UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
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BIOTRADE – DESIGNER'S TOOLKIT

YELLOW ANACONDA
EUNECTES NOTAEUS

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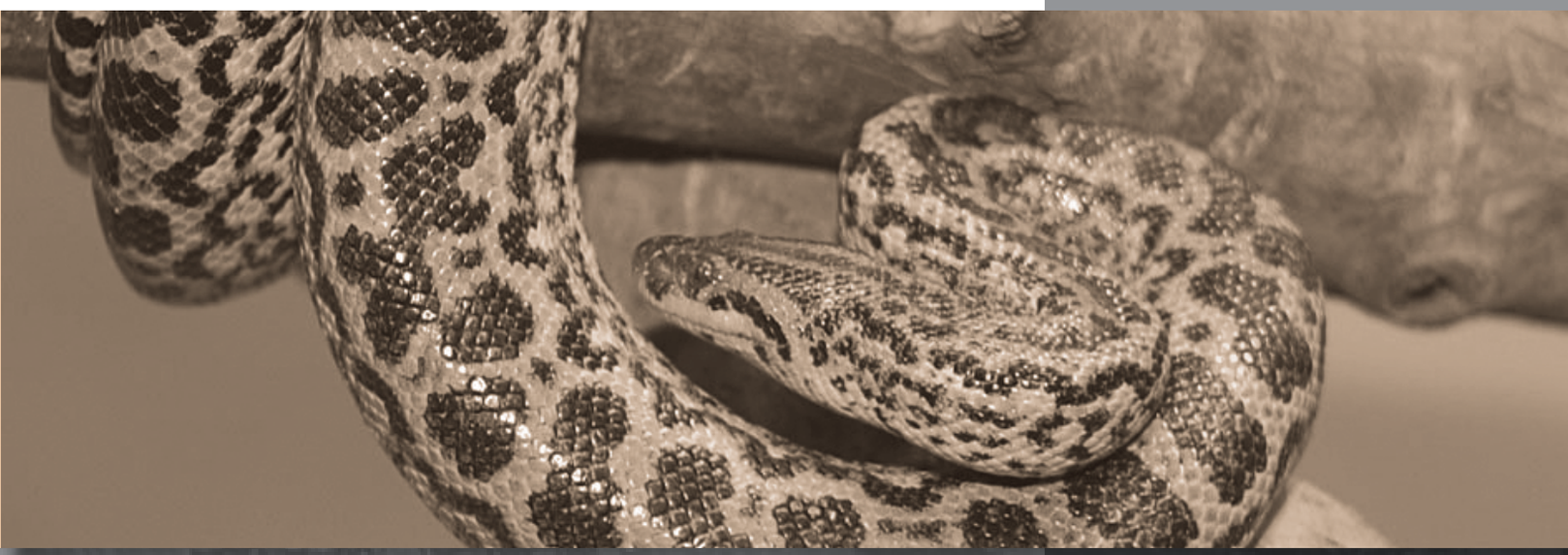

Sustainable Materials for the Fashion Industry
Biodiversity/Ecosystems/Community Impact Review

UNITED NATIONS
New York and Geneva, 2014

Note

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Acknowledgements

This publication was prepared for the United Nations Conference on Trade and Development (UNCTAD) BioTrade Initiative by Burak Cakmak.

This publication was developed within the Swiss State Secretariat for Economic Affairs (SECO)–UNCTAD partnership, under the BioTrade Facilitation Programme – Phase II.

This publication, BioTrade Designer's Toolkit: Yellow Anaconda *Eunectes notaeus.* Sustainable Materials for the Fashion Industry: Biodiversity / Ecosystems / Community Impact Review is a product of the BioTrade Initiative, part of the Division on International Trade in Goods and Services, and Commodities (DITC), UNCTAD. It is part of a larger effort by UNCTAD to analyze trade-related issues of particular importance for developing countries.

This study benefited from inputs by David Prosser, Tomás Waller and Patricio Micucci, assisted by Yvonne Paredes. The desktop formatting was done by Rafe Dent.

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UNCTAD/DITC/TED/2012/5
UNITED NATIONS PUBLICATION

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I. INTRODUCTION

The wild harvesting of animals such as the Yellow Anaconda has the potential to be used as a conservation tool for the species itself and for the protection of it's habitats. The economic incentives that the local communities receive are directly linked to the habitat, producing strong reasons for them to protect and care for the natural areas.

The Yellow Anaconda Management Program in Formosa province in Argentina (YAMP) is the only management program for a snake species in the world, promoting conservation of biodiversity as well as the social and environmental impacts of management and trade of the species.

This factsheet provides insight into the sustainable management program of the species and highlights the market potential, including trade facts and potential policies for the Yellow Anaconda skin trade.

A. Material name and specifications

1. Taxonomy

Kingdom: Animalia.
Phylum: Chordata.
Class: Reptilia.
Order: Serpentes.
Family: Boidae.
Genus: *Eunectes.*
Taxon: *Eunectes notaeus* Cope, 1862.

2. Common names

English: Yellow anaconda.
French: Anaconda jaune.
German: Gelbe anakonda.
Spanish: Anaconda amarilla.

3. Trade names

Kuriju, sucuri amarela, yellow anaconda.

4. Name (etymology)

The name *Eunectes* is derived from the Greek word Ευνήκτης, which means "good swimmer". Local names for the yellow anaconda in South America include the Native American terms curiyú in Argentina and Paraguay, and sucuri amarela or sucuriju in Brazil.

B. Facts

1. Biological characteristics

Although yellow anacondas are much smaller than green anacondas (*Eunectes murinus*, the world's biggest snakes) they do reach lengths of up to 4 meters (typical adult range 2 to 3 m). Yellow anacondas have a yellowish-green background color with blackish bands and overlapping spots that wrap around the entire body. This provides camouflage in murky water or in vegetated marshes. Females grow longer than males and generally weigh more as well. Male yellow anacondas can reach up to 2.5 m in total length while a female can reach a maximum length of 4 m (Waller et al., 2007).

Figure 1. Distribution map (shaded) of the yellow anaconda (*Eunectes notaeus*)

2. Distribution

Argentina, Bolivia, Brazil, Paraguay (see figure 1).

3. Habitat

Yellow anacondas can be found in lagoons, swamps and marshlands associated to slow-moving rivers or streams. During droughts they can be found using caves for shelter and along riverbanks near ponds that retain water. During the rainy months, yellow anacondas can be found in flooded, treeless areas, where they hunt for fishes, water snakes, caimans, water rats, and birds (Burton, 1967; Waller et al., 2007).

Habitat regions: Tropical / subtropical; terrestrial; freshwater.
Terrestrial biomes: Tropical and subtropical forests and savannas.
Aquatic biomes: Rivers and streams.
Wetlands: Marsh; swamp.
Other habitat features: Riparian; caves.

4. Ecology

Yellow anacondas are keystone species; they are one of the top predators in the ecosystems they inhabit. Yellow anacondas interact with other animals in a predator-prey relationship, influencing and being influenced by the populations of other species.

In captivity yellow anacondas can live for more than 20 years. In the wild, a typical lifespan would be shorter depending on natural conditions. Some key biological traits of anacondas, such as growth, age at first reproduction, and reproductive frequency, are very flexible and can change according to varying environmental conditions, in a way that makes yellow anaconda populations very resilient to induced or natural mortality events (Waller et al., 2007).

5. Diet

Yellow anacondas are trophic generalists, preying mainly on animals found in wetland and riparian areas throughout their range. Their diet consists of birds, bird eggs, small mammals, turtles, snakes, occasional fish or fish carrion, and caimans. Yellow anacondas are considered ambush predators and constrictors. They may eat only every few days or weeks, depending on the size of their last prey item and overall prey availability. In the wild, most predation occurs during the relatively dry periods when wetlands have shrunk and prey concentrates around remaining water bodies (Parker, 1963; Strussmann, 1997; Waller et al., 2007).

6. Breeding

Female anacondas breed every two years or less frequently, depending on body condition. They are viviparous, with the largest females capable of giving birth to up to 45 offspring per reproductive event, with each offspring about 55 cm in length. Mating in Argentina takes place at the onset of the local spring season (from September to October). Males become attracted to females when they release pheromones into their surroundings. Several males can congregate around a single female in "mating balls", engaging in copulation alternatively. Ovulation occurs around November and gestation takes 5 months, with the delivery of offspring at the end of the hot season, during March and early April. Anacondas reach sexual maturity at 3 to 4 years old. Schmidt and Inger, 1982; Mattison, 1995; Waller et al., 2007).

II. MARKET OVERVIEW

Anaconda skins, like those of other boas and pythons, are considered a valuable resource and are highly prized in the manufacture of exotic leather goods (Jenkins and Broad, 1994). Historically, Yellow Anaconda skins were mainly exported from Argentina and Paraguay, primarily to the USA and Europe (Micucci et al. 2006a). After trade was effectively banned in 1999, a sustainable management program was established in 2002 and a controlled trade recommenced in 2003. Today, the Yellow Anaconda Management Program of Argentina produces an average of 4,000 skins (10,000 linear meters) a year for export.

A. Sourcing insights

For over forty years, from the mid 1940's to the late 1980's, the yellow anaconda was exploited in Argentina and Paraguay for its skin. Between 10,000 and 60,000 skins were exported annually to the United States and Europe (Waller and Micucci, 1993), until a ban was effectively implemented in the late 1990's. During this time, the exploitation of yellow anacondas was carried out informally, without management guidelines or any regard to the species' biology (Waller et al. 2007).

The hunting of yellow anacondas diminished considerably when trade was effectively banned in Argentina; however, in several locations, anacondas were opportunistically captured and their skins smuggled to neighboring countries for export.

As a result of the implementation of Yellow Anaconda sustainable utilization program in 2002 in the Province of Formosa, Argentina, trade recommenced in 2003 and continues to date. The 'Yellow Anaconda Management Program' (YAMP) was devised to produce entire skins for export. All skins produced in the field are usually exported within a year. Cutting and manufacturing was not allowed in Argentina to avoid illegal activities, however, this policy may change in the future once a traceability system for finished products is put in place.

1. Supply chain structure

The economic structure of YAMP includes government (federal and provincial), exporters (4), hunters (about 300), local buyers (6), and the NGO in charge of the technical program. The government sector receives the smallest portion (4.2%) of shared benefits. The government delegates the administration of the program to an NGO (Fundación Biodiversidad – Argentina) in order to encourage prompt and direct allocation of funds for research and monitoring (14.8%). Hunters and local buyers collectively earn 13.3%, but three-fourths of this amount goes into hunters' pockets. Consequently, about one-third of the international value of a skin remains in the region. Although actual earnings at the local community level represent a three-fold increase over prices paid by illegal traders just a few years ago, the program strongly encourages higher prices to enhance the local allocation of benefits. For example, the price to hunters and local buyers increased 30% in 2012 compared to 2007 figures (Table 1) and is expected to increase even further in next season (2014).

Table 1: YAMP benefit sharing in 2007 (based on a US$50 skin price).

Stakeholder	US$	%
Provincial and export taxes	2.1	4.2
Program running costs (NGO)	7.4	14.8
Hunters and local buyers	6.7	13.3
Stockpiling logistic expenses	3.1	6.2
Total expenses per skin	19.3	38.5
Exportes income	30.7	61.5

Source: Micucci, P. and T. Waller. (2007). *The Management of Yellow Anacondas (Eunectes notaeus) in Argentina: From Historical Misuse to Resource Appreciation.* Vol. 14:3.

2. Processing

For export, there is a minimum allowed skin size, which is 230 cm long by 23 cm wide. Actual skin sizes range from 230 to 440 cm with an average size of 260 cm during annual harvests. In addition, every year the Program establishes a specific skinning pattern, at the level of the tail, to differentiate the year's skins and avoid stockpiling. Skins are nail-stretched on the ground for sun drying by hunters in the fields as they have always done. To nail the skins to the ground, hunters use the spines of a local invasive tree called Vinal (*Prosopis ruscifolia*). There are no slaughtering houses or "live" stockpiling facilities in the region. At this stage, no additives or chemical treatments are used on the skins. Once the skins are dried, they are rolled and stockpiled in the dark until their sale to a local buyer (stockpiler). Raw skins stored for more than a month at a stockpiling facility are rinsed with diesel as a moth repellent. In this way skins can last for more than a year (Figure 2).

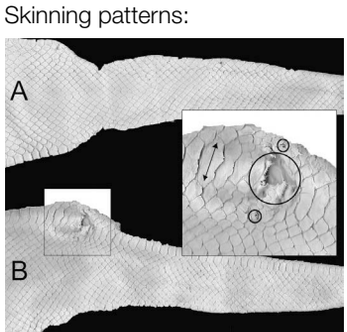
Figure 2: The different stages of processing yellow anaconda skins can be seen below:

Yellow anaconda:

Hunting expedition:

Hunter:

Skinning patterns:



(All photo credits: Fundacion Biodiversidad, Argentina).

Sun drying skins:

Nailing skins with tree spines:

Crust skins:

Export button tag:

B. Harvest overview

1. Exporters

In its early years, (2002-2006) YAMP worked with 7 local companies connected to the reptile skin trade and the export business. However, in the past three years the participating local companies decreased to 4 or 5 companies, with only 2 companies as official exporters who acquire skins from other companies for export. The 2 exporting companies are:

J. A. Milkis,
Céspedes 2639 – Piso 6, Dpto. 6,
C1426DUK Buenos Aires,
Argentina.
Email: jamilkis@gmail.com.

Silberfurs SA,
Suárez 2778,
C1284AGL Buenos Aires,
Argentina.
Email: administracion@silberfurs.com.ar.

2. Tanneries

Formosa province legally requires that no raw skins leave the territory without being part processed. Therefore, skins are either crust tanned or pickled by a local tannery before leaving the province for export.

The main importer for the first 8 years of YAMP (2002-2009) has been Conceria Caravel Spa from Italy. There are now more tanneries buying the skins. The main tanneries sourcing yellow anaconda skins at the international level are:

1. Conceria Caravel Spa (http://www.caravelspa.com/),
   Via dei Campi Alti, 3/5/9,
   56022 Castelfranco di Sotto (PI), Italy.
2. Legnotan Spa (http://www.legnotan.com/)
   105, v. Diaz,
   56028 San Miniato (PI), Italy.
3. Panamerian Leathers Inc. (http://www.panamleathers.com/),
   48 Pleasant Avenue,
   Johnstown, NY 12095, USA.

3. Production and export statistics

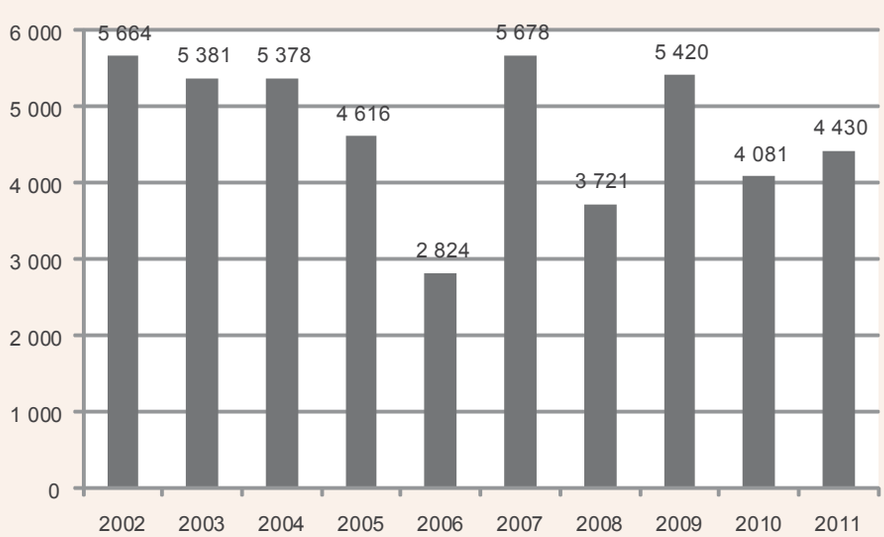
Skins produced by the Yellow Anaconda Management Program. All skins produced are exported.

Between 2003 and 2010 (2011 excluded), 34607 skins were exported to Germany and Italy (Conceria Caravelle SPA), 3736 to United States, and the rest to Panama.

C. Trade policies

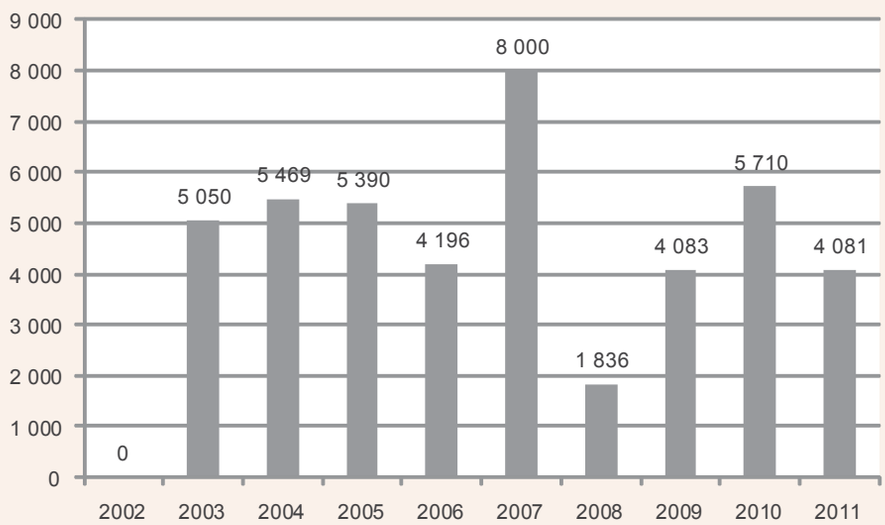
As part of YAMP, all yellow anaconda skins are tagged prior to export with a numbered button tag: AR – YA followed by the number (AR: Argentina, YA: Yellow Anaconda, and a consecutive number since 2002).

Figure 3. Number of skins produced per year



Source: CITES Trade database, UNEP-WCMC.

Figure 4. Skins exported by Argentina according to CITES Trade Statistics supplied by UNEP-WCMC (exports exhibit some commercialization lags among years)



Note: Between 2003 and 2010 (2011 excluded), 34 607 skins were exported to Italy (Conceria Caravelle SPA), 3 736 to United States, and the rest to Paraguay.

There are no export quotas for yellow anaconda skins in Argentina. All yellow anaconda skins produced are the result of a management policy based on the regulation of hunting, the season, and fixed minimum skin size. The resulting yearly production figures mainly show the productivity of the ecosystem caused by environmental factors.

The United States has no specific import regulations related to the yellow anaconda as the yellow anaconda is not listed under the Endangered Species Act. Following the ban on the import of pythons into California, traders have substituted yellow anaconda skins for python skins.

There are no import quotas for yellow anaconda skins set by the European Union. Following a proposal made by YAMP, the European Commission established a minimum skin size policy for imports in 2004 which does not allow the import of skins, from any country, under 230 cm in length.

Figure 5. Sample yellow anaconda products: manufacturer - KellyLocke, Ca, USA http://www.kellylocke.com/

D. Commercial applications

Yellow anaconda skins are used primarily for making bags, belts and wallets. No production is allowed in Argentina to help ensure the effectiveness of the conservation program.

1. By-products

Currently, the skin is the primary part used from the yellow anaconda. Once the animal is skinned, the rest is discarded or used as feed for other farm animals (primarily pigs) living in La Estrella Marsh in Formosa province, Argentina.

There is no local tradition of consuming snake meat and based on current volumes, the export of meat to countries where there is demand is not commercially viable.

III. MATERIAL BIODIVERSITY AND ENVIRONMENTAL IMPACT REVIEW

The Yellow Anaconda Management Program was initiated in 2002 in the Province of Formosa, Argentina. The management plan was conceived to manage an activity that had been exploiting a valuable wildlife resource with no regard for existing regulations. Designated hunting areas were assigned to a restricted number of local skin buyers (LSB). A LSB is authorized to acquire hides from enrolled hunters living or working in his assigned territory; overlapping areas among buyers is discouraged and regulated. A minimum skin size of 230 cm was established for skins, while annual changes in skinning patterns ensure that hunters do not stockpile hides from one year to the next. Sustainability of the species is regulated by examining hunting effort in relation to catch-per-unit effort (CPUE) and monitoring traditional parameters like sex, origin, and size of the skins. About 15% of the program's gross revenues return to cover program costs, whereas 13% goes to community members.

A. Conservation overview

1. Legal status

CITES

The yellow anaconda is listed under Appendix II of CITES.

IUCN Red List

The Yellow Anaconda has not been evaluated under the IUCN Red List of Endangered species.

2. Principal threats

Habitat destruction, unregulated commercial hunting and persecution out of fear are potential threats to the species. Climate change may pose a risk to some populations inhabiting hyper seasonal wetlands.

B. Sustainable use

From the1940s until early 2000s, the management of yellow anaconda skins went from a period of chaos to a period of order and is now developing into a mature market.

The first period, or period of "unrestricted hunting" has uncertain origins. Although there are no clear records, it is likely that this period occurred during the late 1930's and early 1940'sbut, due to lack of records, it would be difficult to quantify the volume of commercial activity in a reliable manner. The first National Law for the Protection of Wildlife (Law 13 908) legislation was passed in the 1950's, which, among other things, prohibited the hunting of the species. However, due to market demand and the high value of skins, illegal hunting continued until the 1980s. In 1980, Argentina ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Law 22 344), which listed yellow anaconda in Appendix II. In 1981, Law 22 421 (National Fauna Conservation Law) was enacted which regulated the implementation of Appendix II CITES-listed species and, in 1986, Resolution 24/86 prohibited the hunting, inter-provincial traffic and trade in federal jurisdiction of yellow anacondas. None of these measures were *per se* effective in halting the illegal hunting and trade of yellow anacondas in Argentina until the ban was effectively implemented in the late 1990's.

In 2001, the period of YAMP "administration" began, based on scientific criteria with the aim of creating an effective and reliable system. For this change to be realized, it was not only necessary to change the legal and administrative procedures, but also ensure a new understanding on the part of the industrial sectors on the need to comply with the new guidelines on use of renewable natural resources. During 2001, a study was carried out to analyze the feasibility of harvesting yellow anaconda in a sustainable manner (Micucci et al. 2002). Research focused on social and ecological aspects, and involved experimentation with innovative management policies. In 2002, as a direct result of this research, the CITES Management Authority asked Fundación Biodiversidad – Argentina to design a management program for the species.

An experimental pilot program (EPP) of the "Program for the conservation and sustainable use of the yellow anaconda (*Eunectes notaeus*) in Argentina" was carried out in the Formosa Province between 2002 and 2004. The EPP was designed to increase knowledge on the reproduction and natural history of this species and to establish experimental management rules and control criteria. It also involved the analysis of resource exploitation from ecological and economic standpoints. During the three-year period, 16,517 skins were obtained with a mean length of 2.6 m, and constant CPUE and yield values. These represent the first records of abundance and sustainability indicators for this little-known species that, although intensively ex-

ploited over past decades, has recently experienced an official hunting moratorium which ensured low hunting pressure.

1. The Yellow Anaconda Management Program

The Yellow Anaconda Management Program (YAMP) seeks to reconcile the traditional utilization of a resource with its long-term conservation, and with the additional goals of promoting biological research on anacondas, avoiding resource misuse and waste, and maximizing local income favoring resource and habitat appreciation (Micucci et al. 2006a).

From a conceptual perspective, the program followed the Adaptive Management Approach (AMA; Holling 1978), which was adopted due to the high levels of uncertainty about the system, and because it provides the ideal conceptual framework for exploited species for which research and population monitoring by standard methods becomes unfeasible in practical terms. The AMA works on a step-by-step basis, monitoring the effects of actions taken through specific control variables and promoting changes, when appropriate, in a feedback fashion to progressively reduce uncertainty.

Anaconda populations are actually managed on the basis of the "sustained yield" harvest theory (Caughley and Sinclair 1994, Webb 2002). Specifically, the program tested surplus-yield production models (i.e., Schaefer 1954, Fox 1970), which have been used mainly in fisheries, but also for terrestrial fauna.

From a methodological perspective, a harvest can be controlled either by placing a quota or by controlling hunting effort (setting a hunting season or limiting the number of people or the amount of time for harvesting a population; Caughley and Sinclair 1994). The YAMP follows the latter approach, making no effort to control directly the number of animals harvested. Harvesting a constant number of animals each year is risky, particularly when the population can be affected by environmentally induced swings (Caughley and Sinclair 1994) or when conducting a census of populations is difficult; both these situations are known or expected to occur in yellow anacondas inhabiting highly seasonal savannas.

Up to seven major reptile skin exporters financed the program under a mechanism controlled by the central government. Federal regulations state that project benefactors will be able to distribute benefits (i.e., snake hides) among themselves in proportion to the funds that each has contributed. The Program costs are fixed and independent of the number of skins produced so there is no incentive to produce more skins to finance research and management.

The Province of Formosa, in northeastern Argentina, was selected for implementing the experimental harvest program due to the abundance of anaconda habitat, a long-standing hunting tradition, and a favorable governmental predisposition.

2. Program setting

Formosan yellow anaconda populations are comprised mainly of adults. Females are larger than males, occasionally reaching a maximum size of 4 m, whereas males rarely exceed 2,5 m. Average animals are about 1,8 m, and very large specimens are uncommon (< 5%). Males exhibit larger cloacal spurs than females, allowing the determination of sex even on skins. Growth and maturity are quite rapid, with males capable of breeding at 1,3 m and females at 1,5 m. Anacondas reproduce on average every two years, depending on the female's fat reserves. Newborns are large (55 cm), very aggressive, and fast growers (Waller et al. 2007).

Anacondas are abundant in Formosa, with the wetlands of the Bañado La Estrella in the West (3,000 $km^{2)}$ and the Wet Chaco in the East (>6,000 km^{2}) providing the most extensive habitat and harboring potentially the largest populations.

3. Harvest control procedures

The harvest of yellow anacondas is strictly confined to three elements: hunters, local skin buyers, and exporters. Middlemen (sub-local buyers and transporters) are not allowed. In the past, middlemen increased the value of the skins to the detriment of hunters. Anaconda collectors are rural and mostly indigenous (pilagá, toba). They rely on livestock breeding, hunting, and fishing. Some 300 families are involved in anaconda hunting, mostly (80%) from the area surrounding La Estrella marsh.

Delimited areas are assigned to a restricted number of local skin buyers (LSB). A LSB is authorized to acquire hides from enrolled hunters living or working in an assigned territory. The LSB can also act as a food supplier or a market-man, and can manage the logistics of transporting and provisionally stockpiling snake hides. According to YAMP guidelines, the exchange of goods for skins is forbidden, unless it is at the specific request of an indigenous community. To ensure com-

Table 2. Main parameters for yellow anaconda (Eunectes notaeus) skins harvested at La Estrella Marsh, Formosa between 2002 and 2006

Year	2002	2003	2004	2005	2006
Average skin length[a] (cm)	271	268	264	263	263
Number of skins <230 cm	1 109	1 075	420	343	142
ε coefficient[b] (%)	-4	-5.5	-0.4	+1.2	+0.4
Females (%)	70.5	69.9	75.8	75.4	76.3
Males (%)	21.3	22.1	20.7	23.1	22.4
Unknown sex (%)	8.2	8	3.5	1.5	1.3

Note: [a] Average size of hides >230cm after correcting for deformation (see text).
[b] Skin deformation coefficient (see text).

pliance, at the end of each harvest season, hunters are surveyed randomly and data is collected on prices and payout modalities. Each LSB serves a designated area, defined in the local buyer's license. If the buyer reaches beyond his area, this could cause conflict with other LSBs, who will consequently report it to relevant authorities. The infringer could suffer confiscation of his goods, among other penalties. The rationale is to generate a local socio-economic impact, equitably including as many families as possible.

During April and May, a series of trips are organized to register and inform LSBs of any modifications to program guidelines. These activities are intended to regulate the hunting effort, although the program places no limit on the number of hunters (in practice they represent a specific number), actual numbers are closely tied to the number of skin buyers for economic and cultural reasons. During the last week of May, and immediately before the beginning of the harvest (June), LSBs are notified of the skinning pattern to be used in the forthcoming season. In some cases, hides must bear both spurs on one side, in other cases, one on each side. This, in combination with leaving the entire head attached to the skin or not, for instance, allows one to select from a number of different skinning specifications from one year to the next in order to minimize the incidence of illegal hunting and stockpiling.

The minimum size of hides is 230 cm from the neck to the cloaca (tail excluded), corresponding to a live specimen measuring approximately 200 cm (Micucci et al. 2003). Because females mature at an average of 165 cm (Waller et al. 2007), this precautionary provision is intended to allow anacondas a reproductive opportunity before they are hunted.

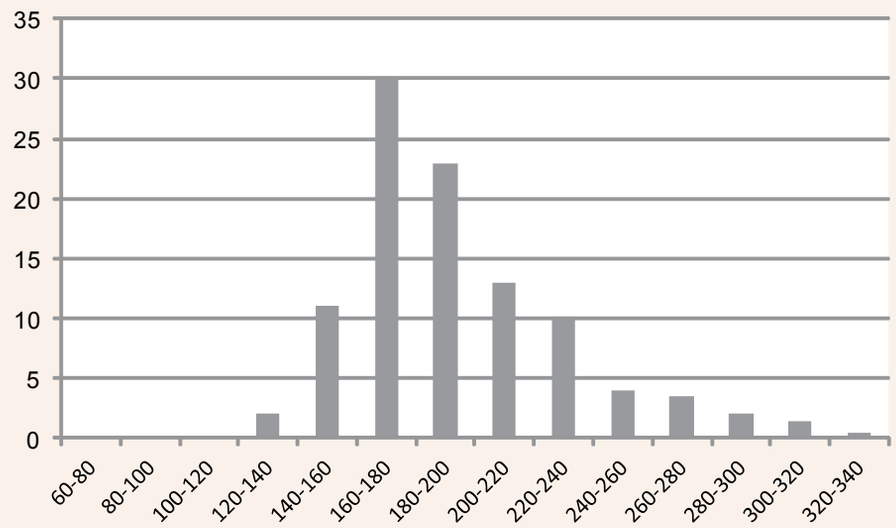
The harvest takes place from June to August (local winter), a period when yellow anacondas do not exhibit any reproductive behavior. The wide range of winter temperatures promotes thermoregulatory behavior, allowing hunters to find and capture snakes by hand. The snakes, depending on program research requirements, are either killed in place or transported live to the hunter's home for data collection.

Most of the conditions imposed on the hunters are enforced when they bring their skins to the LSBs for sale. Skins that do not comply with program standards are not accepted. Furthermore, LSBs are visited periodically by a representative of the exporters (purchasing agent), a provincial wildlife officer, and a program team member for the purpose of buying skins. The skins are checked for compliance with the year-specific skinning pattern and minimum size guidelines. At this time, skins that conform to program standards are individually tagged for control and future tracking; non-compliant hides are seized and, according to program provisions, destroyed. These visits occur at intervals of about three weeks. These procedures and a gradual decrease in flexibility criteria have reduced the number of undersized skins from 1,109 skins in 2002 to 142 hides in 2006.

During the sale, the LSB fills out an "effort form," a legal document that records the number of skins, the name of the hunter, and the date and place of harvest. This document is needed for the hides to be legally transported within Formosa. The contents of the document are crosschecked against the results from the periodic hunter surveys. In case of irregularities, a buyer could be penalized by the cancellation of his license.

Tagged hides obtained through the prescribed process are transported periodically to a warehouse. The representative of the exporters is the only person authorized to transport anaconda hides. Once they arrive, skins

Figure 6. Size distribution of a shipment of yellow anaconda skins that were seized and measured in 1996 in Asunción, Paraguay (N = 539)



are inventoried. At the end of the season, but before leaving the province, hides are sexed (by spurs and bone remnants), measured, and field tags are replaced by export tags that comply with federal regulations. The export tag is required before a CITES export permit is issued and the skins can be transported out of the province. Wildlife inspectors from Formosa, and eventually from the central government, as well as a representative of YAMP supervise this procedure.

Once skins are tagged and all valuable data gathered, the skins are released for distribution among the exporters. In order to transport the hides to tanneries or export ports, Formosan authorities must issue a Transport Guide to each exporter. This document is enclosed with the shipment and is required by CITES Management Authorities in order to issue the CITES Export Permit.

4. Harvest sustainability monitoring

The impact of the harvest on yellow anaconda populations is monitored through traditional indicators (i.e., capture per unit effort vs. effort, size and sex structure of the harvest). Hunting effort is closely checked by means of the aforementioned effort forms, on which basic data are recorded. The model assumes that each batch of skins sold by a hunter to his LSB represents a short and measurable hunting period or event.

Actual harvest monitoring also takes into consideration the significant correlation between number of hunters and gross capture. More hunters usually implies more effort, more capture, and vice versa. (Micucci et al. 2007).

Monitoring sustainability must assess the evolution of the sex ratio of the harvested population. Both sexes, due to low temperatures, are equally vulnerable to capture (Waller et al. 2007). However, because females attain larger size than males, the established size limit (> 200 cm) was expected to result in the harvest of more females than males, presumably in a fairly constant and predictable proportion. Consequently, the actual harvest sex ratio (ca. 75% females) reflects only the established minimum size limit.

Prior to the introduction of the sustainable use program, anaconda exploitation was not permitted and illegal hunting took place with total disregard of size. According to traders and local dealers, Formosa's annual production was approximately 20,000 skins with widths > 15 cm (Micucci et al. 2002, 2006a). This hide width, according to data, would correspond to a skin length of 150 cm and a live anaconda of about 135 cm (Micucci et al. 2002). A shipment of about 500 seized skins from Paraguay were measured and confirmed that the minimum size of skins taken during illegal harvests were of that size. This translates to practically all (90%) anacondas of either sex older than 1.5 years of age (Waller et al. 2007) being vulnerable during that market-driven hunting period. It is indisputable that the current harvest policy has been able to substantially reduce female hunting, both in terms of juveniles and adults.

Current production, without use of quotas, represents a management-derived reduction of harvest to a quarter of Formosa's historical values (5,000 vs. 20,000 skins), and a 40% reduction of female vulnerability to hunting. So, the Program has been very conservative in establishing a minimum size limit despite the fact that, initially, it appeared to promote the hunting of females. What ultimately matters, however, is the overall number, not the proportion of females. If the harvest represents 5% of the total population, a crop that is 75% female equates to an overall female extraction of 3.75%, which should be sustainable according to classical management standards.

Hunters do not seek anacondas of specific sizes, but collect serendipitously the snakes available in a given area (Waller et al. 2007). During the first years of the Program (2002–2003), different prices were paid for skins of three different size classes (230–290 cm, 291–390 cm, > 391 cm), stemming from industry traditions aimed at promoting the harvest of larger snakes. However, this fostered over-stretching and narrowing of skins without increasing the real proportion of large skins in the harvest. In 2004, and to avoid the problem of skin deformation, the program established a single price and demanded that all anaconda hides conform to a standard represented by the equation: skin width at mid-body = 0.10 skin length.

If a population is overexploited, it is expected to see a significant reduction in the average size of skins harvested and/or a significant change in its size or sex structure. Instead, an oscillating pattern was observed, partly attributable to changes in the skinning guidelines since 2004 and to a progressive reduction of small skins due to the imposition of intensive controls. Because no significant changes have been noted (Micucci et al. 2007), it is suggested that current harvest guidelines are appropriate for continued sustainable management of the anaconda populations.

Assuming that current controls are maintained, the sustainable management of anaconda populations is possible. The tools applied to control and monitor for harvest sustainability have been effective, and could be replicated in other developing nations with marketable wildlife resources at a very low cost.

C. Habitat conservation benefits

The Program is mainly being carried out in a wetland called La Estrella Marsh in the province of Formosa, Northern Argentina. The area is a huge seasonal wetland (3,000 km^2) that depends on the yearly Pilcomayo river floods. When YAMP began, the area had no presence of Government officials. YAMP brought about the regular visit of wildlife officers who verified local issues, including the illegal sport of hunting for birds. With increased awareness and control, the Government established new rules to manage the area, which at the end was declared a Public Land Reserve where only sustainable use programs (like YAMP) are allowed to harvest natural resources.

Currently, YAMP is the only approved Program in the area. Local inhabitants are also allowed to hunt some bush meat for their livelihood. The creation of YAMP contributed to a better management of the wetlands, leading to its protection as a natural reserve. Change in the status has also created opportunities for ecotourism in the region.

D. Access benefit sharing / community benefits

As a result of the creation of YAMP, about 300 local inhabitants of the La Estrella Marsh are now able to receive additional income during the local winter months when anaconda harvesting is allowed (June to August). Skin harvesting is able to supplement income for the local community during a period when other labor demand is scarce.

Out of all the hunters, 20% are dedicated hunters that rely on the income generated from yellow anaconda collection during winter months. Labor demand in the area is highly variable and depends on temporal labor contract on a day's pay basis. YAMP represents a continuous and important source of income for the dedicated hunters who spend winter months collecting yellow anacondas for the skin trade. Income generated from the collection has allowed hunters to improve their living conditions leading to better housing and infrastructure for themselves and their families.

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