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THE CALL OF THE WILD:

captive crocodilian
production and the
shaping of conservation
incentives

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Front cover photograph: *Crocodylus niloticus* hatchlings, Africa.

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THE CALL OF THE WILD:

CAPTIVE CROCODILIAN PRODUCTION AND THE SHAPING OF CONSERVATION INCENTIVES

James MacGregor

July 2006

Credit: Steven Broad/TRAFFIC



Siamese Crocodile *Crocodylus siamensis*, Tonle Sap, Cambodia.

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EXECUTIVE SUMMARY

Many crocodilians experienced uncontrolled exploitation in the past when sub-adult and adult crocodiles were hooked, speared, shot or otherwise killed, largely for their skins for international trade. Subsequently, species and populations were protected and over time several successful commercial crocodilian conservation initiatives have been made. Some of these are still based on the offtake of wild animals, many are based on the offtake of eggs from the wild, but increasingly crocodilians are captive-bred. A lack of systematic economic analysis of the global trade in crocodilian skins has been an obstacle to assessing the full potential for the conservation of crocodilians from a market-driven perspective. The means to address this gap were considered by members of the Crocodile Specialist Group (CSG) of the Species Survival Commission of IUCN—The World Conservation Union and TRAFFIC, resulting in the commissioning of this study to assess:

- the impacts on markets for crocodilians of the shift away from their wild harvest towards captive production and
- the impacts on conservation of wild crocodilians of this shift.

To inform the study, research focussed on Colombia, the largest supplier of crocodilian skins to the international market; Zimbabwe, also a prime supplier of crocodilian skins; and France, Italy and Japan, as major consumer countries. Interviews with crocodilian skin industry participants in these last-mentioned countries were conducted from November 2002 to May 2004 and further information was obtained from literature, international trade data and members of the CSG.

Crocodilian skin production in Colombia today is virtually all from captive-bred crocodilians, where the breeding stock is captive, and has an assured place in the market, including in new and growing markets, for example, in Asia. Colombia's crocodilian skin production comprises, almost exclusively, caiman skin, the leather from which is now prized as high quality, having previously taken second place to the widely favoured 'classic' leather from crocodiles and alligators. Zimbabwe's production is based on a mixture of 'ranching', in which eggs are harvested from the wild and raised in captivity, and captive breeding, and the proportion from captive breeding is steadily increasing.

The picture in Colombia and Zimbabwe is mirrored by the imports of the major crocodilian skin consumer countries surveyed, which chart a decline in demand for wild-harvested crocodilian skin, to the point of its virtual exclusion from the trade. Study of the crocodilian skin industry in these countries reflects the upward drift of caiman skin in terms of quality and the consequent blurring of the caiman/classics divide. It also reveals a re-structured industry, with a newly-dominant retail sector, partly governed by powerful fashion-brand conglomerates with global reach. Conservation principles are reported to be absent from retailing strategies and consumers' buying decisions. Where conservation is considered, judgements are simplistic and favour captive-reared crocodilians, without any distinction between ranched and captive-bred sources.

Initial drivers for the shift away from wild-harvested crocodilian production included conservation motives. The premise on which those motives were based, however, has become outdated by the far-reaching changes the crocodilian skin industry has witnessed since the establishment of the first ranching and captive breeding operations. Largely as a result of the success of these, the industry has come to depend upon the quality and reliability of skins from their captive stock and, indeed, has restructured in parallel and in concert with the development of captive-reared crocodilian production to the point where attributes of captive crocodilian skins coincide with those valued by the crocodilian skin industry and are what the market wants.

The rationale for market-driven conservation, on which much crocodilian conservation has been founded, is that the financial benefits of commercial exploitation of the species can be harnessed within a management and regulatory framework to provide strong incentives for conservation. This study suggests that the link between commerce and the incentive for conservation is declining since the links between the crocodilian skin industry and wild populations of crocodilians are increasingly tenuous. The conservation motive for restimulating trade in wild crocodilian skin was clear. Wild crocodilians could once again be imbued with a trade value and, furthermore, one which outweighed their nuisance factor and the value of other potential uses of their habitat. This report suggests that wild-harvested crocodilians once again need to be valued by the exotic skin industry, so that sustainable harvesting of wild crocodilians (i.e. hunting or ranching) will increase. What is less clear is how this might be achieved, but satisfaction of both the conservation requirement for a revival of use of wild crocodilians and market criteria could be achieved, and in this regard it is worth considering that:

- the crocodilian skin industry, or any industry founded on wild resources, is unwise to turn its back on the wild supply;
- wild crocodilian skins retain some advantages in today's market—wild classic skins remain at the vanguard of the strategy of luxury brands;
- conservation messages are not precluded from the fashion world and, with careful planning and development, conservation and brand messages could be synchronized and complementary;
- captive breeding has a role to play in any crocodilian skin industry based on increased use of wild crocodilians and should not be viewed as a production method that needs stamping out.

In the spirit of satisfying conservation and market criteria for crocodilian skins, it is recommended that market potential to favour conservation is harnessed, as outlined below.

Conservation bodies, in co-operation with crocodilian skin industry participants, should.....

-seek out conservation champions
-encourage retailers to realize the potential benefits of the conservation message as a marketing tool.

Crocodilian range State governments, donor agencies and private companies should work together to....

....manage supply, in order to place wild crocodilian populations once again at the heart of the industry, by considering, for example, tied trade; capping captive breeding; quota systems; stimulation of smallholder entry and sustainability along the supply chain; development of a 'conservation brand'; scanning for perverse incentives; conservation tithes.

To improve quality and productivity from wild and ranched crocodilians, producers of wild crocodilian skins should.....

-focus on quality improvements
-review enhancement of the value from wild and ranched crocodilian populations
-research into the potential role of industry associations in securing advantage for wild and ranched crocodilian skins
-learn by example—there is a wealth of experience in sustainable use of wild crocodilians to learn from.

To maximize potential usefulness of trade data, CITES Parties should.....

-improve data, so that it more keenly supports conservation requirements.

INTRODUCTION

All crocodilians are listed in Appendices I or II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which theoretically means they are considered either to be endangered in the wild as a result of trade (largely in their skins) or to be sufficiently vulnerable that they may become endangered without close control of their trade. Appendix II also includes so-called ‘look-alike species’, i.e. species of which the specimens in trade look like those of species listed for conservation reasons. The lack of systematic economic analysis of the global trade in crocodilian skins has been an obstacle to assessing the full potential for their conservation from a market-driven perspective. Information fundamental to this approach, such as the transmission of price signals between producers and consumers, has been unreliable and incomplete. A previous study conducted during 2001 and 2002 (MacGregor, 2002) attempted to address this challenge and identify the factors that will affect the development and success or failure of market-based approaches to conservation of crocodilian populations. The draft report, *International Trade in Crocodilian Skins: Review and Analysis of the Trade and Industry Dynamics for Market-based Conservation*, indicated a ladder of options for future work on the links between the crocodile skin industry and conservation. These options were discussed and developed at a workshop organized at a meeting of the Crocodile Specialist Group (CSG) of the Species Survival Commission of IUCN—The World Conservation Union, in Gainesville, in October 2002, and throughout 2003 by the author in collaboration with CSG members and TRAFFIC International staff. Two of the areas identified for further work are the subjects of this report:

- the assessment of the impacts on markets for crocodilians of the shift away from their wild harvest in favour of captive production
and
- the assessment of the impacts on conservation of wild crocodilians of this shift.

CITES data show that, over the past several decades, captive rearing of crocodilians has increased and often replaced wild harvest as a means of obtaining skins for commercial use. By focussing research on two supply countries—Colombia and Zimbabwe—and through interviews with stakeholders in the crocodilian skin industry in France, Italy and Japan, this study researched the nature of the drivers for the shift away from wild-harvested crocodilian skins before seeking insight into how the shift has affected the markets for crocodilian skins (with reverberations through the supply chain). The characteristics of the industry supply chain are well-documented (MacGregor, 2002) but its markets are less well understood. Certainly, there is a luxury market, but the nature, longevity and dynamics of non-luxury markets for crocodilian skins remain unclear. Finally, by evaluating how the shift in production has influenced the conservation status of affected crocodilians, it aims to uncover levers for such conservation.

After presenting background information on crocodilians and the trade in their skin, this report outlines the present-day supply side of the trade in Colombia and Zimbabwe and the crocodilian skin industry in consumer countries, drawing on the interviews with industry stakeholders in France, Italy and Japan. Key findings are analysed with the main research objectives in mind and recommendations for optimizing conservation options are presented.

BACKGROUND

HISTORICAL TRADE IN CROCODILIANS AND THE MOVE TO CONSERVATION

The term crocodilian refers to the 23 living species of crocodile-like animals comprising the order Crocodylia (alligators, caimans, crocodiles, gharials and false gharials) (King and Burke, 1989). Crocodilian skin has been used by humans for centuries, both for functional and fashionable purposes (Britton, 2002). At least 15 species of crocodilian are or have been commercially traded for their skins on a regular basis; some trade has also occurred in the others (Brazitis, 1987). Until relatively recently, all crocodilian skin came from wild animals.

During the 1920s, the skins were associated exclusively with luxury items, mainly high-priced shoes, but as early as the 1930s they began to be used for mass-produced items. The historical peak of the trade in crocodilian skins appears to have been 1945-1960, during which period over three million wild-taken skins were marketed each year (Luxmoore, 1992). Crocodilian leather in trade was divided, then as now, into ‘classic’ and ‘non-classic’ categories, the distinction being made on the quality of the leather. High value and low volume characterized the former category and low value, high volume caiman skins the latter (Luxmoore, 1992). Although evidence is limited, it is accepted that as recently as the early 1970s, up to two million crocodilian skins were traded each year, of which three-quarters were caiman (Hutton *et al.*, 2001). By 1984, this had been reduced to less than one million. The level of classics in trade in the 1950s and 60s may have reached 500 000 skins per year, but later estimates suggest that this had decreased to around 300 000 by the early 1970s and to 150 000 by 1984, numbers having plummeted owing largely to the over-harvesting of accessible wild populations (Luxmoore, 1992).

The status of several crocodilian populations globally became precarious and forward-thinking individuals and bodies were advocating harvest restrictions by the late 1960s (Britton, 2002). Protection was granted to crocodiles in northern Australia in the late 1960s and early 1970s and CITES entered into force around the same time, in 1975. All living crocodilian species were immediately listed under CITES, most of them in CITES Appendix I (affording the highest level of protection), reflecting how close to extinction some species had come (Britton, 2002). Although all crocodilian species are still CITES-listed—those not in Appendix I are listed in Appendix II, which lists species which may become endangered unless trade is regulated—their conservation status is much improved relative to the beginning of the 1970s. Co-operation between crocodilian farmers, crocodilian skin traders, tanners, manufacturers, designers and major retailers, and regulation, have been critical to this conservation success.

CROCODILIAN CONSERVATION FROM THE 1970s

Wild crocodilian conservation and sustainable use

From the 1970s, once the harm caused by uncontrolled exploitation had been realized, improved protection and tightly controlled exploitation rescued many crocodilian populations from continued decline. Sustainable use became a byword for crocodilian conservation, especially after the workability of sustainable use schemes was demonstrated in several diverse countries (Ross, 1998a). The two key ideas behind sustainable use are the capacity to react promptly to any drop in wild crocodilian population levels and the principle that the people most likely to over-exploit a resource have the greatest vested interest in maintaining it (Ross, 1998a). Re-investment of resource rents—that is investing some profits in ensuring a sustainable flow of income from the natural resource—is also recognized to be important for successful sustainable use of crocodilians (Ross, 1998a). Hunting wild specimens, ranching or captive breeding can all be forms of sustainable use of crocodilians—

although once captive breeding programmes become fully operational, they may lose their link with the wild resource almost completely. Sustainable use of crocodilians has benefitted immeasurably from the support of prominent traders and manufacturers in the crocodilian trade. Winning over the commercial sector to the idea that profits could grow (or at least not diminish) with sustainable use schemes in place provided powerful leverage for compliance and investment by producers (Ross, 1998a).

Wild crocodilian conservation and CITES

Because the main economic benefit of crocodile use is derived from international trade, a stringent system for controlling such commerce was instrumental to controlling use and ensuring sustainability (Ross, 1998a). CITES provided this system and has had an enormous impact on international crocodilian trade (Luxmoore, *et al.*, 1985; Hutton, 2001). CITES listings slowly reduced the supply of wild crocodilians to trade and CITES in turn adapted its controls to respond to developments in other forms of production of crocodilians. As a result, there were transfers of some crocodilian populations from Appendix I to Appendix II for a variety of reasons and using a variety of mechanisms so that, by 1992, there were at least five different levels of control accorded to crocodilians under CITES, as follows (Luxmoore, 1992):

- i) Appendix I
- ii) Appendix I, ‘bred in captivity for commercial purposes’
- iii) Appendix II, transferred from Appendix I for ranching
- iv) Appendix II, on the basis of an interim transfer from Appendix I and subject to quota
- v) Appendix II

Over 20 countries were successful in transferring their populations of crocodilians from Appendix I to II for ranching purposes (MacGregor, 2002) and ranching and quotas continue to be used as precautionary measures in management programmes for crocodilians (Hutton *et al.*, 2001). At least 30 countries are allowed under CITES to export crocodilians (from wild, ranched or captive-bred sources) (see **Table 3**). Crocodilian skins must be tagged with a unique number (see *Resolution Conf. 11.12, Universal tagging system for the identification of crocodilian skins*) in order to be exported legally, according to CITES regulations. In other words, CITES has been central to the gradual replacement of unregulated crocodilian exploitation with other forms of crocodilian production, notably ranching and captive-breeding.

THE CROCODILIAN SKIN INDUSTRY (1980s ONWARDS)

Methods of crocodilian production

The fundamental change in production of crocodilian skin during the last quarter of the twentieth century was wrought by the establishment of hundreds of crocodilian farms worldwide (Luxmoore, 1992). Crocodile farming may be defined as the rearing of crocodilians in captivity for commercial production of skins or other products, or for live animal sales (Luxmoore, 1992). It is important to note that there is some confusing technology here. Where crocodilians are concerned, farming refers to the raising in captivity of crocodilians which originate either from wild-harvested eggs or hatchlings, or eggs produced by captive adults. The former is termed ‘ranching’, the latter ‘captive breeding’. Some farms were established by the early 1980s and several even earlier—Nile Crocodiles *Crocodylus niloticus*, for example, have been ranched in Zimbabwe since 1965 (Luxmoore, 1992), but a distinct upward trend in the number of farms established began in the late 1980s (see **Table 1**). The full extent of the declining trend in wild-harvested animals is hidden from CITES trade data, as not all countries

Table 1

Estimated number of crocodilian skins supplied to the industry by method of production (includes caiman production), 1977-99

Year	Wild	Ranched	Captive-bred	Total
1977	306 337	1258	0	307 595
1978	400 917	175	0	401 092
1979	380 405	991	0	381 396
1980	1 117 219	1039	0	1 118 258
1981	945 000	3029	567	948 596
1982	830 045	3165	177	833 387
1983	861 954	6424	172	868 550
1984	846 951	11 565	632	859 148
1985	1 260 776	17 729	1384	1 279 889
1986	858 312	20 383	3287	881 982
1987	618 603	32 562	6964	658 129
1988	975 774	55 000	8995	1 039 769
1989	527 573	118 854	49 604	696 031
1990	452 486	135 751	112 488	700 725
1991	304 563	164 648	149 946	619 157
1992	259 562	194 389	250 913	704 864
1993	240 029	213 635	576 384	1 030 048
1994	270 174	251 849	599 189	1 121 212
1995	224 483	228 930	846 584	1 299 997
1996	180 855	231 168	690 815	1 102 838
1997	202 809	252 394	534 734	989 937
1998	120 011	236 216	722 978	1 079 205
1999	93 151	255 945	856 143	1 205 239

Source: CITES trade data, supplemented by information provided by the CSG.

trading were Parties to the Convention and because Zimbabwe, France and Italy were initially not bound by CITES regulations pertaining to *C. niloticus*. Nonetheless, the data sketch a trend of falling wild harvests of animals in favour of ranching and, subsequently, captive breeding (**Table 1**).

With the establishment of crocodilian farms, three separate modes of production of crocodilian skins became possible—wild-harvesting, ranching and captive breeding. Definitions and descriptions of these terms follow:

Wild-harvesting

Skin from wild-harvested crocodilians is derived from crocodilians that have spent their entire life cycle (or a large proportion thereof) in a natural (not man-made) environment until harvest. A number of countries still produce crocodilian skins from wild animals—see **Tables 3 and 4**.

Ranching

Ranching crocodilians involves collecting specimens from the wild and rearing them in a controlled environment. CITES has its own definition of the term (in CITES *Resolution Conf. 11.16*).

Ranching is considered a highly precautionary and biologically ‘safe’ method of harvesting, because it relies on harvesting (usually) the youngest life stages that regularly experience high mortality in the wild (Hutton *et al.*, 2001). Initially, captive production was from ranches, not from captive-bred crocodilians (Ross, 2001). Biological studies in the USA, Australia, Papua New Guinea, Venezuela and Zimbabwe all demonstrated that crocodilian populations could sustain moderate harvests, particularly of eggs (Ross, 2001). Parallel developments in the technology of commercial crocodilian raising allowed widespread attempts at ranching and a model arose whereby the preservation of natural habitats, monitoring of wild populations and economic incentives to local landowners and stakeholders were all supported by sustainable crocodilian ranching (Fernandez and Luxmoore, 1996; Joanen *et al.*, 1997; Ross, 1998a). Ranching increased markedly in the 1980s (MacGregor, 2002) and the number of ranched skins stood at approximately 250 000 in 1999 (**Table 1**) (mostly American Alligator *Alligator mississippiensis*).

Captive-breeding

Unlike ranched crocodilians, captive-bred crocodilians are born in captivity. CITES has its own definition of ‘captive-bred’ (in CITES *Resolution Conf. 10.16 (Rev.)*), which states that the term refers to specimens ‘born or otherwise produced in a controlled environment’ if:

- i) the parents were in a controlled environment at the time of development of the offspring; and
- ii) the breeding stock was established legally and in a manner approved by CITES. It must also be maintained without the introduction of specimens from the wild (with certain exceptions) and must have produced offspring of at least second generation (F2) in a controlled environment or be managed in a manner that has been demonstrated to be capable of doing so.

Captive breeding operations must be registered with the CITES Secretariat in order to trade legally under CITES and approval may be withdrawn if they fail to comply with the required conditions.

Ranching was perceived by some authorities and entrepreneurs as impractical, considering the costs of harvesting wild populations on an ‘adaptive management’ basis (by monitoring, field surveys, biological studies, etc.) and the difficulties of regulating access to wild populations. These disadvantages to ranching, coupled with the unpredictability and inconsistency of supplies associated with obtaining skins from wild crocodilians, led to the expansion of captive propagation, built on the techniques developed for ranching (Ross, 2001). Today, captive breeding is the major mode of production for skins in Colombia (Common Caiman *Caiman crocodilus*), Thailand (Siamese Crocodile *Crocodylus siamensis*), South Africa (*Crocodylus niloticus*) and Mexico (Morelet’s Crocodile *Crocodylus moreletii*) and other countries and it has an increased share of production in Zimbabwe (*Crocodylus niloticus*) (Ross, 2001; see **Table 3**). Captive breeding of crocodilians has developed to become the most important means of production of skins to industry, reaching 850 000 skins in 1999 (**Table 1**). Caiman skin, principally from Colombia, dominates supply of skins from captive-bred crocodilians, in terms of volume.

The shift from wild to captive production of crocodilian skins is well documented and a summary of the key changes in the supply of crocodilian skins that this shift has engendered is presented in **Table 2**.

Table 2
Changes in supply characteristics of crocodilian skins to international trade since 1975

Factor	Pre-CITES	Current
Source of supply	Wild—virtually 100%	Wild 6%, ranched 22%, captive-bred 72%
No. of skins in international trade	1-2 million (est'd.)	1 million
Producers	Hunters—-independent and dispersed	Mainly medium-to-large business interests
Producers of wild skins	Hunters—-independent and dispersed	Mix of independent hunters and collectives
Prices per unit (for producer)	Higher than now	Lower than before
Prices per unit (for retailer)	Commensurate	Commensurate
Average quality	Lower than now	Higher than before
Average size of skin	Larger than now	Smaller than before
Leather supply	Higher than now	Lower than before
Supply risk	Less certainty of supply	Far greater certainty of supply
Market segmentation	Species and caiman <i>versus</i> classics	Quality, fashion and, to a lesser extent, caiman <i>versus</i> classics

Sources: MacGregor, 2002; respondents (see **Methods**).

International trade in crocodilian skins

Species, volumes and countries involved

There is an unknown number of separate producers, based in over 30 countries, supplying crocodilian skins to the industry (see **Table 3**; MacGregor, 2002).

Table 3
List of countries producing crocodilians, indicating principal mode of production and species

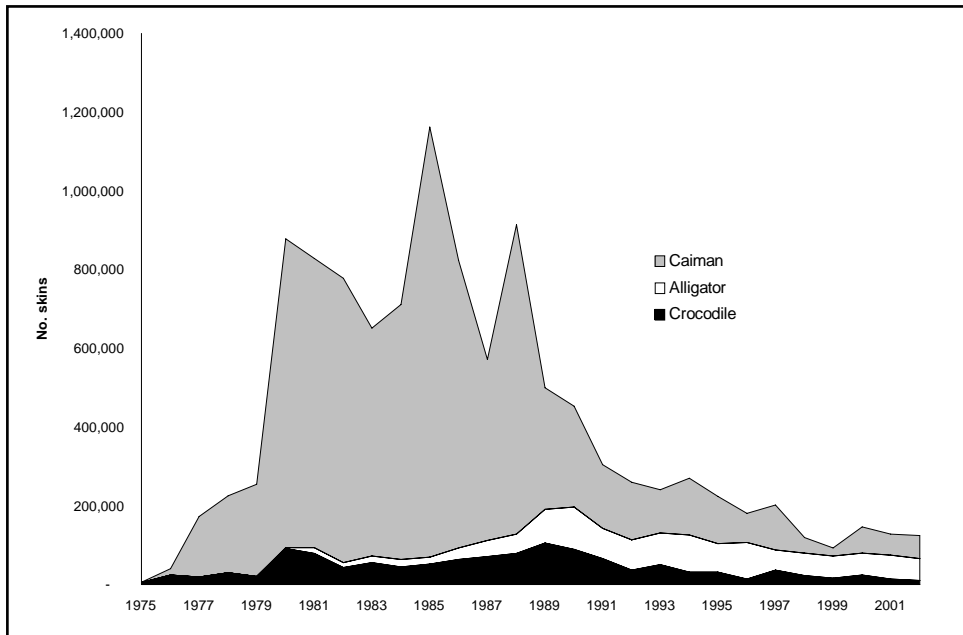
Species	Production method	Countries
American Alligator <i>Alligator mississippiensis</i>	R, but also W and C	USA
Chinese Alligator <i>Alligator sinensis</i>	C	China
Common Caiman <i>Caiman crocodilus</i>	W	Bolivia, Guyana, Nicaragua, Paraguay
	C	Colombia
	W, some C	Venezuela
	C, R (developing)	Brazil
Yacare Caiman <i>Caiman yacare</i>	W	Paraguay
	C	Bolivia
Broad-snouted Caiman <i>Caiman latirostris</i>	R	Argentina
American Crocodile <i>Crocodylus acutus</i>	C	Honduras
Australian Freshwater Crocodile <i>Crocodylus johnsoni</i>	R, C	Australia
Morelet's Crocodile <i>Crocodylus moreletii</i>	C, R (developing)	Mexico
Nile Crocodile <i>Crocodylus niloticus</i>	W, some R	Tanzania
	R	Botswana, Ethiopia, Malawi, Mozambique, Uganda, Zambia
	C, R	Kenya, Madagascar, South Africa, Zimbabwe
	W	Indonesia
New Guinea Crocodile <i>Crocodylus novaeguinae</i>	W, R	Papua New Guinea
	W, R	Papua New Guinea
Saltwater Crocodile <i>Crocodylus porosus</i>	W, R	Papua New Guinea
	R, also C	Australia
	C, W	Indonesia
	C	China, Malaysia, Singapore, Thailand
Cuban Crocodile <i>Crocodylus rhombifer</i>	C	Cuba
Siamese Crocodile <i>Crocodylus siamensis</i>	C	Cambodia, Thailand

Source: Hutton, 2001 and Ross, 2001.

Producer countries for wild crocodilians have changed during the 1980s and 1990s (see **Table 4**). Wild caiman harvests have shrunk considerably in Latin American range States and classic leather production has faded from Papua New Guinea and Zimbabwe, while the USA maintains a healthy export volume. **Figure 2** shows how wild caiman dominance had faded by the early years of the 21st century.

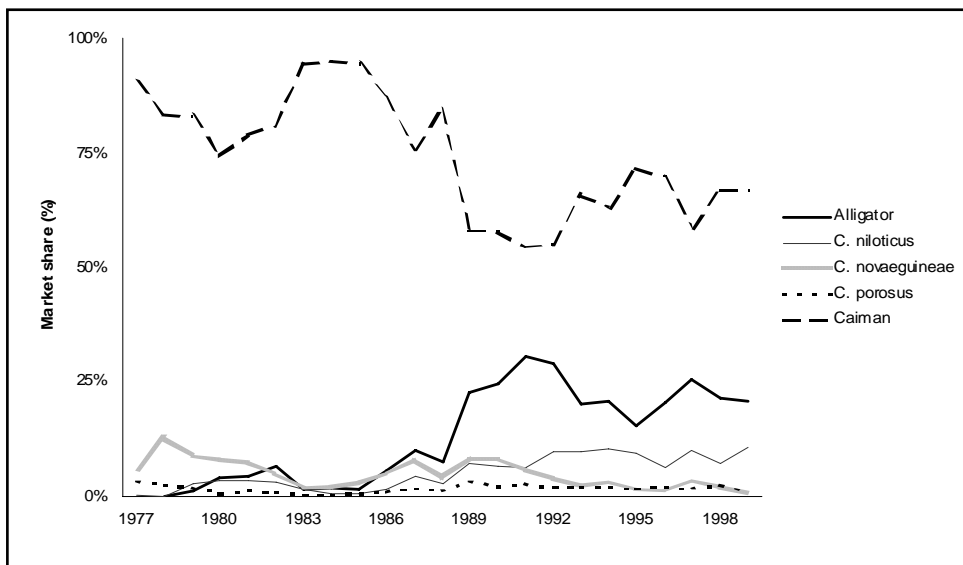
The volume of legally produced crocodilian skins has approximately tripled since 1977—see **Table 1** (MacGregor, 2001a). The sharp increase in trade indicated in 1984–86 is probably an artifact owing to historical under-reporting prior to 1984. The decline which followed prior to the sustained upswing from the early 1990s, is interpreted to reflect the end of unregulated exploitation and the increasing productivity of crocodilian farms and sustainably used wild populations (Hutton, 2001; MacGregor, 2002). The trade in crocodilian skins continues to be divided into classics and caiman, though the ratio has altered, as has the importance attached to the distinction (**Tables 2 and 5** and **Figure 3**). Numbers of classic skins in reported international trade grew, from 43 000 in the mid-1980s to around 400 000 in 1999, a reflection of production from crocodilian farms and more effective management of wild populations (Hutton, 2001; Luxmoore, 1992; see **Table 5**). While the number of classics in declared trade has shown a general upward trend since the mid-1980s, declared trade in *Caiman*

Figure 2
Trend in reported trade in Appendix-II listed crocodilian skins from wild harvests, 1975–2002, by taxonomic type



Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP–World Conservation Monitoring Centre, Cambridge, UK.

Figure 3
Market shares (by no. of items in trade) of crocodilian species supplied to the industry, 1977-99



Source: CITES data, cited in MacGregor, 2002.

Table 4
Reported exports of wild-harvested crocodilian skins, 1975–2002

	1975	1979	1983	1987	1991	1995	1999	2002
<i>Alligator</i>								
USA	-	-	13 971	41 026	75 991	72 263	56 350	56 414
Rest of world	16	-	3473	-	-	-	-	79
Total	16	-	17 444	41 026	75 991	72 263	56 350	56 493
<i>Caiman</i>								
Paraguay	-	13 368	348 722	44 769	6	14 852	-	7595
Venezuela	-	-	-	116 344	126 040	60 019	20 319	15 511
Bolivia	-	33 253	67 364	42 480	1384	-	30	33 746
Colombia	-	125 981	210 818	46 670	-	-	-	-
Panama	-	-	66 477	100	-	2000	-	49
El Salvador	-	-	30 461	11 975	1587	1	-	-
Guyana	-	-	1130	38 526	8207	30	-	534
Rest of world	1102	187 035	63 815	205 917	25 254	43 608	411	636
Total	1102	359 637	788 787	506 779	162 478	120 509	20 760	58 070
<i>Crocodile</i>								
Papua New Guinea	-	1150	11 150	40 180	32 896	17 928	10 923	5939
Indonesia	-	-	6899	111	11 518	2845	196	340
Zimbabwe	-	-	785	7723	11 241	3558	183	1572
Zambia	-	4	2	2394	340	5377	1500	3
South Africa	-	-	-	688	254	1	2047	3
Rest of world	4728	19 614	36 887	19 702	9845	2002	1192	1702
Total	4728	20 768	55 723	70 798	66 094	31 711	16 041	9559
<i>All</i>								
Total	5846	380 405	861 954	618 603	304 563	224 483	93 151	124 122

Note: Blanks may signify unreported trade as well as zero trade.

For Zimbabwe, the values given here are known to be wrong—see **Methods** regarding CITES data. There were no wild-harvested crocodiles from at least 1987 onwards, according to records kept by the crocodile-rearing industry in Zimbabwe—see **Figure 6**.

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

crocodilus peaked around that time with annual volumes of over one million skins. Numbers of caiman skins in trade dipped after this time before rising again in the 1990s, from around 300 000 skins at the beginning of the decade, to reach the figures shown in **Table 5** (MacGregor, 2002).

Prices and values

There is no reliable global estimate of the total value of crocodilian skin trade, but an initial estimate of the economic value of the trade at the point of export from producer countries is USD50 million and the figure realized at retail may be ten times larger (MacGregor, 2002). There exists a ‘ladder’ of values associated with different species, types and qualities—for instance, caiman skins tend to be cheaper than classic skins and ‘grade

Table 5
International reported trade in crocodilian skins, 1996-2002, as declared in CITES annual reports*

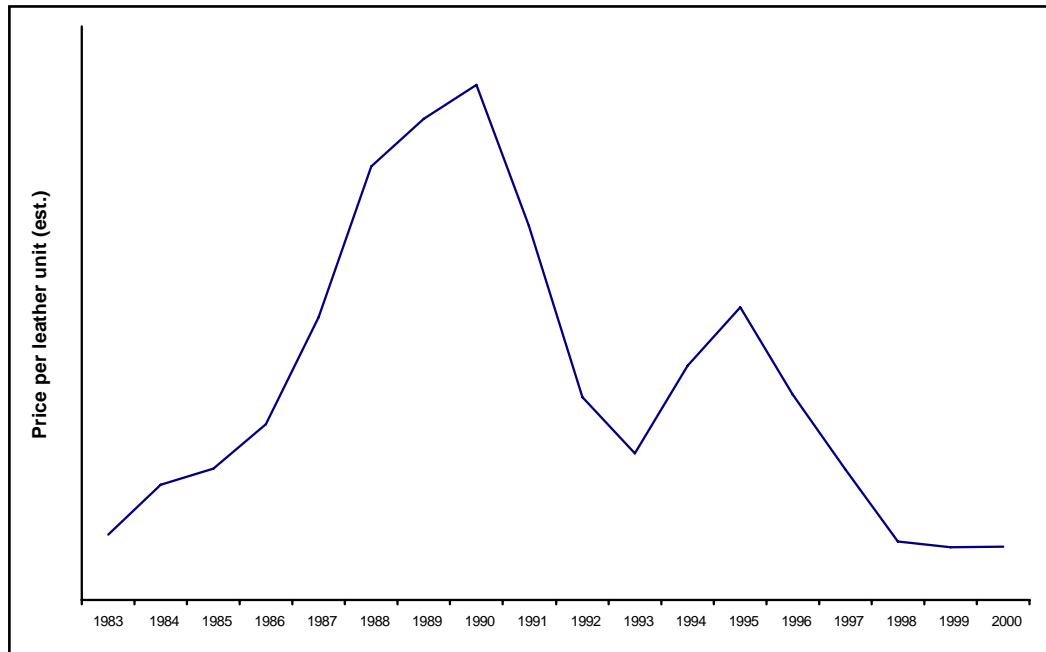
Species	1996	1997	1998	1999	2000	2001	2002
<i>Alligator mississippiensis</i>	163 936	198 649	206 620	239 944	249 155	343 116	237 840
<i>Crocodylus acutus</i>	0	0	0	0	0	100	0
<i>C. johnsoni</i>	1641	194	309	45	10	0	2
<i>C. moreletii</i>	20	146	193	2	1228	3643	1588
<i>C. niloticus</i>	>67 528	89 568	79 717	133 339	147 240	150 757	159 798
<i>C. novaeguineae</i>	14 234	33 012	25 491	22 191	23 233	30 634	30 749
<i>C. porosus</i>	19 651	18 554	24 123	15 971	25 791	28 164	24 278
<i>C. rhombifer</i>	40	0	2	0	0	0	0
<i>C. siamensis</i>	3186	5452	1679	5459	2417	4422	3580
subtotal	270 236	345 575	338 134	416 951	423 283	560 836	457 835
<i>Caiman crocodilus crocodilus</i>	26 346	37 084	35 580	32 571	38 155	25 510 [¶]	17 220 [¶]
<i>Caiman crocodilus fuscus</i>	656 585	475 053	691 348	777 791	840 993	710 113	564 611 [¶]
<i>Caiman latirostris</i>	0	0	0	0	0	88	90
<i>Caiman yacare</i>	1261	21 115	6497	615	15 629	32 940	45 439 [¶]
subtotal	684 192	533 252	733 425	810 977	894 777	768 651	627 360
GRAND TOTAL	954 428	878 827	1 071 559	1 227 928	1 318 060	1 329 487	1 085 195

Notes: * Figures based, wherever possible, on country of export data; [¶] = data-deficient

Source: CITES annual report data compiled by UNEP-WCMC and presented in Caldwell 2004.

1' skins can fetch nearly half as much again as 'grade 2' skins (MacGregor, 2002). Research has indicated that this 'ladder' of values is poorly defined and there is undoubtedly a 'messy middle' where low-grade classic skins and high-grade caiman skins compete directly. The estimated unit price, pre-export, of crocodilian skin has fluctuated wildly. According to various sources of information cited in MacGregor (2002), crocodilian skin prices appear to fluctuate in unison, in general. **Figure 4** shows the collective price fluctuations at export, 1983–99.

The average reported US dollar value per *Alligator mississippiensis* skin, 1997-2002, at the point of export from the USA, was USD97 (Caldwell, 2004). The average reported Brown Caiman *Caiman crocodilus fuscus* skin, at point of export from Colombia, for the same period, was USD41 (Caldwell, 2004).

Figure 4**Price fluctuations (in USD) at export, 1983–1999 (at 1999 values)**

Source: various sources cited in MacGregor, 2002.

Structure and stakeholders in the industry

(Material in this sub-section is taken from MacGregor (2002), unless indicated otherwise.)

Trade in crocodilian skins supplies the fashion accessory business in a variety of market segments worldwide. In the fashion industry, the crocodilian segment is typically associated with sophisticated or luxury tastes along with superior product quality, upheld by family-run firms with ‘traditional’ values. This remains true to a large degree, but the industry has undergone significant change in the past 15-20 years, including, as mentioned, with regard to its source of supply.

Structure

In common with most industries using wild species, the crocodilian skin industry evolved to be ‘hour-glass-shaped’, having, at least until recently, numerous producers, manufacturers and retailers, but a relatively small number of tanneries, thus providing a constriction mid-way along the supply chain. Intermediaries pepper the trade, from crocodilian to consumer, operating at or between all industry sectors and their significance varies. There has been little vertical integration between sectors (fusion of links in the supply chain), suggesting that each stakeholder along the supply-chain worked for individual profit maximization and not that of the industry. This creates a strong risk that the transmission of signals along the supply chain, and particularly from consumers to producers, will be distorted. From a conservation viewpoint, this means that rent is likely to be dissipated away from the resource and is likely to lodge instead in other sectors of the industry. However, the crocodilian skin industry has recently re-structured, as will be discussed (see **The present-day crocodile skin industry**).

Industry participants

Crocodilian skin **producers** are the first link in the supply chain. They procure and provide skins by hunting wild animals or by collecting eggs or young from wild or captive populations to grow specimens under controlled conditions, for skins, for profit. They sell their skins to intermediaries, tanneries or exporters. **Tanning** is a crucial element in the supply chain. French and Italian tanners have traditionally been important in this sector, but recent years have seen the growth of capability and capacity in other countries. Historically **manufacturers** have been, and many still are, part of skilled family businesses, but manufacturing has diversified and developed technologically. Manufacturers are increasingly found in range States and on a larger scale. When it comes to **retailing**, crocodilian leather articles are sold in several distinct market segments—boutiques, high street retailers, street markets and discount outlets. The luxury sector retailers, which typically rely for business on reputation and prestige associated with their name and built up over time, are the trend-setters for the rest of the industry. The non-luxury retail sector is less well understood, but it is certain that, in many countries, crocodilian leather goods are available to less wealthy consumers. **Intermediaries** operate between stakeholders at different levels in the supply chain. Their role is rarely long term.

Important **consumer markets** for finished crocodilian leather articles include Japan, the USA and Europe—and the non-Japanese Asian market is growing in a way that has yet to be quantified. There was broad agreement from a wide range of stakeholders in the crocodilian skin industry (interviewed for MacGregor, 2002) on a series of characteristics of consumer preferences for crocodilian leather goods. They agreed that there was some level of constant demand for ‘larger’ crocodilian skin products by wealthier consumers who sought quality. Demand was thought to fluctuate among consumers influenced by various factors, including fashion, and demand for smaller, fashionable goods was thought to be volatile. There was reportedly some level of environmental/conservation awareness among some consumers, but also confusion over how to express this in purchasing decisions. A preliminary classification of consumers of finished crocodilian leather articles in Europe and the USA endorsed the view that there was an upmarket group of consumers of crocodilian leather goods, who had a high level of disposable income and for whom quality was paramount. At the other end of the spectrum was the ‘bandwagon’ type of consumer—constituting by far the largest consumer group—who buys what shops stock and what fashion magazines promote. In between are middle brackets of consumers, including wealthy, fashion-conscious buyers and a less exclusive, middle-income group.

METHODOLOGY

Surveys of the crocodilian skin trade and industry were undertaken in Colombia and Zimbabwe. Interviews with stakeholders in the crocodilian skin trade and industry were conducted in person and via telephone in France, Italy and Japan; staff from five tanneries, three industry associations and regulatory bodies were interviewed, as well as seven processors, three intermediaries and three retailers. These interviews were confidential to encourage interviewees to offer frank opinions about the industry. Interviewees are generally referred to anonymously in the remainder of the report as ‘respondents’. Interviews were conducted from November 2002 to May 2004. Other information on the crocodilian skin trade and industry was obtained from literature and from members of the IUCN-SSC Crocodile Specialist Group, to whom the author had free access during research and writing.

International trade data on crocodilians are available from CITES annual reports from Parties. These were analysed and all international trade data displayed in this report are from this source originally, unless otherwise stated. These data can provide key information in understanding trends in the use of crocodilians, but they are

incomplete or inaccurate for several reasons. Firstly, countries involved in international trade in crocodilians acceded to CITES at different times between 1975 and 1988. Secondly, these data cannot reflect domestic consumption of skins and meat, nor poaching and illegal trade. Thirdly, the data are submitted by CITES Parties with varying degrees of accuracy and timeliness. Fourthly, Hong Kong and Singapore do not provide data on manufactured items of Appendix-II and -III species (J. Caldwell, Trade Database Analyst, UNEP-WCMC, *in litt.* to J. Gray, TRAFFIC International, May 2005). All data refer to gross trade, unless otherwise stated. Data on pre-CITES trade are privately held by industry participants and unavailable.

For definitions of the terms ‘wild-harvested’, ‘ranching’ and ‘captive-bred’ within the context of this report, see **Background**. Other terms are explained in the text, as they occur.

THE CROCODILIAN SKIN TRADE AND INDUSTRY IN COLOMBIA—A SUPPLY COUNTRY

USE OF CROCODILIANS IN COLOMBIA—SOME KEY FACTS

This historical section is based on Jenkins *et al.* (1994) and Medem (1985), except where otherwise indicated.

- In the late 19th century wildlife was Colombia’s third-most significant export.
- Recreational hunting pre-1930s.
- Hunting of American Crocodile *Crocodylus acutus* 1930s to late-1950s—approx. 30 000 per annum exported.
- Hunting of Orinoco Crocodile *Crocodylus intermedius* 1930s to late-1950s—approx. 10 000 per annum exported.
- Hunting of Brown Caiman *Caiman crocodilus fuscus* early-1950s to early-1980s—approx 400 000 skins per annum exported (Bryant, 2002; Ross, 1998b).
- The populations of *Crocodylus acutus*, *C. intermedius* and *Caiman crocodilus fuscus* were serially depleted between 1930 and 1980.
- Commercial attention turned to caiman-only harvest once relatively valuable crocodilian species had reached economic extinction.
- Wildlife hunting was uncontrolled until legislation in 1969 controlled hunting of some species.
- In 1973, wild caiman harvest was banned, as populations were believed to be at sub-economic levels. It is estimated that more than 12 500 000 skins had been exported from the country by the time this ban was imposed (B. Ortiz, Director, TRAFFIC South America, *in litt.* to T. Mulliken, TRAFFIC International, 8 June 2004).
- Colombia joined CITES in 1981.
- In 1987, captive breeding started with the aim of conferring conservation benefits (by supporting alternative production to wild harvests) and contributing to the rural economy.
- By February 1994, over 100 experimental and commercial enterprises breeding caiman in captivity had been set up. The average investment was USD250 000 (1994 figures) although many have invested far greater sums. Most farms were producing multiple species—although 27 were concentrating solely on *Caiman crocodilus fuscus*.
- Since 1991, Colombia has been the largest supplier of crocodilian skins to the international market—the vast majority from captive-bred sources.
- In 2004, there were 47 caiman farms and 17 *C. acutus* farms in Colombia. (Alvaro Velasco, Deputy Vice Chairman, Latin and the Caribbean region, CSG, *in litt.*, 9 May 2004).

- Colombia's prominence as the main producer of crocodilian skins worldwide is founded on production of skins of *Caiman crocodilus fuscus*, by far the most numerous caiman in international trade formerly and now (Jenkins and Broad, 1994; Caldwell, 2004). The subspecies is reported to be restricted to Atlantic coastal drainages of Colombia and western Venezuela (Ross, 1998a). Other caimans are native to Colombia, but their skins do not feature in international trade, or only in relatively small quantities (Caldwell, 2004).

POPULATION AND CONSERVATION STATUS OF CROCODILIANS IN TRADE IN COLOMBIA

Colombia has the greatest diversity of crocodilians in the world (Larriera *et al.*, 2004). Population surveys of crocodilians in the country were recently conducted in 1000 km² in four areas, over four years; but the sample size was too small to extrapolate to the entire populations (Rodriguez, 2000). However, most populations of *Caiman crocodilus fuscus* are believed to be locally depleted or fragmented (Larriera *et al.*, 2004; A. Velasco, *in litt.*, 9 May 2004). Ross (2001) describes the status of wild *C. crocodilus* in Colombia as 'poorly known, depleted'. The species is listed in CITES Appendix II (except *C. crocodilus apaporiensis*, which is in Appendix I).

The crocodilian skin industry is not thought to be impacting wild crocodilian populations in Colombia negatively—Jenkins *et al.* (1994) and Larriera *et al.* (2004) concluded that the removal of adult breeding stock for captive breeding was unlikely to cause long-lasting damage to the wild populations of *Caiman crocodilus fuscus* in Colombia. Allegations of the laundering of wild harvested skins through farming operations have been made, but never proven. Currently, Colombia is beginning several ambitious conservation initiatives funded by the industry and the authorities, which will include sustainable use of all major species (Larriera *et al.*, 2004).

DEVELOPMENT OF THE CROCODILIAN SKIN INDUSTRY AND DRIVERS FOR THE SHIFT TO CAPTIVE PRODUCTION

Several businesses active in the caiman leather trade surveyed for this study believed that pre-CITES caiman trade from Colombia was entirely wild-harvested and mainly supplied the mass market (typified by conventional retailers, including street vendors, in urban centres), including for watchstraps. The first crocodilian breeding ventures in Colombia are reported to have been non-commercial and established for conservation or scientific purposes (Luxmoore *et al.*, 1985) and Ross (2001) reports that captive breeding in Colombia was adopted as the major means of production in response to a poor security situation in rural areas. Since the 1980s, the government and the private sector have invested in industrial capacity for breeding crocodilians, bringing commercial success, skills and technology to the rural economy of Colombia. Initial development of crocodilian farms was supported by the division of government responsible for promotion of exports, which offered cheap credit for farm development, and by the Ministry for the Environment, which offered technical advice. International suspicion that wild-sourced skins were being laundered through Colombian crocodilian farms gave rise to the threat of trade sanctions against Colombia. To counter this, the Colombian CITES Management Authority instigated domestic restrictions on the size and volume of skins for export (see CITES *Notifications to the Parties nos. 742 (7/5/93) and 2002/031*) (Larriera *et al.*, 2004). The industry association, AZOCOL, was formed in 1990 and this has a close relationship with the Ministry of the Environment and other industry stakeholders in Colombia. By 1994, over 100 farms were operating.

Colombian production of cheap, captive-bred caiman took the industry into new territory. Efficient production methods generated a growing volume of exports and, by the early 1990s, Colombia was the largest producer of crocodilian skins in the world (MacGregor, 2002; see **Key Facts**). The successful crocodilian skin industry in Colombia expanded the range of crocodilian species it produced, both from farms and from the wild, and included production from species threatened with extinction. Producing and tanning sectors of the industry

joined forces; in one case, a tannery sold shares to local caiman farmers to access capital for technological investment and to guarantee quality and stable raw skin supply. Colombia's efficient and high production of crocodilian skins in a declining market gave the industry opportunities to diversify into new market segments and geographical markets, also. Exports grew ten-fold during the 1990s (Caldwell, 2004) and Larriera *et al.* (2004) confirmed that Colombia was still the largest supplier of crocodilian skins (and probably the largest producer of crocodilian leather) to international trade. Colombian crocodilian skins nowadays supply the mass and middle markets (the latter comprising exclusive retailers, yet distinct from the luxury boutiques). Despite this success, it is not clear that it was planned or expected by the authorities in Colombia.

Any venture breeding crocodilians in Colombia is required to operate non-commercially for an experimental phase (a minimum of two years) before the CITES Management Authority issues a commercial licence. The CITES Management Authority determines the annual export quotas for each farm and these are enforced by the Ministry of the Environment, which also obliges all farms to provide crocodilians for restocking wild populations—reportedly at 'significant' financial cost to farmers (Larriera *et al.*, 2004), but apparently at a level where they are willing to comply. The export quota for captive-bred *Caiman crocodilus* for 2005 was for 599 000 skins (Anon., 2005).

PRODUCTION OF CROCODILIAN SKINS IN COLOMBIA—METHODS AND VOLUMES

Table 6 shows reported exports of skins of *Caiman crocodilus fuscus*, 1994-2001, among which Colombia clearly dominates.

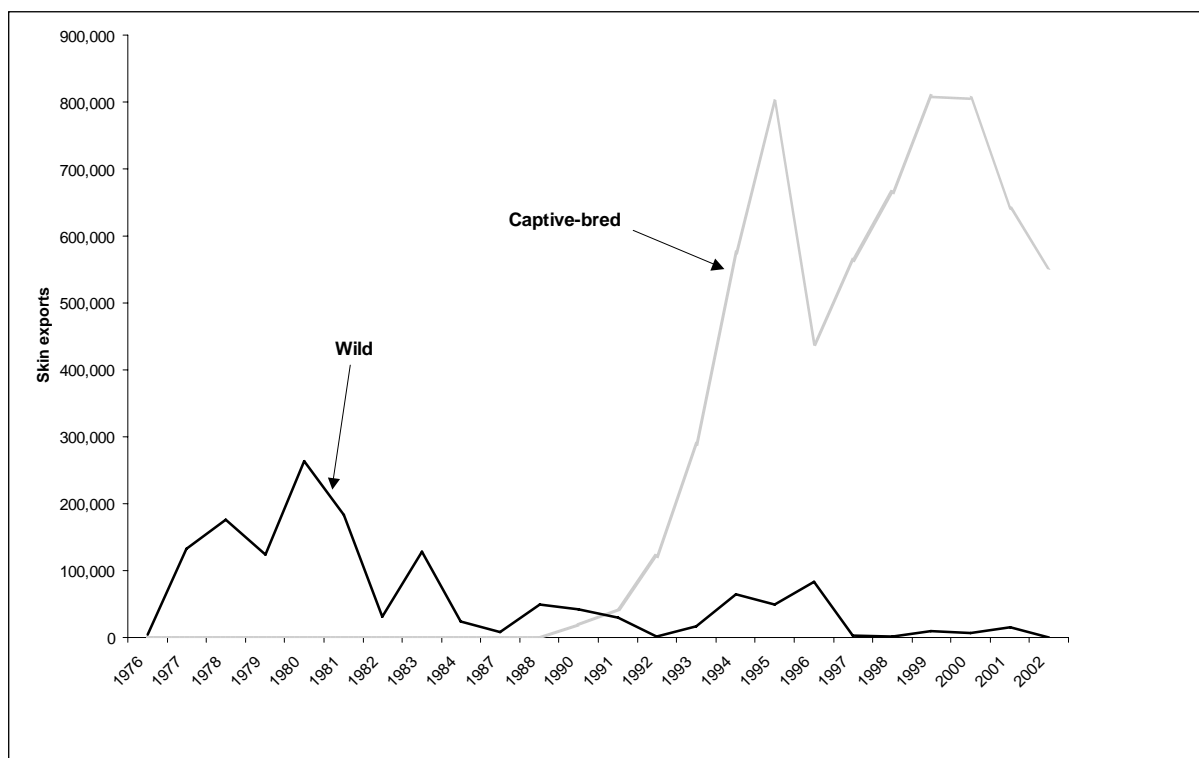
Table 6
Reported exports of *Caiman crocodilus fuscus* skins, 1994-2001, from Latin America

Exporter	1994	1995	1996	1997	1998	1999	2000	2001
Brazil	0	0	0	0	3	0	0	0
Colombia	514 792	764 358	646 832	451 307	669 269	777 529	824 303	698 413
Costa Rica	0	0	0	0	40	0	0	0
Cuba	0	12	302	500	5	2	0	0
El Salvador	0	1	0	0	0	0	0	0
Guatemala	62	0	0	0	0	0	0	0
Honduras	0	2000	5656	22 000	18 104	0	0	0
Nicaragua	8441	4328	3795	1246	3927	250	6440	0
Panama	0	0	0	0	0	10	10 250	11 700
Total	523 295	770 609	656 585	475 053	691 348	777 791	840 993	710 113

Source: Caldwell, 2004.

Captive-bred caiman is now the main crocodilian skin product from Colombia (see **Table 3**). **Figure 5** shows how exports of wild-harvested caiman skins fell (long after the ban on such production) and the rapid growth of exports of skins from captive-bred caimans in the early 1990s.

Figure 5
Reported exports from Colombia of caiman skins by source, 1976–2002



Note: The level of wild-harvested skins may be lower than that reflected here; no legal caiman from Colombia comes from the wild, so presumably these data reflect mistakes in record-keeping. Ratched crocodylians are not recorded here either, although Luxmoore (1992) reported that almost all *Caiman crocodylus* produced by Colombia in 1990 were from ranches.

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

COLOMBIAN INTERNATIONAL TRADE IN CROCODYLIAN SKINS

Exports and re-exports

Reported exports of caiman skins (*Caiman crocodylus fuscus*) from Colombia have chiefly involved 10 destination countries (Table 7), which include the prominent tanner countries, Singapore, Italy and France. Exports to Mexico, Thailand and the USA have increased notably over the past decade, while those to Panama, Japan, France and Italy have declined. Exports of skins of the subspecies described a general rising trend during the 1990s, from under 100 000 skins in 1990 to over 800 000 skins in 2000 (Caldwell, 2004).

Table 7 shows the initial destination of skins exported by Colombia, but the journey of a shipment often includes several countries. For example, Singapore, which is an importer of large volumes of caiman skins, is primarily an entrepôt and processor, as well as having one of the world’s largest tanneries. As such, the majority of skins imported by Singapore are re-exported to final destinations and/or manufacturing destinations, for example, China, Mexico and the USA (Table 8 and see Table 9). Table 9 shows that Colombia, which has a small but growing processing industry, exports leather items made from its own *Caiman crocodylus fuscus* skins.

Table 7

Reported destination countries of *Caiman crocodilus fuscus* skins exported by Colombia, 1993–2001

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Singapore	253 204	258 088	271 081	339 631	194 145	263 920	313 005	313 116	315 979
Mexico	96		8002	10 022	5356	34 544	107 415	115 565	102 821
Thailand	35 987	29 980	61 027	108 748	137 862	148 926	140 486	121 887	99 304
USA	3665	682	5811	10 921	20 097	37 255	88 519	138 712	86 149
Italy	45 111	45 472	216 846	52 402	37 510	74 630	19 116	45 625	24 010
Germany	7953	4600	2000	1000	1000	19 650	25 771	23 520	23 643
France	56 436	68 025	120 690	15 265	7 682	33 940	25 803	19 643	16 560
Panama	30 500	61 089	47 774	65 180	15 000	20 700	10 006	17 439	16 000
Japan	15 237	57 209	68 074	43 256	31 883	35 767	50 124	33 541	15 539
Spain	2330	366	3500	2958	419	1500	1000	3252	4308
Rest of world	9230	10 991	28 328	7139	1753	322	201	3	-
Total	459 749	536 502	833 133	656 522	452 707	671 164	781 456	832 303	704 313

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

Imports of Colombian crocodilian skin and skin products

Net imports of Colombian caiman skins are shown in **Table 10**. Mexico and the USA show rising imports over the decade, echoing the trend in Colombia's exports to these countries; according to interviewees included in this study, Mexico is exporting increasing amounts of caiman leather watchstraps and footwear to the USA. Singapore, Italy and France—long-standing tanning countries—show declining net volumes of direct imports of caiman skin from Colombia (see also **Table 8**; Singapore). This finding correlates roughly with the pattern in reported exports of *Caiman crocodilus fuscus* skins from Colombia to France and Italy (**Table 7**). Mexico, the USA and China show clear rising trends in imports (**Table 10**).

Table 11 shows importing countries for leather items produced from *Caiman crocodilus fuscus* skins from Colombia, indicating the location of retail centres for these goods. The USA shows steady growth in imports of Colombian caiman leather items, as it does for net imports of the skins (**Table 10**).

There are numerous constraints associated with relying on the data presented in the preceding tables to illuminate detailed trade, particularly as the amount of leather per item is not recorded (see also the limitations of the data mentioned in **Methodology**), but they give some indication of trends in export destinations for Colombian caiman skin and leather items—and therefore of processing/manufacturing and retailing centres for these. The apparent, recent shift towards siting of manufacturing in Mexico, Eastern Europe and Asia claimed by some interviewed for this study is supported by the data in **Tables 7 to 11**, as is the prominence of the USA as an importer of Colombian caiman leather.

Table 8
Re-exports from Singapore of *Caiman crocodylus fuscus* skins originating in Colombia, 1993–2002

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	712	45 183	115 612	56 375	40 881	67 915	81 291	34 500	99 150
Mexico		120		4	1529	16 114	31 164	88 750	90 243
USA	4	479	4286	10 426	23 281	52 466	70 664	59 289	74 992
Rest of world	2502	37 805	32 987	29 719	30 104	24 789	29 202	45 322	56 245
S. Korea	17 894	41 656	35 570	56 938	55 590	39 183	39 449	33 248	31 862
Thailand	1000	22 243	25 871	23 410	20 098	29 702	31 663	34 155	22 928
Hong Kong	6898	22 243	416	572	653	952	1589	13 921	15 271
<i>Singapore total:</i>									
Exports	29 010	169 729	214 742	177 444	172 136	231 121	285 022	309 185	390 691
Imports	253 204	258 088	271 081	339 631	194 145	263 920	313 005	313 116	315 979
Net	224 194	88 359	56 339	162 187	22 009	32 799	27 983	3931	-74 712

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

Table 9
Exports of leather items produced from *C. c. fuscus* skins from Colombia, 1993–2001

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
Italy		81 837	96 071	106 882	104 988	144 743	118 847	177 813	244 848
Mexico								188 655	233 695
France							187 716	172 414	121 900
Switzerland								133 881	113 203
Germany	6178	12 460	14 165	12 992	8676	5245	16 114	40 497	27 155
Austria			43 915				26 570	16 729	21 183
Spain	584	1428	854	10 037	5765	11 003	11 272	14 351	16 153
Colombia	1103	7140	2792	4449	4154	5841	6192	8749	9663
China									8650
S. Korea		1464						5533	4026
USA	7491	1433	3480	37 439	22 453	17 548	14 750	3762	1824
Hungary						25 920	48 465		
Japan			3324		1051	973		633	
Madagascar					6789	34 575			
Panama						2500	2200		
Rest of world	565	30 881	94 263	18 485	571	1235	1282	2025	1693
Total	15 921	136 643	258 864	190 283	154 447	249 583	433 408	765 042	803 993

Notes: Singapore and Hong Kong do not report trade in manufactured products of Appendix-II species—see **Methods**. Blanks may signify unreported trade as well as zero trade.

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

THE MARKET NICHE FOR COLOMBIAN CAIMAN—QUALITY ISSUES

Since the CSG mission to Colombia in 1993 identified potential quality upgrades throughout the industry, investment and streamlining have reduced damage rates considerably and, as Ross (1998b) noted, technical developments in processing have helped to produce caiman skins of close to classic quality and appearance. Certainly, there has been a change in the perception of the business practices of Colombian industry abroad. Interviewees surveyed in Europe indicated that Colombian caiman had transformed from leather considered cheap to being widely used for its reliability and quality. Interviewees in both Colombia and Europe confirmed that skins from Colombia had been mostly first-grade for approximately five years and Colombian caiman is now reported to be providing quality leadership for mainstream customers, not least because of Colombia's transformative power as the largest producer.

Table 10
Reported net imports of caiman skins from Colombia, 1993-2002

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Mexico	96	386	9152	10 285	9612	59 108	156 746	215 219	194 021	222 506
USA	3686	32 626	55 060	67 479	47 503	78 016	159 138	196 275	156 420	138 755
China	1112	44 911	120 977	56 990	43 165	68 333	81 529	36 576	100 435	N.a
Thailand	36 987	44 340	72 414	119 645	137 280	168 538	160 231	97 398	91 134	93 358
HK	8162	23 541	1879	1308	5477	6963	8630	53 163	42 092	N.a
Japan	14 639	69 827	69 538	54 524	48 156	46 233	72 053	57 335	32 339	N.a
Korea	17 906	48 887	51 570	68 269	67 535	38 630	29 059	33 366	31 703	37 746
Germany	8068	4206	2102	1524	1187	19 912	27 270	23 876	26 160	2406
France	33 670	54 368	116 871	20 850	7872	46 156	28 904	26 853	18 165	13 937
Italy	54 380	64 043	242 118	60 494	51 310	85 904	16 040	42 927	16 714	33 836
Spain	2596	2191	3404	3174	2055	4433	3642	15 702	11 206	3345
Panama	22 631	3201	-11 046	-1288	-10 173	13 503	-4820	-1305	7388	N.a
Switzerland	22 630	21 023	28 588	24 125	12 971	-5893	2507	-4023	1816	N.a
Singapore	224 194	88 359	56 339	162 187	22 009	32 799	27 983	3931	-74 712	-59 459

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

The high quality product from Colombia has had impacts throughout the industry, generating competition with species hitherto in a different league. A clear indication of this is in the evident competition in the middle and mass markets, for example in the cowboy boot industry. **Table 10** shows Mexico and the USA importing greater quantities of caiman skin from Colombia, which is apparently competing with, and displacing, alligator—a classic skin traditionally used for the cowboy boot industry, that operated out of the southern USA before being re-located to Mexico, (J. Don Ashley, Ashley Associates Inc., pers. comm., 5 May 2004; Ross, 1998b). Caiman skin has not traditionally been seen as a challenger to alligator skin. It is significant to note that this competition to supply the cowboy boot market was foreshadowed by a battle for the watchstrap market in the early 1990s. In this case, caiman was displaced by alligator from the USA, by watchmakers keen to secure quality and reliability. Alligator was competitively priced and aggressively marketed and respondents interviewed for this study alleged that the perception of 'problems' with the caiman trade from Latin America, such as the laundering

accusations, accelerated the shift to alligator, which still supplies the watchstrap manufacturing industry today (J.D. Ashley, *in litt.*, 5 May 2004). However, Mexico, as well as recently importing increasing amounts of caiman skin from Colombia (see **Imports of Colombian crocodilian skin and skin products**), has also recently been exporting caiman watchstraps to the USA.

Table 11
Importers of leather items produced from *Caiman crocodilus fuscus* skins from Colombia, 1993–2001

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001
USA	19%	24%	31%	42%	45%	40%	19%	40%	47%
Switzerland	29%	43%	43%	27%	22%	10%	46%	22%	20%
Rest of world	40%	5%	4%	9%	6%	4%	6%	10%	9%
Japan	10%	16%	17%	17%	15%	6%	3%	8%	9%
Hungary	0%	0%	0%	0%	1%	11%	12%	12%	8%
Hong Kong	1%	2%	3%	3%	5%	4%	1%	3%	2%
France	0%	1%	0%	0%	5%	14%	0%	1%	2%
Russia	0%	0%	0%	0%	0%	0%	0%	1%	1%
S. Korea	0%	1%	0%	0%	1%	0%	0%	0%	1%
Singapore	0%	2%	0%	1%	0%	0%	0%	0%	0%
Italy	3%	4%	1%	0%	0%	11%	11%	0%	0%
Mexico	0%	0%	0%	2%	0%	0%	2%	0%	0%
Total	15 921	136 643	258 864	190 283	154 447	249 583	433 408	765 042	803 993

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

COLOMBIA: SUMMARY

- Wild populations of *Caiman crocodilus fuscus*, the subspecies in Colombia on which the crocodilian skin industry is based, are reported to be fragmented and depleted.
- Drivers for the shift from wild-sourced crocodilian skin production appear to have been conservation or science at first, though a situation of poor security in rural areas has also been cited. Commercial interests engaged during the 1980s.
- The dominant modes of production for caiman skins in Colombia appear to have been hunting in the wild and captive breeding, in chronological order.
- Production has soared in terms of numbers of caiman skins since the early 1990s and Colombia is the world leader in terms of numbers of crocodilian skins produced.
- There has been a general rise in net imports of Colombian caiman skins to China, Thailand, Hong Kong (which maintains separate Customs statistics to China), Mexico and the USA; Mexico is the biggest importer.
- There has been an general decrease in imports of the same by France and Italy and imports by Japan have remained fairly steady.
- Italy, Mexico, France and Switzerland are the biggest exporters of leather items made from Colombian caiman.
- The USA is by far the biggest net consumer of leather items made from Colombian caiman; Switzerland, the next-most important importer of such items, re-exports most of them; Japan and Hungary are other significant importers.
- Colombian caiman has transformed. Once viewed as a cheap, second-category leather, it is now widely used for its reliability and quality.

THE CROCODILIAN SKIN TRADE AND INDUSTRY IN ZIMBABWE—A SUPPLY COUNTRY

USE OF CROCODILIANS IN ZIMBABWE—SOME KEY FACTS

This historical section is based on Loveridge (1996), Kievit (2000) and Sgobbi (2000).

- Before the 1960s, wild populations of crocodilians were conserved on protected lands (since 1949) but unsustainably harvested on public, communal and private lands—mainly adult animals for skins. At this time crocodilians had no legal status and were classified as vermin. During the 1950s and 60s, crocodiles were virtually eliminated in Zimbabwe (Hutton *et al.*, 1987).
- In 1959, the first game ranching schemes were established alongside extensive livestock ranching.
- In 1960, conservation laws gave *Crocodylus niloticus* legal status as a ‘game animal’.
- In the mid-1960s, crocodilian ranching began.
- 1965–79, political and economic isolation of Rhodesia.
- 1970s, captive breeding of crocodilians began.
- 1980, Zimbabwe became independent, joined CITES and entered a reservation against the listing of *Crocodylus niloticus*.
- 1981, the Crocodile Farmers’ Association of Zimbabwe (CFAZ) was established.
- 1984, there were six ranching operations, using eggs from Lake Kariba and Zambezi River.
- 1987, adaptive management of crocodilian egg collection began.
- late-1980s, growth in the number and geographical distribution of crocodile ranches.
- Late-1990s/early 2000s, political turmoil causes the number of ranches to shrink by half.
- 2001, exports reach record high.

POPULATION AND CONSERVATION STATUS OF CROCODILIANS (*CROCODYLUS NILOTICUS*) IN TRADE IN ZIMBABWE

Over 20 crocodile surveys have been carried out since 1968 in Zimbabwe; all but three noted densities of over one animal per square kilometre. Surveyors have not used similar survey methodologies, so population trends are almost impossible to gauge accurately (Loveridge, 1996). However, the accepted wisdom is that, owing to ranching, *Crocodylus niloticus* in Zimbabwe, the only native crocodilian in use by the crocodilian skin industry in that country, was no longer threatened there by 1976 (Kievit, 2000). Ross (2001) describes the wild population of *C. niloticus* in Zimbabwe as ‘well known, robust’. The Zimbabwean population of the species is listed in Appendix II of CITES.

DEVELOPMENT OF THE CROCODILIAN SKIN INDUSTRY AND DRIVERS FOR THE SHIFT TO CAPTIVE PRODUCTION

Wild harvests of *Crocodylus niloticus*, effectively unregulated, ended during the late 1950s and 1960s as population densities were reduced to sub-economic levels. Ranching of the species, which began during the 1960s (Ferguson *et al.*, 2004; Richard Ferguson, CSG, *in litt.*, 11 November 2003; Hutton *et al.*, 1987; Luxmoore *et al.*, 1985), was driven by conservation concerns but development of the potential for local communities to benefit from this wildlife resource was also a driver. The 1975 *Parks and Wildlife Act* gave responsibility for wild crocodilians to ‘landholders’. These landholders were mostly livestock farmers with access and entitlement to wild crocodilians who were in control of their use and habitat, with the goal of profit. A complicated quota system constrained the availability of eggs for ranching until, in 1987, unlimited egg collection was allowed. This is alleged to have generated great benefits for conservation and industry, including by allowing the re-location of crocodilian farms closer to their feed sources.

During the economic and political isolation of Rhodesia pre-1980, information flowed poorly and the prices paid for skins were far below the market price. Moreover, close control of the crocodile farms stifled any conspicuous financial incentives while the industry was guided by advice from the Department of National Parks and Wildlife Management (DNPWLM). Political independence in 1980 and the formation of CFAZ saw the beginning of a redress in the balance between Zimbabwe's sellers and the buyers of *Crocodylus niloticus* skins. The formation of CFAZ renewed market access for the newly independent Zimbabwe, which invigorated its industry and, by 1988, all farms were marketing their product through CFAZ. From the end of the 1980s, CFAZ members obtained financial help from the government, amounting to nine per cent of export value, under the 'export incentive scheme' (from 1987–93). Zimbabwe has a rich backdrop of development-based wildlife management and use, as exemplified by programmes such as CAMPFIRE, set up in 1986, which is intimately linked with egg collection for crocodilian ranching. CFAZ limited its sales to preferred customers only, to embed relationships with Japanese customers and European tanneries. Quality was recognized as a key to ensuring the hard-won market segments would endure (Loveridge, 1996). This limited market access, but also reduced risks (Loveridge, 1996). Such persistent investment in supply chain relationships is also exemplified by the fact that several farms in Zimbabwe are contracted to produce for Hermès in Paris (Anon., 2003a).

The renewed market access for Zimbabwe's crocodile skins allowed investment in other services for the industry. Considerable advances were made in the technology of rearing and breeding *Crocodylus niloticus* and this also helped the ranching industry expand. This stimulated entry into crocodile farming as an economic activity by new entrepreneurs and crocodile captive breeding started in Zimbabwe in the 1980s (Luxmoore, 1992).

The industry is flexible, innovative and responsive to buyer trends or requests, owing partly to the availability of domestic processing capacity. Flexibility proved key during the global price slump of the early 1990s. For instance, CFAZ designed a serially-numbered product tag for the Japanese market. Alongside the trade in skins, Zimbabwe's industry has developed complementary trades to exploit the fullest potential value of the crocodilian resource. One recent expansion in Zimbabwe that respondents indicated was enhancing farm profitability was complementary sales of meat; sales of exotic meats to Europe surged during fears over Bovine Spongiform Encephalopathy (BSE) (Latham, 2001)—but precipitous export drops to Asia followed the outbreak of Severe Acute Respiratory Syndrome (SARS) (Anon., 2003b). In 2002, Zimbabwe exported a range of crocodilian products, which included: *hornbacks*: 'finished' to the USA (2500 units) and 'wetsalted' to Singapore (15 000 units), Thailand (6700 units) and Japan (500 units); *backskins*: 'finished' to Italy (21 000 units); *meat*: 125 t (worth USD750 000), to China (80%) and Europe (20%); and *trophies* (a small wild harvest is allowed under CITES). Crocodile ranching and captive breeding are, in any case, usually combined with other forms of land use such as hunting, photographic safaris, tourism, agricultural use or ostrich farming.

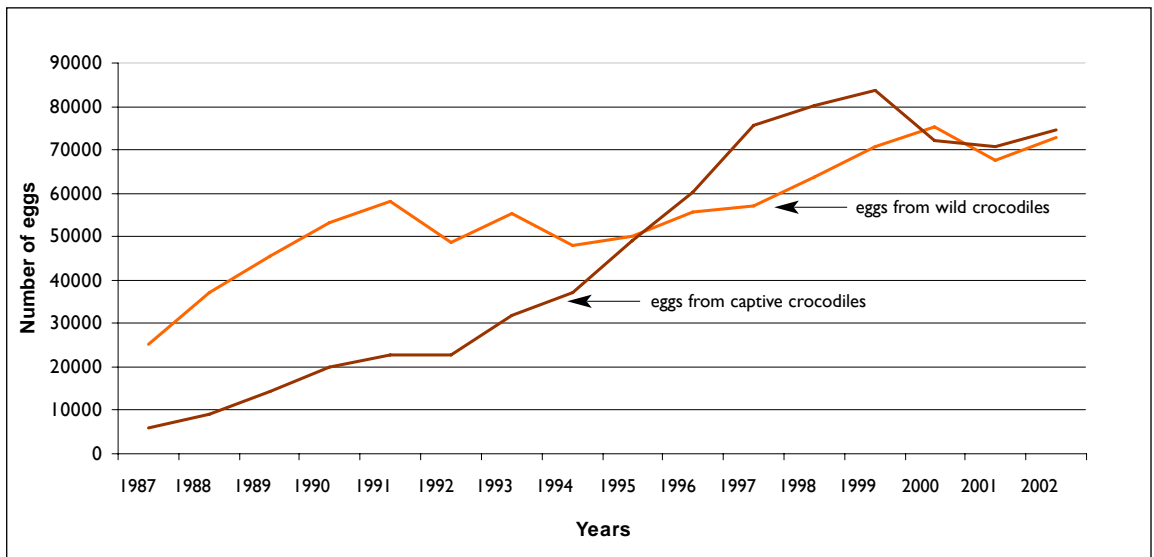
Risks and uncertainty, both real and perceived, have had a big impact on all land use in Zimbabwe since 2000. In the crocodilian sector, the risk and uncertainty posed by conducting business with Zimbabwe, coupled with strategic decisions to avoid goods produced under an oppressive regime, is losing market share for many products. This may also hold true for crocodilian leather and meat (Bafana, 2001).

PRODUCTION OF CROCODILIAN SKINS IN ZIMBABWE—METHODS AND VOLUMES

Farmed production expanded to outstrip wild production—by 1984 there were six ranches containing 27 700 crocodiles in Zimbabwe and by 1992 there were 32, with a stock of 122 854 (Luxmoore, 1992 and see also **Figure 6**). Wild egg collection increased from 25 282 in 1987 to 72 987 in 2002. Over the same period captive-bred eggs increased from 5984 to 74 604 (see **Figure 6**). The growing emphasis on captive breeding, in

particular, appeared to make economic sense—it has been estimated that the costs of collecting eggs or hatchlings from the wild or hatchlings is double that of producing eggs in captivity (Loveridge, 1996). Additionally, this growing emphasis has reportedly been a response to insecurity among commercial interests over government regulation (Ross, 2001). The proportion of ranched skins was recently estimated to be 45% of crocodilian skins produced, but the hatchlings from wild-collected eggs are not kept separate from captive-bred stock (Ferguson *et al.*, 2004).

Figure 6
Trends in the source of production of *Crocodylus niloticus* eggs in Zimbabwe, 1987–2002



Source: Unpublished records of the Crocodile Farmers’ Association of Zimbabwe (CFAZ).

INTERNATIONAL TRADE IN CROCODILIAN SKINS TO AND FROM ZIMBABWE

CITES-reported trade in *Crocodylus niloticus* skins from Zimbabwe, 1997-2002, averaged around 62 000 skins a year and ranged from 45 650 skins (1998) to 74 500 skins (2000) (Caldwell, 2004). In the past, exports were only to France, Japan and Singapore—at one time only to France (Luxmoore, *et al.*, 1985). Nowadays, exports of *C. niloticus* skins from Zimbabwe are chiefly to five countries—France, Japan, Singapore, Thailand and the USA (see **Tables 12** and **14**). Singapore increasingly performs entrepôt functions, processing skins to increase their shelf life, but not manufacturing into finished goods, as **Tables 13** and **14** indicate. Via Singapore, Zimbabwean skins go most prominently to China (see **Table 13**). According to respondents taking part in the survey for this report, Thailand is manufacturing products from Zimbabwean *C. niloticus* skins, mainly for the Japanese market.

In 2002, CFAZ reported its crocodilian skin trade to be worth USD7 million.

Table 12

Reported destinations for and shares of *Crocodylus niloticus* skin exports from Zimbabwe, 1984-2002

Country	1984	1987	1990	1993	1996	1999	2002
Singapore				54%	64%	71%	32%
France	85%	93%	64%	4%	9%	5%	26%
Thailand							26%
Japan	0%	6%	30%	42%	19%	16%	8%
USA	3%		0%	0%	1%	6%	4%
Rest of world	12%	0%	6%	0%	7%	3%	3%
Total	3242	6277	12 612	27 875	43 019	52 147	85 369

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

Table 13

Singapore's re-exports of *Crocodylus niloticus* skins from Zimbabwe, 1993–2002

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
China			1292	4894	4997	1028	1826	350	8392	18 634	15 454	12 513
USA							226	1065	2754	2414	3514	12 000
Korea			80	1489	1557	1247	1885	341	2185	2519	1100	4623
Japan	252	3122	2505	2189	406	554	1038	806	1901	2616	1397	3792
France		6		21	98	332	292	78	368	505	1865	1809
Germany		299	318	153	553	88	936	209	434	808	1178	1508
Rest of world		22	2398	1768	70	1075	1401	869	1968	3644	4464	2151
Total	252	3449	6593	10 514	7681	4324	7604	3718	18 002	31 140	28 972	38 396

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

Table 14

Net imports of *Crocodylus niloticus* skins from Zimbabwe, 1993–2002

Country	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Singapore	8539	3605	23 619	23 120	17 043	5132	19 658	-15 457	-2694	-9487
France	1072	2171	796	3913	9218	3 952	-1 197	12 024	26 681	21 752
Thailand	210	1150		170			20	18 124	27 677	20 621
Japan	14 145	7936	12 705	8837	12 243	3738	11 262	12 893	10 679	13 026
USA	57	52	436	381	5351	2 950	6763	4985	7099	14 774

Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

ZIMBABWE: SUMMARY

- The crocodilian population of Zimbabwe is unknown, but thought not to be under threat.
- Drivers for the shift from wild production of crocodilians were scarcity of the wild resource, conservation, and development incentives. Initially, captive production was closely controlled by DNPWLM.
- Production of crocodilian skins from Zimbabwe soared between the beginning of the 1990s and the beginning of the 21st century, with an attendant swing towards skins from captive production.
- Singapore, France, Japan, China, the USA and Thailand are the biggest importers of *Crocodylus niloticus* skins from Zimbabwe, direct and/or via Singapore.
- The trade in crocodilian skins from Zimbabwe was estimated to be worth USD7 million in 2002.

CROCODILIAN SKIN TRADE AND INDUSTRY IN CONSUMER COUNTRIES

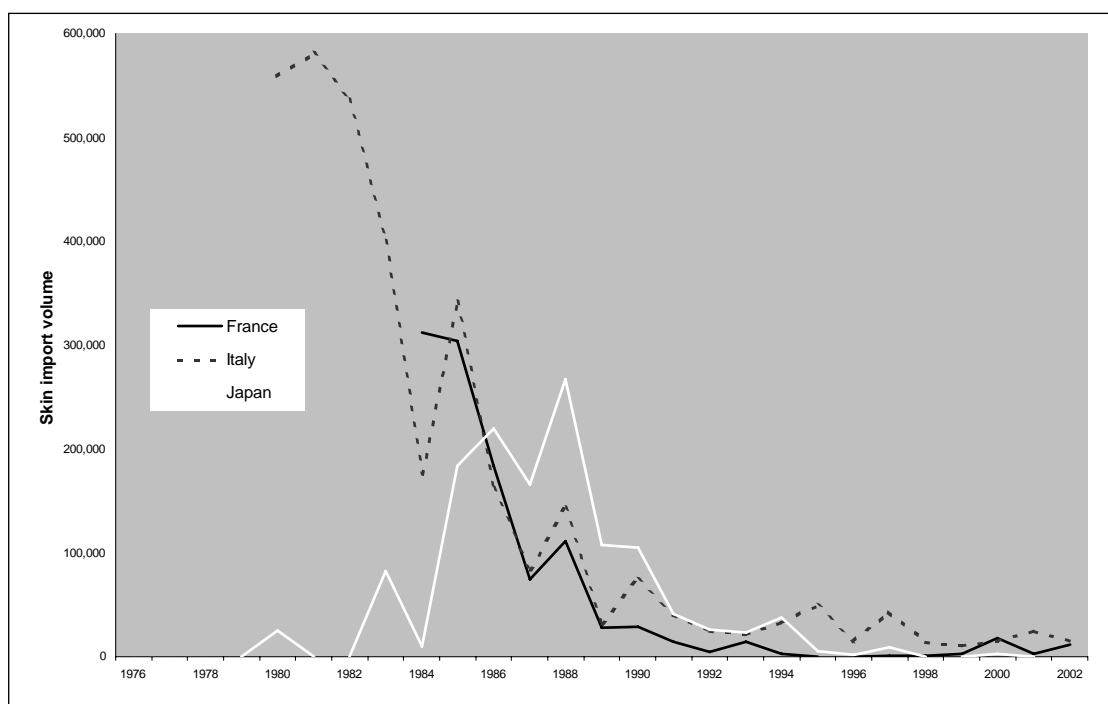
This section is built on findings from literature and on interviews with stakeholders in the crocodilian skin trade and industry (‘respondents’) in three key countries consuming crocodilian skin leather and products—France, Italy and Japan. It characterizes imports to these countries and describes changes in the industry.

CROCODILIAN SKIN IMPORTS TO FRANCE, ITALY AND JAPAN

From wild or captive stock?

Since the enactment of CITES, imports of wild-harvested caiman skins have fallen several-fold for France, Italy and Japan, 1976-2002 (Figure 7), as might be expected from trends in world production of caiman skin (Figure 2; Table 4, Figure 5). Respondents explained that the significance of wild caiman was waning for the

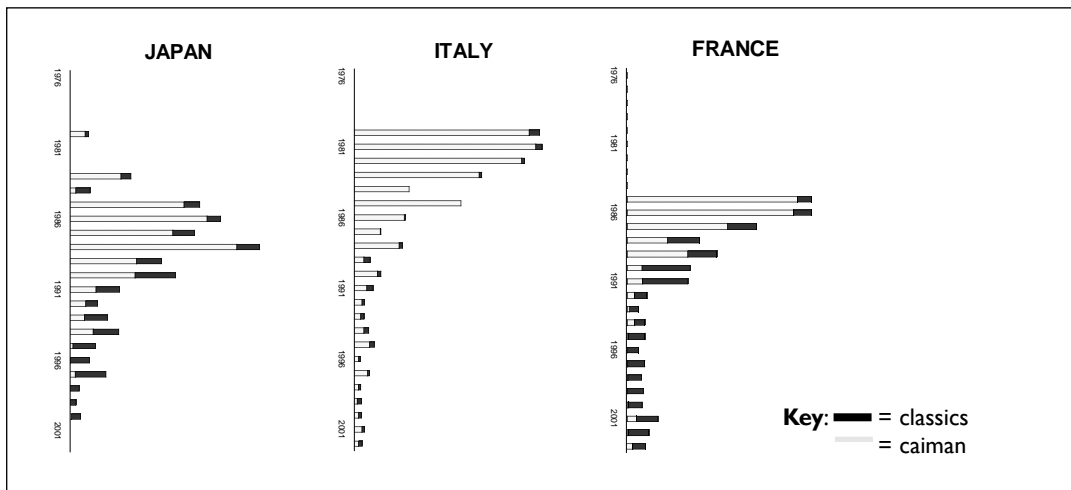
Figure 7
Reported imports of wild-harvested caiman skins to France, Italy and Japan, 1976–2002



Source: CITES trade statistics derived from the UNEP-WCMC *CITES Trade Database*, the UNEP-World Conservation Monitoring Centre, Cambridge, UK.

crocodilian skin industry in Europe and that most of the caiman skin imported by Japan was from captive-bred animals (in Colombia). Imports of wild-harvested classic skins by the three countries do not exhibit a clear decline in the same way, and indeed imports of these by France reportedly grew around 1990, owing to greater imports of alligator and *Crocodylus niloticus* skins (see **Figure 8**). Japan’s imports of wild-harvested classic skins were also greater in the 1990s than in the decade immediately following the enactment of CITES. However, **Table 15** shows that the overwhelming majority of imports of classic skins from five taxa to Japan were nonetheless from captive-bred animals in 2002.

Figure 8
Relative proportion of wild caiman and classic skin imports, 1976–2002



Source: as for Figure 7.

Table 15
Reported Japanese imports of skins from five species of crocodilian, 2002, showing estimated proportions from wild and captive animals

Species	Proportion from captive animals	Proportion from wild animals
<i>C. niloticus</i>	98%	2%
alligator	90%	10%
<i>C. porosus</i>	90%	10%
<i>C. siamensis</i>	100%	
<i>C. novaeguineae</i>	50%	50%

Source: Japanese Leather Importers’ Association; Takehara, *in litt.*, 27 April 2004; respondents.

Caiman or classic?

France has reportedly imported more classic skins than caiman skins in every year from 1990 to 1999, inclusive, apart from 1992 and 1995 (MacGregor, 2002). In several years, imports of classic skins were more than double those of caiman skins. In Italy, the picture is more or less the reverse for the same years (MacGregor, 2002). Japan is a significant net importer of both caiman skins from Colombia and *Crocodylus niloticus* from Zimbabwe (Tables 10 and 14).

THE PRESENT-DAY CROCODILE SKIN INDUSTRY

Before CITES, the industry produced for a niche market, mainly based in Europe, the USA and Japan, and was built on relationships and reputation (see **Background**). The history of the trade is replete with tales of daring and speculation, fortunes lost and won, as exemplified by some Australian adventurers (Anon., 2006). Those interviewed for this study noted that one effect of falling wild crocodilian harvests was to strip the industry of these romantic notions. In their place came a new transparency to many key aspects of the business—and challenges to the traditions of firms which had prospered in the pre-CITES era.

Some of these changes may have been direct consequences of the change in method of crocodilian skin production, but others, as will become clear, were simply part of a general trend in this and other industries. For example, the location of processing, particularly manufacturing, is changing in many industries, owing to a range of factors, including labour costs. Similarly, political factors are affecting the market for goods from Zimbabwe and reforms that swept through the northern provinces of Italy in the 1980s (*Terza Italia*) may have influenced structural changes to the Italian manufacturing sector, including in the crocodilian skin industry.

To understand changes in the crocodilian industry better, its present-day structure and some of the consequences of this new structure are examined below.

The retail sector

Earlier research indicated a three-tiered or hour-glass structure to the crocodilian skin industry (MacGregor, 2002; Sgobbi, 2000 and see **Background**), but this has been refuted as simplistic by several influential industry stakeholders (Ross, 2004). Indeed, respondents participating in this study and personnel associated with the CSG have revealed new information on the structure of the crocodilian skin industry. In the view of the majority of respondents, two recent and connected changes at retail level have fundamentally altered the dynamics of the industry—retailer mergers and the expansion of the conglomerate retailer. Retailers are not only seeking control of one sector of the industry, but also reaching backwards down the supply chain, exercising greater control over those who deliver the goods to them. These developments have led to the rise of retailers as newly powerful forces in the industry, as will be described.

Changes at the top

Companies that retail luxury goods have become a more dominant force and significant players overall on the demand side of the crocodilian skin industry, owing to their powerful financial leverage and the volumes of skin they purchase. Merging with other players at retail level, retail conglomeration ('horizontal integration'), and fusion with sectors of the industry further down the supply chain ('vertical integration'), have contributed to the establishment of this powerful position—and in these ways the crocodilian skin industry has behaved no differently to many other industries in developed countries in the late 1990s. Other economic forces have changed the locus of power, too, including the nature of contracts. Such concentration at the retail end has typified the luxury brand sector of the crocodilian skin industry since 1998, including for long-term retailers of crocodilian leather accessories such as Gucci, Louis Vuitton, Richemont and Rolex. Increasingly, these ways of conducting business pervade the stratum of the market beneath the luxury brands—composed of so-called 'conventional brands'—which is eager to emulate the luxury sector.

Essentially, the part of the crocodilian skin industry associated with luxury accessories has been re-spliced to comprise i) the luxury brands, integrated with tanneries and manufacturers, who are using the highest-quality leather and accessing the most lucrative markets—estimated at 30% of the market; ii) conventional brands, which are non-traditional users of crocodilian leather—e.g. Prada (Milan-based designer leather goods company) and Coach (a US accessories brand); and iii) small boutiques and specialist stores supplied by independent artisans—sharing the remaining 70% of the market, the so-called ‘middle market’.

Horizontal integration—(retail mergers and conglomerations)

As mentioned above, horizontal integration has contributed to the empowering of retailers. As a prime example of this trend towards conglomerate retailers, Louis Vuitton Moët Hennessy (LVMH), the French luxury goods company, has subsumed many companies in the past couple of decades, including Christian Dior, Givenchy, Prada, Fendi and Donna Karan (most of which have retained their discrete brand identity, however). Analysts expect that the main long-term advantage of conglomerated luxury brands will be protection from economic cycles owing to the diversity of the portfolio of businesses that are managed—that is, successful products will compensate for under-performing products. The significance of this for the crocodilian skin industry could be more stable demand (in aggregate) for crocodilian skins, but the precise dynamics require far better data to be understood in a useful way.

Vertical integration—(fusion of the retail sector with other links in the supply chain)

Respondents to surveys for this study revealed that, in the light of the financial significance of leather and their acute risk aversion, powerful luxury brand retailers have supply control as one of their prime objectives, which they are achieving through ownership of, or contractual arrangements with, other sectors of the industry (‘vertical integration’). Gucci and Hermès—the most significant luxury brands for the crocodilian leather industry—have been key retailers of crocodilian leather products since their inception during the inter-war period. Currently, both are engaged in focused backward integration and have invested in exotic leather, buying shares in specialised tanneries (see below; Anon., 2001). Both rely on their leather goods brands for the bulk of their profits (Anon., 2003c; Anon., 2002a; Anon., 2004b). As the well-known retailer Giorgio Armani put it, ‘A vertically-integrated approach where we control all the aspects of design, production, distribution and retail, is ultimately the correct strategy for the long-term prosperity of the brand’ (Anon., 2004a).

Examples of vertical integration from retail level were cited by respondents during surveys. All respondents noted that luxury brands only required the very highest quality skins and were willing to go to great lengths to access these. For instance, it was reported by Australian suppliers producing *Crocodylus porosus* exclusively for Hermès that all first-grade skins were shipped to France, whereupon Hermès bought only those skins that met their standards, returning the remainder to the producer (Hyde, 2000; Anon., 2003d). Hermès also has control in the tannery sector through its ownership of shares in two tannery businesses in France. Gucci has likewise integrated with the tannery sector by entering into partnership with the *Caravel Pelli Pregiate* tannery business, an exotic skins tannery that has supplied Gucci for the past decade. Gucci is also to found its own tannery, projected to become the ‘biggest supplier of luxury pelts in the world’ (Anon., 2001). Where manufacture is concerned, luxury brands draw on expertise from artisans and contractual deals between manufacturers, most of whom are second- or third-generation leatherworkers in dozens of small workshops, include a variety of exclusive and non-exclusive contracts (Johnson and Kapner, 2003). The artisans, for whom staying independent currently carries perceived risks of being outside the latest wave of industry change, have allegedly embraced the new way of working.

Advantages of integration for the retail sector

The benefits of integration, from a business perspective, include:

- *Efficiency*—by melding traditional craftsmanship with computerised production systems, luxury brands report spectacular improvements in efficiency in production of leather goods [five-fold] since 1998 without lowering quality (Johnson and Kapner, 2003). Successful streamlining of the period between design and ‘ready to ship’ product has helped boost flexibility.
- *Team working*—Designers are working with artisanal craftsmen to ensure that fashion and artisanal qualities (such as the efficiencies associated with making bags, to ensure that style and skin size are both addressed) are considered.
- Increasingly, *risks are shared* among industry participants through contractual arrangements between retailers and other sectors of the industry. This risk-sharing allows suppliers and processors to be more flexible, in order to accommodate fluctuations in consumer demand, for example, for different styles or finishes. It also allows greater possibility of investment in innovation by tanners, designers and manufacturers.

Several of those interviewed for this study contended that the crocodilian skin industry was ripe for integration owing to the relatively inefficient nature of its traditional structure, replete with relationship-based trades and intermediaries. The application of modern supply chain management principles (streamlining the supply chain and compressing costs) had proved successful for some luxury brands and, on the whole, respondents to interviews conveyed a strong sense of needing to be a part of the changes. Certainly, several respondents representative of smaller, independent businesses, particularly in Europe, made it clear that ‘success’ had been at the expense of independent industry participants. In Italy, several respondents noted that many artisan manufacturers were ‘out of their depth’ when thinking about competing with conglomerate luxury brands in Japan—as such they pursued old strategies that used to work, while their traditional buyers followed modern trends and

Box 1 ~ Characteristics of luxury brands for crocodilian leather

- *Competition differentiation*—although fierce competition is reported among brands, it is rarely over price—customers are believed to interpret discounts and low prices as a signal of weak demand for a brand, which raises doubts over quality. Rather, competition exists over other factors—including quality, style, brand image and celebrity association.
- *Gregarious*—famous names cluster, for example, in the streets around Via Montenapoleone (Milan) and in Old Bond Street (London).
- *Value creation*—immense value is created along the supply chain owing to the brand. The challenge of maintaining brand integrity is key to selling luxury goods over a long period of time.
- *Control of the supply outlet*—during the past decade the elite luxury goods firms have been painstaking to control their distribution very tightly to ensure there are a small number of high-quality outlets (Voyle, 2003).
- *Persistent advertising*—two-thirds of luxury brands that cut their marketing budget by over 10% during the 1990-93 recession later went out of business (Anon., 1999a).
- *Innovative marketing*—this can take many forms. For instance:
 - ✦ LVMH (Louis Vuitton Moët Hennessy), the French luxury goods group, is listed on the ‘socially responsible’ ethical market index FTSE4GOOD Europe.
 - ✦ Some products are strategic and not supposed to make money directly but rather to raise the entire brand’s cachet—respondents from the retail sector believed that some crocodilian leather products fulfilled this role.

reportedly switched to other manufacturers. On the other hand, several respondents from Italy reported developing lucrative niche markets and failed to recognize any retail-led ‘controlling mechanisms’—and appeared to compete successfully.

Several respondents from European manufacturers noted the relative rigidity of price ranges for crocodilian skin products as compared to pre-1995 pricing strategies. The fact that, since the shift to captive production, supply of crocodilian skins has fallen, quality increased, retail prices remained similar and yet the price paid for skins at the ‘farm-gate’ is lower (**Table 2**) may seem counter-intuitive. However, this trend is common to international trade in agricultural and natural resource products worldwide. Reasons include the relative weakness of small and independent entrepreneurs in international supply chains and the growing corporate management systems that drive industry supply. In other words, this is another result of the market power associated with retail consolidation—price is a visible element of this trend and retail brands are increasingly imposing implicit ‘restrictions’ or limitations on other participants in the industry.

Disadvantages of integration for the retail sector

Owing to the alleged greater power of the retailers, adverse circumstances faced by them will have strong ripple effects throughout the industry. This in some ways increases the risk for other industry participants, for whom it is no longer enough to comprehend the vagaries of each fashion cycle, but who must now also comprehend the cycles of leadership and strategy in luxury brand management. Some of the risks powerful brands face are listed below.

- Luxury brands are prey to several forces that, unheeded or unchecked, have been the downfall of other brands. For example, there is a need for:
 - * Constant diversification to lower their exposure to fashion cycles and world events (Anon., 2004a; Lenander, 2003)—brand dilution is the perverse reward for popularity (Anon., 2004a);
 - * Maintenance of brand integrity—the indefinable aura that convinces a consumer to pay a lot of money for something that could be bought more cheaply elsewhere (MacGregor, 2002; McGregor, 2003; Anon., 2004a; see **Box 1**);
 - * Controlling distribution to avoid ‘parallel importing’, where retailers take advantage of cross-border price differences to undercut their competition.
- Many luxury-goods firms are from euro-zone countries and thus their costs are primarily in euros but their revenues are mostly in dollars or yen and this exposes them to foreign exchange fluctuation. The rise in the relative value of the euro in 2003 produced serious problems for the profitability of these firms (Anon., 2004b) and may do so again (Jones, 2005).
- The management of conglomerate luxury brands changes more quickly than management changed within the crocodilian skin industry in the past (see Johnson, 2003) and management change has financial risks to business. As an illustration of this, Goldman Sachs estimates that the loss of Mr Ford and Mr De Sole from Gucci could wipe 15%—or one billion euros—off Gucci’s value.
- Compression of the supply chain has resulted increasingly in contracts between larger European buyers and ‘smaller’ producers. This could result in fewer options for producers to sell—although it could, alternatively, result in greater competition between buyers.

Shops

Interviews with those involved in the crocodilian skin industry highlighted certain key changes to shops selling crocodilian skin products since the early 1970s, in addition to the retail mergers already discussed. These include the:

- *Decline of the independent specialist retailer*—Although empirical information is limited, conventional wisdom holds that serial declines occurred in this sector of small boutiques and specialist outlets in the long-established markets of the USA, France and Italy—in the 1950s, 1980s/1990s and since the late-1990s, respectively. These outlets were often supplied directly by local artisans, with patron exclusivity and personal service (Robinson, 1999).
- *Expansion of the lower-value markets*—crocodilian leather products are available globally at a range of prices in a wide range of markets, which are continually diversifying, altering emphasis and, it is alleged, expanding.
- *Expansion of the association with wristwatches*—the wristwatch market has become increasingly significant during the past 10 years, particularly for smaller skins from farmed sources.

Consumers

Little is known or publicly available on the identity of the typical luxury goods or crocodilian leather product consumer. Most of what is known is focused entirely on the luxury market; indeed, conventional wisdom holds that typical consumers of crocodilian leather products are not affected by economic cycles (Anon., 2003e).

Those interviewed for this study noted that the type of customer had changed, as new countries had become affluent and as the customer base in traditional countries had expanded. Indeed, it is fair to say that the customer base for crocodilian skin products is diverse and international, yet it is certain that, of the traditional markets, it is the Japanese consumer, at home and abroad, who is the target consumer for luxury goods retailers. The USA and Europe remain important, but are waning. Of increasing importance are consumers in all Asia (i.e. beyond Japan), which is the world's fastest-growing retail market, especially for designer boutiques and luxury retailers (Anon., 2004c).

Japanese consumers

(This section relies on data from Anon., 2002c, d, and e)

Up to one-quarter of sales of luxury goods are in Asia (Anon., 2004c; Anon, 2003b; Anon., 1997; Nueno and Quelch, 1998). Retail analysts estimate that Japanese customers used to buy one-third of the world's luxury goods (Anon., 2002a; Anon., 2002b), but since 1990 the proportion has fallen to 15–25% (Anon., 2004c; Rahman, 2003a), although in an expanding global market. All respondents questioned for this study involved in the classic skins trade noted that Japanese consumers have an enduring relationship with crocodilian leather products, which sell for the highest global prices in Japan. Many industry participants from Italy reported a strong and persistent demand from Japan since the 1960s. This is backed up by literature (Ishii, 1990; Anon., 1992a; Koh, 1998) and by statistical evidence suggesting a close relationship between Japanese consumers and the health of the classic skins market (MacGregor, 2002).

Responses in interviews carried out for this study indicated that, at the upper end of the market for crocodilian skin bags in Japan, about 30% sold for over JPY500 000 (USD4549)—mostly classic leather products, sold by luxury brands—and about 70% sold for JPY100–200 000 (USD909–1820)—a mixture of classic and caiman leather products, sold by conventional brands. The Japanese Leather Importers’ Association researched into domestic consumers of crocodilian products in 2002, finding that the vast majority were females over 50 years old (see **Table 16**)—the likely customers for the costlier 30%. These findings resonate with other, limited evidence on luxury brand consumers in Japan (Anon., 1999b; Anon., 1996; Terazono, 2004). However, the younger female customer—the ‘office lady’—is of rising importance (Nueno and Quelch, 1998; Sawaji, 2002; Anon., 1997; Silverstein and Fiske, 2003). The way Japanese consumers buy luxury products is changing—respondents from Japan and Europe reported that conglomerate luxury brands were crucial today, replacing traditional luxury brands (particularly Italian luxury brands).

Table 16
Estimated age structure of crocodilian leather product consumers in Japan, 2002 (n=12 274)

Age	Total	Proportion (approx.)
<19	74	1%
20–29	802	7%
30–39	1594	13%
40–49	2714	22%
50–59	4241	35%
60–69	2175	18%
70>	674	5%
Total	12 274	

Source: Japan Leather Importers’ Association.

To carve a market niche, the Japan Leather Importers’ Association has pioneered a ‘Made in Japan’ tag, which is being tirelessly promoted and with reported success—over 300 000 items with this tag are being sold per year. There was a belief among interviewees in Japan that this embellishment could add 10% to the sale price in Japan.

Although Japan imports a sizeable proportion of the wild skins in legal trade, the importance of conservation attributes for Japanese consumers is assumed by respondents to be minimal. Indeed, representatives from the Japan Leather Importers’ Association concede that the Japanese consumer does not have an interest in environmental characteristics. This is not specific to crocodilians—the wave of environmental concern has yet to break in Japan.

Travel is crucial to sales of luxury goods (Anon., 2003a)—an estimated 25% is sold in airports (Nueno and Quelch, 1998; Anon., 2004c)—and the Japanese feature heavily in this retail segment. Japanese consumers visiting Hong Kong and Singapore, for example, are attracted by cost savings up to 40% (Anon., 2004c; Anon, 2003b; Anon., 1997; Nueno and Quelch, 1998). As a result, several key respondents participating in this study noted the correlation between falling prices for crocodilian skins and the wars in Iraq in 1991 and 2003, as travel is vulnerable to world events and this impacts directly on luxury brand sales (Anon., 2004c; Rahman, 2003b).

Non-Japanese consumers

Markets in the Europe and the USA continue to be significant, but the identity of the consumer is poorly understood. It is suggested that men are becoming increasingly important customers. Older customers remain important—in the USA, not only is the older generation a group of heavy spenders, but their number is growing as longevity increases (Silverstein and Fiske, 2003: 259).

Fashion

Demand-side industry respondents noted that fashion cycles for crocodilian leather products were traditionally long and traditional styles and colours were preferred. They also noted geographical sequencing—for instance, in the 1960s, Europe led New York in crocodilian leather fashions by two years and New York in turn led middle-America by a further two years (Silverstein and Fiske, 2003: 101). This helped dictate the nature of the manufacturing industry that supplied it. Today, however, many respondents argued that fashion cycles for all goods are global, owing to tighter management of the fashion industry by a few conglomerate businesses.

See also **Background** for information on consumer groups.

Intermediaries, tanneries, manufacturers and processors

Intermediaries

Intermediaries were once crucial to the functioning of an industry typified by poor communication and information flow, by the importance of personal relationships, and by the inherent uncertainties of wild-harvests (see **Background**). In general, the intermediary is the first industry participant to be elbowed from a maturing market and this trend has been reported, but not independently verified, in the crocodilian skin industry. It is generally believed that the last 20 years have seen a reduction in the number of the intermediaries between producers and consumers (Hutton *et al.*, 2001). Survey respondents indicated that this was because tanners were the first to integrate backwards down the supply chain ‘beyond’ or ‘through’ the intermediary, often brokering deals directly with producers and smaller domestic tanners. The fact that retailers are also integrating backwards (see *The rise to power of the retail sector*) could also be a causal factor.

Tanneries

Tanneries have formed a key and relatively narrow sector in the industry for many years (see **Background**), with large tanneries in France and Italy, the traditional centres of the international trade in crocodilian skins, sited to take advantage of the European manufacturers’ demand for skins, and in Singapore. Changes over the past 20 years have been noted in each market sector:

- *Tanners for luxury retailers*—In Europe, the major tanneries that traditionally served both the large fashion houses and the smaller independent manufacturers are increasingly integrated with—and dependent on—conglomerate luxury brand retailers. The extent of the changes wrought by new business arrangements is starkly delineated; respondents from large tanneries estimated that the proportion of their throughput going to these retailers has expanded from 15% 20 years ago, to 33% 10 years ago, to 75%.

- *Tanneries for the middle market*—tanning capacity is growing in producer countries and in final consumer countries—including the USA, Mexico, Colombia, Italy, South Korea and Japan—and the skins tend to be for domestic manufacture and sale.
- *Tanneries for lower-grade and caiman markets*—In the USA, small tanneries supply the cowboy boot market and subsidiaries of French tanneries supply alligator to European processors and manufacturers.

These trends have prompted the larger tanneries to disperse their satellite agents, both tannery buyers and inventory capital—such as warehouses, throughout the world’s main crocodilian leather-producing and consuming countries.

Only a relatively small number of firms have held sway in the tannery sector because of the perceived optimal size (large) for operating in this sector. However, there is increasing evidence that this optimal size related to the needs of the supply chain in the pre-electronic era. Moreover, scale economics appear to be favouring smaller more flexible tanneries now. In the past 20 years, information requirements have changed as the supply of skins has changed from wild to captive-sourced, thereby reducing uncertainty over supply caused by the variability of wild harvests. Also during this period, inventory needs changed. In the past, with wild crocodilians supplying skins, uncertainty meant inventory management was a strategic market-positioning tool. Now, inventories have become a purely financial hedge and flexibility of inventory is key. Finally, there has been a change in access to capital, and globalisation and liberalisation have afforded more entrepreneurs the opportunity to acquire capital to finance investments and to offset risks.

A significant proportion of tannery turnover was traditionally made sourcing and selling large first-grade wild skins. Following increased integration with retailers, the retailer gets first refusal on buying skins. This attracts criticism from tannery customers outside the luxury and conventional brands sectors. Manufacturers of high-quality, hand-made, crocodilian leather products note that the quality of the supply that remains after the tannery’s conglomerate business partner has made their choice is poor. As a result, the price for these second-grade skins is falling. Indeed, many industry participants suspect that there are bloated inventories of second-grade crocodilian skins, a rumour that apparently is further diminishing prices. Integration is a business arrangement that could diminish profits for tanneries.

Manufacturers

The nature of the artisan and his or her relationship with suppliers and customers has fundamentally changed over the past 20 years.

High-value items

Historically, and until the 1980s, France and Italy were synonymous with quality leather manufacture and their domestic artisans manufactured the majority of the high-quality crocodilian leather products sold by independent specialist retailers worldwide. These artisans accounted for the first- and second-grade leather and concentrated on exotic leathers. The decline in the manufacturing sector in traditional locations has been occurring since the 1950s and accelerated in the 1980s and 1990s. The vast majority of respondents agreed that independent manufacturers are ceding power to the dominant brands—both luxury and conventional brands have elbowed independents from this sector. Several key reasons were offered, including the Asian recession (1996–2000),

which hit Japanese consumers hard, the inability to adapt to modern conditions and increased competition from artisans in Japan, South Korea and China, as well as producers of high quality counterfeit leather goods.

Despite these factors, the top end of the manufacturing sector is resisting a dominant trend to relocate to regions offering cheaper labour (Anon., 2002a). Instead, in Italy and France, skilled artisans often now work under some form of contract to one of the luxury brands, increasingly conglomerate luxury brands.

Lower-value items

Little is known about this sector of manufacturing in the industry, but new entrants in new locations are a feature, as they are for manufacturing higher value items. While the drift in production from traditional regions worried many survey respondents, an equal number believed it was a positive development. Certainly, it may prevail as it is alleged that almost every conventional brand, i.e. those outside the top-tier of luxury brands, is either already manufacturing in Asia or thinking of it (Johnson and Kapner, 2003). Respondents believed the quality of cheaper crocodilian leather products had increased.

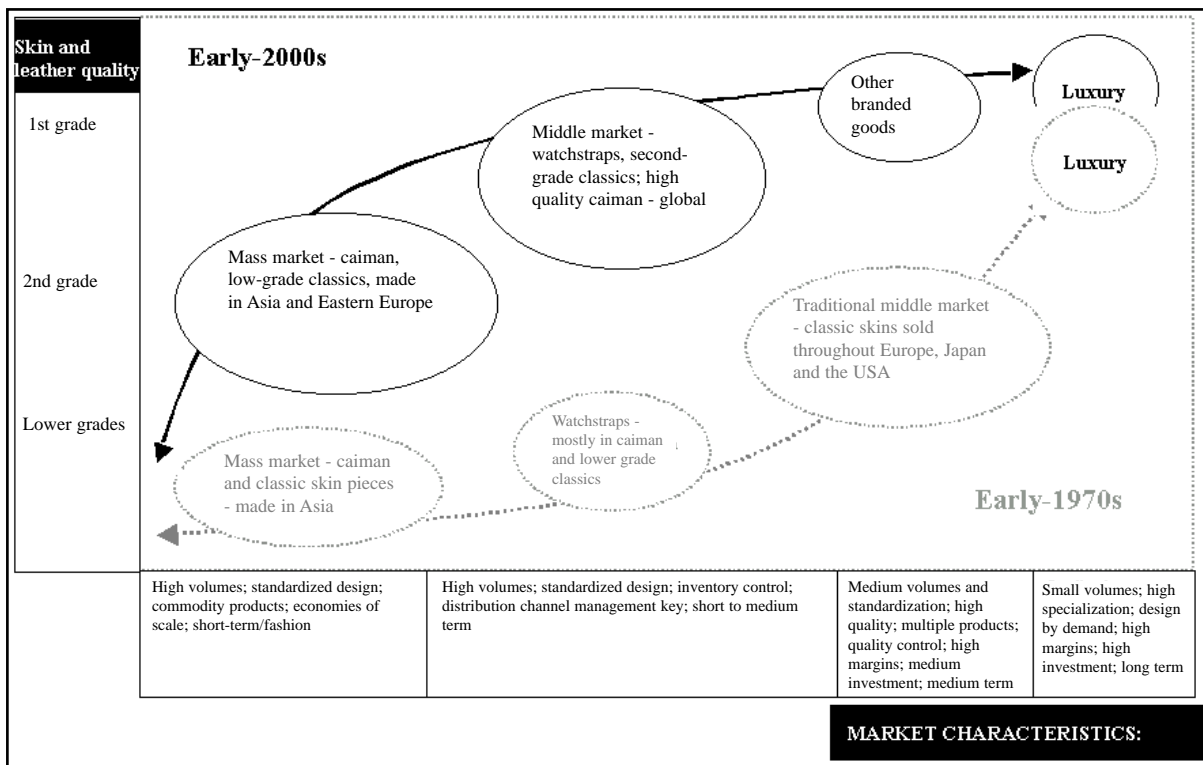
Quality issues

Leather quality has always been a ‘passport’ for entry into the high-value markets, but a ready market has always existed for the lower grade skins. While this holds true today, the ‘bar has been raised’; some industry participants now consider quality from farmed skins as the ‘standard’ and there was consensus from respondents that, in the past 15 years, the quality of crocodilian leather had increased. Interviewees surveyed in Europe indicated that Colombian caiman, i.e. mostly from captive-bred animals, had upgraded and was now providing quality—first-grade—leather and quality leadership for mainstream customers. In part, this was reported to be the result of technical developments in processing (see **The crocodilian skin trade and industry in Colombia—a supply country**).

Wild-harvested skins, by contrast, have not risen in quality—several processors in Europe and Japan noted the falling quality of wild skins in recent years, including those of *Alligator mississippiensis* from the USA. In 2003, allegedly for the first time, wild alligator was cheaper per unit than ranched—owing to pix disease, drought, and incentives of the release scheme (whereby farmers are encouraged to release lower quality crocodilians into the wild) (Hockstader and Brulliard, 2003; J.D. Ashley, *in litt.*, 5 May 2004; Christine Brewton, Chairman, Natural Capital Resources Foundation, *in litt.*, 10 May 2004). Hence, although there is some filtering of wild classic skins into the luxury market and into the conventional brands market, these skins are now mostly supplying the mass and middle markets. Wild-harvested caiman skins are most likely to enter the mass market.

Figure 9 depicts a generalised view of the markets existing in the early 1970s and early 2000s to illustrate how changes have taken place, using the quality of leather and skin as a framing mechanism. It shows the alleged shift of the watchstrap market into the middle market (see section on **Colombia**), as classics leather diversified into this market (see **Japanese consumers**), the upward drift in terms of quality in the mass market and also the change in location of manufacturing bases for that market.

Figure 9
Changing market characteristics for final products in crocodilian leather



Conservation

What role do conservation considerations play in consumers’ perceptions of crocodilian leather products? Despite earlier findings (MacGregor, 2002) from a range of stakeholders in the crocodilian skin industry that there was reportedly some level of environmental and/or conservation awareness among some consumers (see **Background**) and despite the registration of LVMH as socially responsible (**Box 1**), evidence from respondents in this study was clear—conservation principles are absent from consumers’ buying decisions and from the crocodilian skin industry. No conservation message is conveyed clearly by retailers—the ‘echo’ of wild crocodilian conservation barely reaches the consumer. The same is apparently true for other players in the industry, as those interviewees surveyed for this study who are also members of the CSG reported their limited success in educating their fellow industry participants on the importance of conservation. Indeed, significantly, industry participants saw risks associated with trying to educate buyers of luxury brands about conservation as there was the potential for confusion and the possibility of ‘dropping’ crocodilian skin altogether. Luxury brand retailers concurred with this sentiment. Many of them reported that they preferred to use farmed skins to avoid the risk of repercussions from environmental or animal campaigners. The fact that good conservation credentials are sometimes recognized as an attribute in the marketplace is reflected by comments from many respondents in Europe, who indicated a strong preference for working with alligator leather, allegedly because it was legal, abundant and had assured conservation credentials. However, the comment that farmed skins are preferred to avoid the risk of repercussions from environmental campaigners indicates that the marketplace makes a simplistic judgement, including a positive correlation between conservation and farmed crocodilians, without any distinction between ranched and captive-bred animals and the possible conservation benefits of the former (see **Background**).

In view of the above, considerable effort would need to be aimed at repackaging wild or ranched crocodilian leather to increase interest and sales in conservation. Retailers indicated that the specific physical attributes associated with wild skins—such as abrasions and cuts—might be of interest, but it would be short-term and was likely to be a fashion only (Christine Brewton, *in litt.*, 10 May 2004). On the other hand, there is a business imperative running in parallel with wild crocodilian leather, for it remains at the vanguard of the industry (according to respondents and see **Figure 8**) and is intimately linked with attractive profit margins on only small volumes.

DISCUSSION

The move from wild- to captive-sourced skins has precipitated changes in the crocodilian skin industry. At the same time, the industry has undergone changes regardless of the shift in the source of its raw material. As for any impacts of this shift on the conservation of wild crocodilians, there are definite points to note and these, and the impacts of the shift on markets, are discussed below. First, however, it is useful to summarize what the drivers were for this shift to captive production.

What have been the drivers for the shift away from wild-harvested crocodilians?

Reasons for the initial move to production from captive crocodilians and for the upsurge in crocodilian farming, largely based on ranching, in the 1980s may be considered as first-generation drivers, in other words, the circumstances which caused individuals and governments to back crocodilian farming as a viable alternative to hunting for wild crocodiles. As positive results of crocodilian farming became evident, this provided a second generation of drivers and so the shift in production continued and captive breeding of crocodilians has grown to become the means of supplying the industry with a massively increased proportion of its skins. The list of drivers below is categorized into first- and second-generation drivers and is based on surveys carried out for this report and on other literature on the subject.

First-generation drivers

Scarcity of wild crocodilians

A reduction in the supply of wild-sourced skins—the result both of over-exploitation and of the effects of CITES controls—was undoubtedly a catalyst for the rise in popularity of the farming of crocodiles (Luxmoore *et al.*, 1985 and see earlier sections of this report).

Conservation

In both Colombia and Zimbabwe, the original prompts for the ranching and captive breeding of crocodilians were reported to have included conservation motives, the supply of wild crocodilians having dwindled. Conservation was commonly a driver for crocodilian farming initially, the thinking being that the production of specimens in captivity would take the hunting pressure off wild populations (Hutton *et al.*, 2001).

Business

Business interests were not far behind initial conservation incentives in Colombia and Zimbabwe. The Government of Colombia and the private sector invested in commercial breeding of crocodilians during the 1980s and economic benefits for communities local to wild crocodilians were similarly an incentive for ranching in Zimbabwe. Again, the situation in Colombia and Zimbabwe seems to have been in keeping with general trends in crocodilian farming and conservation, as it became clear in the late 1980s that the effective conservation of crocodilians frequently depended on giving wild populations an economic value (Hutton, *et al.*, 2001).

Regulation

As national and CITES regulations came into effect in response to the need for conservation of wild crocodilians, wild-harvesting was increasingly closed off as a legal source of skin supply, whereas captive production, according to certain conditions, was permitted. In this way, regulation favoured captive over wild production.

'Cultural' preference

There were reportedly significant 'cultural' influences affecting which mode of production was first adopted and developed in any given country. Ross (2001) states that some regulators of crocodilian use programmes have become passionate advocates of their preferred mode and resistant to changes.

Second-generation drivers

Business

As captive production of crocodilians rose, so the success of its methods was endorsed and economic incentives to invest in captive production rose. Thus, the number of caiman skins produced each year from captive crocodilians (principally from Colombia) went from zero to over 500 000 in about 10 years between the mid-1980s and mid-1990s (**Table 6**) and, essentially, a new agricultural business had been spawned (Hutton *et al.*, 2001). In Zimbabwe, captive breeding enterprises started up in the 1980s, founded on the successes and experiences of crocodilian ranching in the country. The crocodilian skin industry is robust—a constant feature has been persistent demand—and its potential to raise foreign exchange makes it an attractive development option. This has encouraged portfolio diversification into crocodile ranching by some companies (Anon., 2003a). Whilst captive breeding of crocodilians can, in theory, be established in any State, there are significant barriers for entering the crocodilian skin industry for countries with supply based on wild harvests—it is necessary to be able to supply a large volume with a significant proportion of first-grade skins to enable promotion of stock to brands—and this favours development of economic incentive schemes around captive-bred, not wild crocodilian populations.

Control of supply

Pre-CITES, the uncertainty of skin supplies played a significant role in shaping the industry, a function of the reliance on wild-sourced skins. The uncertainty inherent in wild crocodilian skin supply is illustrated by the case of wild alligators from the USA, where a combination of factors, including drought and disease, have resulted in reduced quality of the skins with related price fall. By contrast, captive breeding and ranching are more efficient at providing the industry with a reliable supply, in terms of quality, quantity and timeliness and this is likely to promote these methods among producers.

Market requirements—diminishing comparative advantage for wild skins

Respondents noted that, before 1980, when wild skins dominated trade, supply was a key driver in the industry and crocodilian skin attributes valued by the industry coincided with those of wild skins. Now, however, the market wants the quality that skins of captive animals produce. The 'pull' factor appears to be the top-end of the luxury goods market, followed by its emulators in all other market sectors. Any potential attributes that leather from wild animals may possess—such as conservation attributes—are reported to be unimportant, even unwelcome, to the industry and not recognized by consumers.

Market evolution

Crocodilian skin markets experienced unprecedented volatility, for a variety of internal and external reasons, after the initial embracement of captive production methods. This included a price crash between 1990 and

1993—see **Figure 4**—changing demand profiles, oversupply, the swing in production method and allegations of illegal trade. Wild harvest was one of the losers—market share and price diminished as procurement strategies of newly powerful retailers began to favour other production sources.

Technological advances

Developments in the technology of commercial crocodilian raising led to widening development of first crocodilian ranching, then captive-breeding programmes (see **Background**).

Regulation

Having first sanctioned captive production, regulation then acted as a driver for maintaining the shift from wild production, providing elements of an enabling framework for the industry. Captive breeding, in particular, can obtain CITES approval relatively easily in terms of procedure, while approval for ranching and wild harvest programmes requires a more extensive national programme of conservation and management (Ross, 2001).

What have been the impacts of the shift to captive production of crocodilians on markets for crocodilian skin and its products?

It is important to examine the effect of the shift from wild-sourced skins on the crocodilian skin industry as a whole (in the sense that there are markets all along the supply chain, culminating in the ‘marketplace’). **Table 2** lists changes in supply characteristics of crocodilian skins in international trade, many linked to the change in method of production. Drawing on findings from this study, the following implications of these and other changes resulting from the shift in production can be identified.

Impact of improved control over supply

As already explained, captive breeding and ranching are more efficient at providing the crocodilian skin industry with a reliable supply, in terms of quality, quantity and timeliness, with consequences for the industry, as described below.

- **Quality:** As already explained (see **Quality issues**), the shift to captive production has meant a shift to higher quality crocodilian skins. This has affected the entire industry supply chain as several factors compound one another, as follows:
 - *Quality skins are available*—production from farmed and ranched skins has increased the proportion of high-grade leather.
 - Consequently, *the quality bar is raised*. Most respondents contended that luxury brands set unrealistic consumer expectations with the flawless skin quality of their products. Conventional brands then try to emulate this, hoping to ‘upgrade themselves out of harm’s way’; this raises the value of quality and lowers the value of all lower grade skins.
 - Consequently, *quality is now the prime differentiator*—traditional differentiation between species and origin is no longer the most important factor in buying decisions by retailers, although the classics/caiman divide does seem to persist, as suggested by the fact that the upper end of the market in Japan featured mostly classics sold by luxury brands—and by the frequent mislabelling of caiman goods as classic at retail level in lucrative markets worldwide.
 - Consequently, this results in a *shrinking market share for second-grade skins* (those with which industry participants formerly made the bulk of their turnover—see **Figure 9**).
 - *As the quality of wild skins has not increased*, their marketing potential is poorer.

- *Efficiency*: While the restructuring of the retail end of the industry was not caused by the shift in production method for crocodilian skins, the shift is likely to have been viewed as an opportunity by analysts brokering the various mergers and acquisitions. A significant proportion of profit is made by large brands from their leather goods portfolio, hence, investors and managers at retail level will tend to be acutely risk-averse in selection of their raw material (see **What are the drivers for the shift away from wild harvests?**).
- *Flexibility*: Captive production of crocodilians allows flexibility to a greater degree than does wild production. In Zimbabwe, flexibility and innovation proved key to maintaining markets for its crocodile skins, particularly during the global price slump of the early 1990s—for example, by designing a product tag for the Japanese market. Changes within the structure of the Colombian crocodilian captive-breeding industry have enhanced opportunities to diversify to other species and to integrate with the processing sector of the industry. This responsiveness allows maintainance of market share under changing conditions.
- *Lower costs*: As the more efficient production and streamlined supply chains associated with captive production have in turn streamlined costs, so have markets for cheaper crocodilian skins expanded (see **Consumers**) and prices for crocodilian skins been driven down (see **Figure 4**).

Impact of change in skin size

Skins from captive crocodilians tend to be smaller, on average, than those from wild ones. This affects final product choice and hence reduces the price per skin for smaller skins. In this way, the change in production source is likely to have been a key factor in the expansion of the lower-value market and of watchstrap production (see **Consumers**). However, it should be noted that wild-harvested crocodilian skin is at the vanguard of exotic leather portfolios; respondents averred that this was the case and **Figure 8** shows the persistence of wild classics in France and Japan.

Impact of increased collective action

Horizontal associations of industry participants often prove more sustainable and promote growth better (through greater leverage in negotiation and marketing). Moreover, collective action at national level eliminates the trap of domestic competition. It is not possible to claim that all increased collective action within the crocodilian skin industry is attributable to the change in skin production methods. However, it is the case that increased organization of elements in the industry, including vertical and horizontal integration, ensued following the shift in production, in some cases facilitated along the lines of a new, shared cause among crocodilian farmers—as, for example, the CFAZ in Zimbabwe. Indeed, the benefits of association are writ large in the success of the Zimbabwean crocodilian skin producers. The advantage of having an association to sell skins to international processors and traders was key to securing, and in some cases sustaining, market share. In Colombia, crocodilian skin farmers have realized that collective selling of skins to international processors and traders are key to securing, and in some cases sustaining, market share, something which would have been harder to achieve with wild-sourced skins.

Impact of relative stability after the main shift

The market is less volatile than at times during the past 25 years, which saw unprecedented prices and quantities for crocodilian skins. This volatility was at least partly the result of over-production of skins by farms, beyond market demand, causing falling prices from 1990—a problem that was solved, also in part, by a number of

producers going out of business (Hutton, *et al.*, 2001). There are vivid signs the industry is less volatile than at any time during the past 25 years, as it matures into an approximation of a modern retailing industry.

Impact of new industry participants

- *New ideas*: The shift in production methods and the changes it engendered challenged established traditions and behaviour within the industry and admitted new participants. This is likely to have opened the way for discovering new markets, investigating other new opportunities, for example, in technology, and to have weakened time-honoured notions, such as the classics/caiman divide.
- *Change in character of the industry*: Falling wild-harvested skin volumes are alleged to have ‘ripped romance from the industry’; mavericks are disappearing, and are replaced with the cautious commercial entrepreneur. The rugged raw image cultivated by the crocodile skin industry (and perpetuated by some marketers) is still a part of the allure associated with crocodilian leather products, albeit a disappearing one.

How does the shift in production impact on the conservation status of wild crocodilians?

There are potential impacts on the conservation of those crocodilians affected by the shift from hunting to captive production (see **Table 3**). (There are some crocodilians that barely feature in trade, for which any changes in the crocodilian skin industry will be largely irrelevant.) The impacts and potential impacts of captive production, for crocodilians and other species, have been considered before (e.g. Anon., 1992b; Ross, 1998a; Luxmoore *et al.*, 1995), but examples drawn from this study and specific to crocodilians are given for each impact noted below, in order to frame discussion of market-level mechanisms for stimulating conservation of crocodilian species in trade in the final sections of this report.

Poorer knowledge of wild crocodilian populations associated with captive breeding

Luxmoore *et al.* (1985) assessed the impact of the then nascent crocodilian farming on conservation. What he wrote in the mid-1980s resonates with the findings of Ross (2001) a full fifteen years later, which is that countries relying primarily on captive breeding of crocodilians for production, as opposed to ranching or wild harvest, are more often than not associated with poorly known, depleted wild crocodilian populations. This follows as a result of the poor ties they often maintain with the wild resource. In Colombia, where captive breeding is the predominant method of crocodilian production, there is little knowledge of native wild crocodilians, but what there is suggests that populations are depleted. In Zimbabwe, detailed knowledge of wild crocodilians has declined as regular monitoring has been discontinued in line with a steady conversion from ranching wild eggs to increased captive breeding.

Reduced incentive to conserve wild crocodilians and their habitat

Re-investment of resource rents has been recognized as important for successful sustainable use of crocodilians. Captive breeding operations, which often operate as closed circuits, are likely to have limited interest in wild crocodilians and can have a particularly erosive effect on *in-situ* conservation incentives (Ross, 2001). Re-investment in wild crocodilians has been unsupported in practice by captive-breeding operations, for which they have been criticised (MacGregor, 2001b, 2002; Moyle, 2003; Hutton *et al.*, 2001). In some cases, this is because crocodilian farms have been unable to predict the direction of the market and a great number have failed or remain supported only by government funding. In other, commercially successful cases, it is simply the case that reinvestment in wild crocodilian populations is not widely undertaken. For example, captive breeding operations

for caimans in Colombia are obliged, legally, to provide animals for restocking wild populations, but are nonetheless deemed to be providing little assistance to wild caiman conservation (Larriera *et al.*, 2004).

Where commercially successful captive production of crocodilians is underway, sustainable use of wild crocodilians is likely to be of reduced interest, as the relative returns from crocodile habitat are much lower than those from alternative forms of land use (for example, forestry, livestock) (Woodward, 1998; Thorbjarnarson and Velasco, 1998; Thorbjarnarson, 1999). As a result, local farmers and landholders are much less likely to tolerate proximity to wild crocodilians and the risks they pose to humans and livestock without some recompense and much more likely to respond to incentives to transform crocodilian habitat. This function is likely to be more pronounced when captive production relocates outside range States, further reducing incentives for *in situ* conservation. At the same time, the fall in the market significance of wild-harvested skin is likely to have deflected official attention from those wild harvests that do occur—the link between bureaucratic scrutiny and economic welfare is well-documented for other commodities. Moreover, mass production of skins from captive-bred crocodilians drove down prices for skins from all sources (**Figure 4**). This further lessened the value of wild crocodilians and the potential for re-investment in conservation of their populations on the part of the crocodilian skin industry.

The situation is different in the case of ranching (as opposed to captive breeding). One of the chief prerequisites for approval of a ranching scheme under CITES is that it should ‘be primarily beneficial to the conservation of the local population (i.e. where applicable, contribute to its increase in the wild or promote protection of the species’s habitat while maintaining a stable population)’ (CITES *Resolution Conf. 11.16*). In other words, incentives to conserve wild crocodilian populations should be built in to all ranching schemes for the species approved by CITES and they should not be viewed through the same lens as captive breeding operations in this regard.

Reduced pressure on wild crocodilians

Captive production of some highly endangered crocodilian species has provided important conservation insurance as wild populations have declined towards extinction (Ross, 2001) and ranching has successfully reduced exploitation of wild crocodilians and contributed to their populations, while also providing the crucial link with production and industry. Ross (1998a) judged 11 of the most commercially valuable crocodilian species to be the species least threatened with extinction and that the main threat to the survival of the six most endangered crocodilians was not trade, but the status of their habitat. The succession of depletions of one crocodilian species in the wild after another (as in Colombia, 1930-80) is no longer seen and crocodilian populations were retrieved from virtual elimination in Zimbabwe after the 1960s, some few years after crocodilian ranching began there.

Creation of wealth for reinvestment in wild crocodilian conservation

Once captive production reaches a certain stage of commercial evolution, it offers the potential for reinvestment in conservation of the species in the wild and its habitat. Some evidence of such re-investment is reported from Colombia. For example, Colombia has a national programme for the conservation of *Crocodylus intermedius* (Naranjo *et al.*, 2000) and a national management and conservation programme is being considered for Black Caiman *Melanosuchus niger*, based on the Treaty of Amazon Co-operation (*Tratado de Cooperación Amazónica*, 1997) and the Colombo-Peruvian Plan for the integral development of the basin of the river Putumayo (*Instituto Sinchi e Inade*, 1998). These plans have been designed and managed by the Ministry of the Environment, in

collaboration with the domestic crocodilian industry and show the potential to lever conservation gains from nurturing economic incentives for captive breeding of crocodilians. Colombian captive breeding operations also provide crocodilians to re-stock wild populations, as previously noted.

In Zimbabwe, there has been re-investment in wild crocodilian conservation and in the communities neighbouring the crocodilian populations (as in the case of CAMPFIRE).

Commercial production of crocodilians has been a vital component of funding for an endangered species programme for the Chinese Alligator *Alligator sinensis* and Philippine Crocodile *Crocodylus mindorensis* (Ross, 2001).

Enforcement

Control of illegal trade in the products of endangered crocodilians was rendered more complicated by introducing legally acquired farmed products into the market (Luxmoore *et al.*, 1984). However, CITES requirements that farmed crocodilian skins be marked to attempt to address this problem, and the fact that numerous crocodilian use programmes have demonstrated that the capacity-building required (and paid for) by commercial use results in greatly improved enforcement and decreased illegal activity (Ross, 2001), has meant that enforcement has not been weakened as a result of a the shift to captive production. The huge Colombian production of caiman has not prevented other Latin American countries from successfully protecting their caiman species (Ross, 2001).

CONCLUSIONS:

As the Discussion has summarized, the drivers for the shift in crocodilian skin production from wild to captive animals were initially mainly conservation, regulation, science and the dearth of wild crocodilians remaining to supply the trade, at least in Colombia and Zimbabwe, but a second wave of incentives for captive production were more commercial in nature and, ultimately, market-led. Indeed, the drivers for captive production and the drivers for market preference became closely connected to the point where, just as attributes of wild-sourced skins used to coincide with those valued by the crocodilian skin industry, so do those from captive crocodilians (epitomized by quality and reliability of supply) now coincide with what the market wants. The availability of high-grade skins from captive production had an affect on the whole industry, with the effect of creating a middle market of expanded significance, typified by new competition between different leathers and ventures into new markets. The change in production also brought new entrants into the industry and new associations. Changes that were separate but parallel with these developments, such as restructuring by the dominant retailing sector, also led to the favouring of skins from captive crocodilians by the market. The move to ranching and captive breeding of crocodilians is widely considered to have been a conservation success until now, but what conclusions may be drawn regarding production methods and the future conservation of crocodilians as the captive breeding component continues to grow, while ranching remains relatively stationary?

The premise of market-driven conservation, on which much crocodilian conservation has been founded, is that the financial benefits of commercial exploitation of the species can be harnessed within a management and regulatory framework to provide strong incentives for conservation. This study has reaffirmed that links between the crocodilian skin industry and wild populations of crocodilians are diminishing as wild-harvested crocodilians decrease in significance in the industry. The conservation rationale for restimulating trade in wild crocodilian skin is clear—wild crocodilians can be imbued with a trade value and, furthermore, one which outweighs their

nuisance factor and the value of other potential uses of their habitat. It is important that such attributes should once again be valued by the crocodilian skin industry, so that sustainable harvesting of wild crocodilians (i.e. hunting or ranching) can be maintained. What is less clear is how this might be achieved. Producers have lost influence and this reduces the potential to squeeze a conservation message into the supply chain, as conservation is not an issue at the retail end of the chain—conservation does not sell crocodilian skin products; the link has been all but lost. The large retailers of the modern crocodilian skin industry would appear to have the power to turn it around, but market imperatives must obviously be adhered to. Satisfaction of both conservation and market criteria could be achieved, however, and in this regard the following are worth considering:

- The crocodilian skin industry, or any industry founded on wild resources, is unwise to turn its back on the wild supply. Unpredictable impacts on the industry (for example, disease, changes in consumer preferences on a global scale) could shake its reliance on captive-reared stock.
- Wild crocodilian skins retain some advantages in today's market—wild classic skins remain at the vanguard of the strategy of luxury brands. Indeed, the market and industry appear to continue holding a special place for these skins, with evidence that a range of industry participants continue to make considerable profit trading in it.
- As noted by several respondents—including one major retailer—and by MacGregor (2002), conservation messages are not precluded from the fashion world and, with careful planning and development, conservation and brand messages could be synchronized and complementary.
- Captive breeding has a role to play and should not be viewed as a production method that needs stamping out. It may offer little to conservation in the short term, but in the medium and long term it does offer the potential for re-investment in conserving wild crocodilian populations. This business cycle is well understood in Colombia where an alliance between industry and regulators is developing the industry along lines that promise to hit its original goals crafted 20 years ago—those of rural development and conservation—albeit at a sub-optimal level.

RECOMMENDATIONS

Bearing in mind the opportunities for satisfying conservation and market criteria for crocodilian skins outlined above, the following recommendations are made for capitalizing on market potential to favour conservation.

Conservation bodies, in co-operation with crocodilian skin industry participants, should.....

...seek out conservation champions—These are needed to re-embed conservation concerns throughout the crocodilian skin industry. Since there is a range of media and messages to choose from, it is a priority for industry stakeholders to collaborate, share ideas and decide strategies on this. Providing a united front will help to convey the message most efficiently, but the identification and co-opting of salient and visible stakeholders will be key. The process of imbuing a conservation message with market acceptability will take time, necessitating long-term and constant pressure, but history has shown that producers and traders have long-term involvement in the crocodilian skin industry and it is therefore in their interests to be open to ideas for the long-term benefit of the industry. As the middle market is a follower of the luxury market, it will be important to ensure conservation messages meet the various needs of this market. Moreover, as Japan is a prime consumer of crocodilian leather, and as the market for this expands into the rest of Asia, conservation messages will need to bear this audience in mind, especially.

...encourage retailers to realize the potential benefits of the conservation message as a marketing tool— This recommendation is closely linked to the previous one, but focuses specifically on retailers, as they are key industry participants to involve. In particular, brand retailers who maintain wild crocodilian skins as premier product, but fail to convey attendant conservation messages, hold great potential for effecting market-led conservation. There are likely to be unexplored opportunities for introducing a conservation dimension into their core brand objectives and for marketing this dimension as a positive differentiator from other brands; perhaps the traditional romantic and rugged notions of crocodilian hunting could become fashion messages.

Crocodilian range State governments, donor agencies and private companies should work together to....

...manage supply, in order to place wild crocodilian populations once again at the heart of the industry. The volume of skins supplied is a crucial determinant of available opportunities for conservation. Management should include the use of economic incentives, particularly as the crocodilian skin industry is ripe for employing these throughout its supply chain owing to the successful and solid nature of the industry structure. Management options need to be identified and assessed but, among others, should include consideration of:

Tied trade—regulation of trade to ensure that captive-bred production promotes conservation through tied trade volumes with ranched and wild harvest production.

Capping captive breeding—mechanisms could include a moratorium on new captive breeding enterprises for export outside range States, and domestic quotas.

Quota systems to help authorities efficiently manage domestic production and the international trade.

Stimulation of smallholder entry and sustainability along the supply chain—it is a priority to lower barriers to entry to the industry for those range States with responsible management of their wild crocodilians that wish to supply. This is particularly so in range States where opportunities need to be seized for realizing the maximum level of economic value of crocodilians, but where funds and management systems are not available to facilitate this.

Development of a 'conservation brand' founded on wild and ranched crocodilians to imbue the customer base with conservation values and to seed retailers' procurement strategies.

Scanning for perverse incentives—existing policies and regulations, including the mix of CITES and national regulations, should be assessed to identify any negative or perverse incentives for conservation, such as export restrictions on skins from wild crocodilians.

Conservation tithes—in order to ensure investment in conservation by captive breeding operations, a tithe could be levied on each skin exported from these farms, which could in turn be reinvested in conservation activities.

To improve quality and productivity from wild and ranched crocodilians, producers of wild crocodilian skins should.....

....*focus on quality improvements*—wild-harvested skins have a reputation for relatively poor quality in a market which values quality. To assess how and whether this should be addressed as a means of increasing their market share, the role of quality in the market needs to be better understood, in order to direct producer decisions, marketing efforts, investments in technology, and so on.

....*review enhancement of the value from wild and ranched crocodilian populations*—feasibility studies should be undertaken to review possibilities for maximizing the productivity of crocodilians, for example by enhancing the value of the trade in hides and by diversifying into trade in crocodilian meat and other by-products of the main trade.

....*research into the potential role of industry associations in securing advantage for wild and ranched crocodilian skins*—industry associations have proved useful mechanisms for leveraging positive change at producer level in industries including the crocodilian skin industry. Their potential role in bringing benefits—such as lower risks, increased opportunities and better access to information and technology—to producers of wild crocodilian skins should be investigated.

....*learn by example*—there is a wealth of experience in sustainable use of wild crocodilians to learn from, for example, in the case of Zimbabwe, but also experience with alligators from ranched and wild harvests in the USA. Such programmes will stand the best chance of succeeding if they are flexible, collaborative, market-focused and innovative, perhaps using resource managers to access opportunities for marketing skins, paying attention to the attributes of wild and ranched crocodilians.

To maximize potential usefulness of trade data, CITES Parties should.....

....*improve data*—CITES Parties need to invest in an expanded trade database that more keenly supports conservation requirements. Database source codes already reflect the variety of crocodilian production regimes being used, but the usefulness of the data would be enhanced if they included declared trade values, which would increase transparency, private sector interest and research potential.

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