could be analysed. The network structure of the trade consists of a three tier structure. Local village collectors (called Ramasseur) occupy the first and lowest tier; these are rural Malagasy located in remote villages that lead a subsistence lifestyle. Their involvement in the trade is on a casual basis. Intermediaries (called Collecteur) occupy the second tier; they are Malagasy people mostly based in, or around, Antananarivo. They have a full time involvement in the trade. Exporters also have a full time involvement in the trade and occupy the third and highest tier. In 1999 the EMP officially recognised three export businesses, with two managed by foreign nationals and one by a Malagasy national.

Between 1989 and 1994 there were at least nine collectors, four intermediaries and six exporters compared with 1995–1999 when at least 19 collectors, four intermediaries and 13 exporters were known to operate. After the introduction of the EMP in 1999 the number of collectors fell to four, the number of intermediaries remained at four and the number of exporters fell to three, increasing to five in 2001. Interviews established

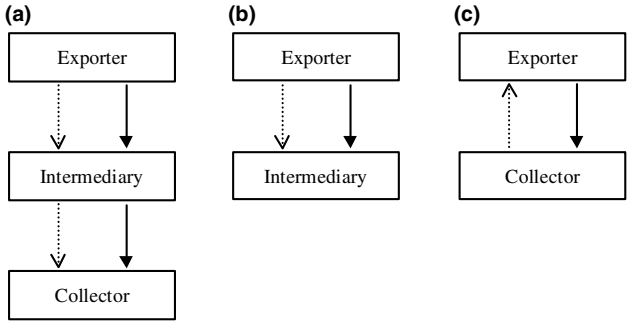

Fig. 5. Variations to the management prescribed structure in the supply chains for the four legally traded chameleon species from Madagascar: (a) management structure; (b) structure for *F. pardalis* collection; (c) structure for *F. lateralis* and *F. oustaleti* collection around Antananarivo. Dotted arrows show the direction of supply and solid arrows show flow of revenue.

that there were actually many more collectors still operating in the supply of other species, but it was not known how many. It was also established that supply chains varied (Fig. 5) between the four species and did not necessarily follow the three tier structure detailed in the EMP (Ramandimbison, pers. com.). The two species collected around Antananarivo (*F. oustaleti* and *F. lateralis*) were supplied both using the official structure (Fig. 5(a)) and by local people capturing chameleons as they encountered them and taking them directly to the exporters (Fig. 5(c)) for payment lower than the officially set figure. Only one intermediary supplied exporters with *F. pardalis* apparently (Fig. 5(b)). This structure could only be correct for individuals supplied from Nosy Be, an island off the northern coastline, the base for this intermediary. Yet wholesalers and retailers put much emphasis on the fact that they have for sale specific colour morph variants, each variant originating from a specific area and these areas being very widely spread.

People on Madagascar involved in the wildlife trade are secretive and often reluctant to provide information directly. Therefore, price and income data were obtained from various sources: invoices ($n = 18$) submitted to government departments, company price lists ($n = 64$), reports (Ferraro, 1994; Jenkins, 1994) and interviews ($n = 16$) with wildlife trade stakeholders on Madagascar. Due to prices varying greatly between species (e.g., 5–250 US$ at export) and CITES policy limiting trade to four species, calculations regarding the generation and distribution of revenues from the trade were based on mean price of the four species within each time period(-see Carpenter, 2003, for further calculation detail). To permit comparisons across periods, mean period price was converted to US$ (using the relevant years' exchange rate) then adjusted to 2003 prices (using the consumer price index) (Perman et al., 1999).

Comparing prices for the four species across all periods was not possible because no data were collected for

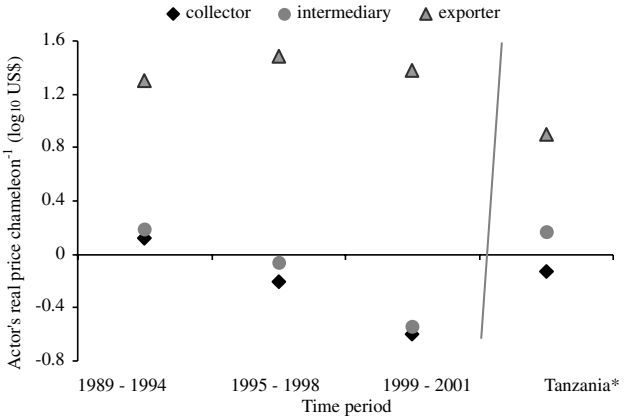

Fig. 6. Real prices paid (US$) per chameleon to actors involved in the chameleon trade on Madagascar over three time periods and to counterparts in Tanzania (Roe et al., 2002). Prices are adjusted by the Consumer Price Index to 2003 prices and are based on the prices paid for the four legally traded species after CITES actions. The species included in the Tanzanian trade were *B. fischeri*, *Chamaeleo dilepsis*, *Rhampholeon brevicaudatus*.

period 1 (Fig. 6). Collectors received their best chameleon price, US$ 1.31, per individual between 1989 and 1994. This value fell consecutively over the following two periods to US$ 0.62 between 1995 and 1998 and US$ 0.25 between 1999 and 2001. Similarly, intermediaries received their best chameleon price, US$ 1.55, per individual between 1989 and 1994. The value also fell consecutively over the following two periods to US$ 0.87 between 1995 and 1998 and US$ 0.29 between 1999 and 2001. In contrast, exporters received their lowest price, US$ 20.18, between 1989 and 1994, increasing to a high of US$ 30.44 between 1995 and 1998 before falling to US$ 23.83 between 1999 and 2001. Comparing the figures from the last time period (1999–2001) with chameleon trade counterparts in Tanzania (Fig. 6), Malagasy collectors received 33% less, Malagasy intermediaries 20% less, while Madagascar's exporters received 300% more for an individual chameleon.

Economically, the period between 1989 and 1994 created the best monetary returns for both Malagasy collectors and intermediaries. Many chameleon species have well defined spatial distributions and it is assumed that collectors would have corresponded closely with species' distributions. Therefore, the greater number of species traded prior to CITES actions suggests the nine local collectors reported for the first period must be considered a minimum. Therefore, the economic structure was at its best, regarding both the number of Malagasy gaining an income and the prices they received, between 1989 and 1994.

Governance actions were best adhered to when exporters on Madagascar showed political willingness by co-ordinating with efforts to establish a management structure on the trade. The EMP represented a form of voluntary self-regulation with compliance observed prior to enactment. The numbers of individuals and species were greatly reduced after its establishment (Figs. 1 and 3) and, in 2000, recording the most efficient enforcement of both international and national legislation. The EMP incurred costs in three main ways: (1) a reduced number of Malagasy involved in the trade, therefore, fewer incomes generated for local people; (2) exporters were in a position to dictate who was permitted to trade; (3) exporters dictated the price differentials experienced between exporter and either intermediary or collector.

6. Discussion

Changes in governance have had major impacts on the levels and structure of trade in chameleons from Madagascar. Allen and Edwards (1995) state that legislation should facilitate the sustainable use of resources not make it impossible, and that national policy should ensure resources are valued at rates that compete with other forms of land use. The liberalisation of Madagascar's exports in 1988 was intended to expand international trade and increase foreign revenue. It did result in an increase in GDP and, therefore, could be viewed as a success (Cadot and Nasir, 2002). The number of chameleons harvested from the wild increased rapidly between 1988 and 1994, supporting the view that trade liberalisation tends to accelerate resource exploitation (Laurance, 1991). Aquaculture has similarly witnessed increased trade on exposure to new markets following national policy reforms (Battacharya et al., 1999; Noshab, 2002).

However, Robinson (1993) states that national goals to increase GDP via increased exports only result in increased consumption, deforestation, overgrazing and over cultivation whilst per capita incomes decline. The experience on Madagascar is that trade liberalisation resulted in an increase in the harvesting and export of species, which also initiated an increase globally in the chameleon trade (Carpenter et al., 2004). After the national reforms and up to CITES actions, the rate at which the trade increased was on average 62% per annum. However, over the same period, exports in *Calumma* increased at 90% per annum in contrast to *Furcifer*, which increased at 59% per annum, indicating clearly a market preference for *Calumma* species.

Concern over the level of trade from Madagascar led CITES to recommend restricting imports to just the four chameleon species belonging to the genus *Furcifer*. The effect of the CITES recommendations was to cap the trade at approximately 20,000 chameleons per annum, with *F. lateralis*, *F. pardalis* and *F. oustaleti* dominating the trade. Exports in *Calumma* species collapsed, but apart from the year 2000 there have always been some imports of species belonging to this genus. Similar successful controls on trade have been recorded

for avian species also (Jepson et al., 2001; Roe et al., 2002).

Successful trade restrictions can have a number of undesirable side effects, such as the creation of a black market trade if the wildlife resource remains in high demand (Heltberg, 2001). Similarly, unemployment or the lowering of incomes for those involved in the wildlife trade (Stoett, 2002; Heltberg, 2001), switches to unprotected or substitute wildlife resources (Santiapillai et al., 1999; Huitric et al., 2002), or a change in land use (Battacharya et al., 1999) may be encountered. In the case of both the CITES restrictions and EMP establishment there is little evidence for a black market trade in chameleons, despite misidentification and consignments containing non-tradable species. There is much evidence highlighting reductions in Malagasy incomes after CITES and EMP actions, the EMP reducing greatly the local incomes generated from the trade. Similarly, it is only after the EMP that the number of Malagasy stakeholders involved in the trade is observed to greatly decrease. There is much evidence of a shift in trade to only those species that are officially traded after the CITES actions, but also a shift to substitute chameleons from other countries after the EMP.

Despite claims that Madagascar is involved in substantial illegal trade (Hoover, 1998), this study encountered little evidence in the field for such claims. This was the case even in the more desirable *Calumma* species following their suspension from the trade. This implies either that the demand for *Calumma* is very limited and/or the prices paid for individual *Calumma* are too low to provide enough of an incentive for people to involve themselves in illegal trade. Heltberg (2001) emphasised the importance of a drop in demand together with prices if no black market is to emerge following trade restrictions, although this ultimately means lower incomes for local people (Stoett, 2002). A drop in demand may result from changes of attitude in the demand country, as witnessed with seal culls and the fur trade (Roe et al., 2002) or through the substitution of an alternative resource.

Where incentives are favourable for the continuation of trade loopholes in international agreements can be found allowing trade to continue, for example through exports from a neighbouring country (Heinen et al., 1995; Iriarte et al., 1997) or deliberate misidentification of the exported product. Madagascar has been the source country in previous illegal trading court cases (Hoover, 1998), and there is evidence of endemic chameleons from Madagascar having been exported from other countries in the region (Carpenter, 2003). Consignments from Madagascar have included non-native species and cases where the species identity was not provided. However, the numbers involved were low and greater awareness and emphasis is now on management authorities of importing countries to improve their enforcement of CITES legislation (Carpenter, 2002, 2003).

An alternative to the creation of black markets as a response to the closure of trade is substitution, either in species or source. Species substitution is a relatively common experience, for example cattle bone and sambar antler for ivory (Santiapillai et al., 1999) and mole rat bone for tiger bone (Hogan, 2000). Individuals from a captive breeding centre can also substitute wild caught individuals, such as observed in snakes and tortoises (Hoover, 1998), ginseng (Bolgiano, 2000), deer (Iriarte et al., 1997) and Malagasy chameleons (Angus Carpenter, pers. obs.). However, although there is some evidence for an increase in the number of captive bred chameleons traded through time the number remains small and the international trade remains dominated by wild caught animals (Carpenter et al., 2004). However, the USA dominates the import market and the supply of captive bred animals (Hoover, 1998; Carpenter et al., 2004). Therefore, the importance of captive bred animals as an alternative source could be underestimated if the USA market is supplied internally.

It has been highlighted that CITES actions successfully resulted in a shift in the species exported from Madagascar, from a mix of *Calumma* and *Furcifer* to only *Furcifer* species. Concomitantly, a shift in the distribution of local benefits gained from the trade is observed, away from the rainforests in the east, which are the centre of much conservation interest on Madagascar. Evidence for a substitution of resources also comes from an increase in the number of species traded from other countries (Carpenter et al., 2004).

Often scepticism surrounds the intentions of global governance institutions, with the USA and western Europe viewed as using such organisations to promote a form of soft cultural imperialism or eco-colonialism (Crowe and Shryer, 1995; Noshab, 2002; Stoett, 2002). The fact that the Experimental Management Program (EMP) was indigenously generated on Madagascar indicates a willingness to address the issue of management of the trade. At its inception, the EMP was effective in restricting the number of chameleons exported. The exporters' incentive to comply was a possible expansion in the number of chameleon species permitted in the trade. However, it also permitted longer term benefits for exporters as they effectively managed their own trade, setting prices and dictating who could be involved. Therefore, the EMP essentially represented a cartel. However, the exporters' enthusiasm for the program waned once it became clear that CITES would not allow the number of species to increase, leading to frictions between the exporters. Due to CITES restricting the number of species and the EMP reducing the number of individuals traded resulted in a consumer market being only partially fulfilled. Therefore, when exporters no longer supported the EMP, incentives were

there to increase trade again. Hence, the number of chameleon species and individuals exported increased in 2001, under the ranched or captive bred categories of CITES (Carpenter, 2003). Currently, Madagascar imposes taxes on wildlife exports; 4% of invoice value for wild caught individuals, 2% from ranched and captive breed 1% (Jonney Rajaonimanana, pers. com.).

The effect of trade restrictions on the income of local people can be positive or negative (Roe et al., 2002). This study showed that chameleon prices differed before and after trade restrictions with local people, both collector and intermediary, suffering disproportionately greater price reductions than exporters. Currently the involvement of local people in the trade is casual, further investigations should be conducted into the possibilities of recruiting local people permanently. Their greater involvement would require a fairer allocation of benefits from the trade to permit a shift of income away from detrimental deforestation practices, currently the greatest risk for biodiversity on Madagascar (Myers et al., 2000). The shift in the collection of chameleons to *Furcifer* would also have denied collectors in the east further income from the trade. If the trade were to sustain local people involvement across Madagascar to benefit conservation, then the resumption in trade of *Calumma* species would need to be proposed to permit wider access to such revenues. The collectors and intermediaries incomes were reduced further when the EMP (dominated by a cartel of powerful exporters) imposed an economic structure on the trade. While protecting exporter incomes it reduced the income of intermediaries and collectors. This resulted in a near 100-fold differential between the price paid to exporters and local collectors, in contrast to a 10-fold difference in Tanzania.

This study has shown the highly complex network and interactions that make up trade networks in natural resources. It has also shown predictable and unpredictable consequences resulting from actions aimed at governing the trade. The increase in chameleon exports from Madagascar should have been expected with trade liberalisation. The degree to which the increased trade threatened the conservation of species is still unknown. CITES actions were quick and effective in their aim to cap the trade, and must be regarded as a considerable success. But the conservation benefits are unclear due to a lack of population monitoring and the benefits from wildlife resources to local people diminished. The allocation of benefits to local people was further reduced following the EMP, with the collapse of the EMP resulting in a period of uncertainty. Local people receive fewer benefits from the chameleon trade at a time when efforts should be made to develop the conservation benefits. An extreme lack of goodwill between exporters and those involved in the governance of the trade also exists. Despite still being listed as not tradable, there has been an increase in the number of *Calumma* species traded since the effective collapse of the EMP. This highlights the need to provide sufficient incentives for all stakeholders to remain within programs developed for best management of resources.

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