Survey of Status, Trade, and Exploitation of Central American Iguanas

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Work Assignments:

- Site visits to open markets and breeding facilities. Interviews with interested government, NGO, and education stakeholders -CLS, LF, SP, LR.
- Compilation of legal instruments per country. Data analyses of export and import activities - AR, PM.

Ctenosaura oedirhina

Iguana iguana

Ctenosaura similis

Ctenosaura defensor

TRAFFIC
the wildlife trade monitoring network

IIF

ISG
iguana specialist group

U.S. FISH & WILDLIFE SERVICE

U.S. DEPARTMENT OF THE INTERIOR MARCH 3, 1849

UVU UTAH VALLEY UNIVERSITY

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INTRODUCTION AND OBJECTIVES

The Central American iguanas (of the subfamily Iguaninae) found in the CAFTA-DR signatory countries included in this report, Guatemala, Honduras, El Salvador, Nicaragua and Costa Rica, are the green iguana (*Iguana iguana*) and ten species of spiny tailed iguanas *(Ctenosaura acanthura, C. bakeri, C. defensor, C. flavidorsalis, C. melanosterna, C. oedirhina, C. palearis, C. praeocularis, C. quinquecarinata, C. similis).* All of these species are under varying levels of threat from habitat degradation, invasive species, and direct exploitation. They span the continuum of having very broad distributions to being extremely limited in range. Many of the species are difficult to tell apart, particularly at the juvenile stage. Additionally, because species' range across borders, there are varying levels of legal protection and enforcement of those protections within and between species. This sets up a complicated scenario for implementation of management programs and conservation efforts, as well as for designing effective legal instruments.

Iguanas have several traits that make them particularly susceptible to over-exploitation by humans. For example, they are conspicuous during the mating season and have predictable nesting habits, both factors that make them easy targets for hunters and collectors. *Ctenosaura similis* and *Iguana iguana* are the two species most exploited for their meat and eggs (Fitch, Henderson, & Hillis 1982; Campbell 1998), but certainly not the only iguana species under such pressure. In fact, there is a local yearly festival in Olanchito, Honduras centered around hunting and consumption of *C. melanosterna*. The various iguana species differ in their life history and behavioral characteristics and as such their populations vary in their ability to sustain impact of exploitation and habitat disturbance. Although *C. similis* and *I. iguana* are very wide ranging and habitat generalists, other species have a very narrow range distribution and/or specific habitat requirements. For example, *C. bakeri* and *C. oederhina* are island endemics and *C. quinquecarinata* appears to only use tree cavities, which can be uncommon in disturbed forests.

Adding a unique dimension to its status, hundreds of thousands of *Iguana iguana* are produced each year in captivity in large and small facilities for both human consumption and use in the pet trade. This activity has been heavily promoted as a conservation tool and economic base for struggling communities, although little assessment of the actual outcomes has been conducted. Other species are also found in the pet trade, both legally (*C. quinquecarinata*) and illegally (for example, *C. palearis* and *C. defensor*) and their trade levels have not been reviewed.

The overall aim of this report is to bring together, into one document, relevant information that can inform future conservation efforts, management actions, and research directions for Iguaninae species within the 5 CAFTA signatory countries. Gathering of this information is operationally divided into 4 loosely grouped categories: Field Component, Trade Data, Legal Framework, and Literature Review. Current conservation status of each species is shown in Table 1.

1.1. Field Component.— The aim of the field component was to obtain first hand accounts of the wide variety of topics effecting Central American Iguaninae populations: exploitation, societal norms, and conservation activities.

In each of the five CAFTA signatory countries we visited local markets, captive breeding facilities, NGO's, academic institutions, and government authorities. We spoke with many locals directly involved with exploitation of iguanas, such as farmers, hunters, and vendors. We collected information on local uses and customs in relation to iguanas in the region and identified ongoing activities by individuals and organizations that directly concern iguana conservation.

1.2. Trade Data.— The aim of the trade component of the project was to gather baseline regional and international trade data for the Central American Iguaninae (*Ctenosaura* spp. and *Iguana iguana*) from Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

1.3. Legal Framework.— The trade component of the report provides a compilation of the legal frameworks and instruments that might directly or indirectly affect iguana conservation, use, and trade practices in each of the countries covered; as well as a brief description of the international instruments that could be considered as most relevant.

1.4. Literature Review.— The aim of this component was to identify current research activities, relevant articles and data (published and unpublished) in the scientific, private, and governmental sectors. We focused on the topics of geographic distribution, taxonomy, and biology. The search was in no way exhaustive: rather it served to complement the other components of the project.

Table 1. Current Conservation Status of Central American Iguana Species.

Species	Distribution	IUCN 2004	IUCN 2010 (or proposed)	CITES Listing	Threats
C. acanthura	Tamaulipus to Veracruz, MX; Nenton Valley, GT	not evaluated	in progress		Harvesting
C. bakeri	Utila, Bay Islands, HN	CR	(CR)	Appendix II	Habitat destruction, harvesting, pet trade, limited distribution, pollution
C. defensor	Yucatan, MX; El Mirador, GT	VU	(VU)		Habitat destruction, pet trade
*C. flavidorsalis**	HN, ES, GT	EN	(VU)		Habitat destruction, harvesting, limited distribution
*C. melanosterna**	Cayos Cochinos, Valle de Aguan, HN	CR	(EN/CR)	Appendix II	Habitat destruction, harvesting, pet trade, limited distribution
*C. oedirhina**	Roatan, Bay Islands, HN <100m	CR	EN	Appendix II	Habitat destruction, harvesting (food, medicinal use, persecution), limited distribution, invasive species
*C. palearis**	Valle de Motagua, GT	CR	(EN)	Appendix II	Habitat destruction, harvesting, pet trade, limited distribution
C. praeocularis	Southeastern HN	not evaluated	(DD)		Habitat destruction
*C. quinquecarinata**	NI, CR	EN	(VU)		Habitat destruction, direct destruction
C. similis	Mexico to Panama <1300m	not evaluated	LC		Harvesting with highly localized impact (food, medicinal use, collecting)
I. iguana	Neotropical < 1000m	not evaluated	in progress	Appendix II	Harvesting with highly localized impact, habitat destruction, pet trade

*Changes in proposed listing from 2004 to 2010 result from earlier misunderstanding of the criteria, rather than a change in the populations.

2. METHODS

2.1. Field Component.— Four trips were made to CAFTA signatory countries by at least one PI on each trip and varying numbers of in-country collaborators participating during each visit. We sought out persons within each country having direct experience with iguana conservation, research, exploitation, and management (captive and wild) to discuss the current issues and societal attitudes facing each species. Collaboration was solicited prior to on-site visits via email and phone in order to maximize time in each country and impromptu interviews were arranged whenever the opportunity arose. Established contact list is provided in Appendix A-I.

2.1.1. Dates of Travel. Site visit 1: June 2009 (Guatemala); Site visit 2: December 1-18, 2009 (Nicaragua, El Salvador); Site visit 3: February 26th – March 13th 2010 (El Salvador, Honduras, Guatemala); Site visit 4: May 1-16th 2010 (Costa Rica).

2.1.2. Market Visits. Markets and roadside vendor sites were surveyed opportunistically

from May 2009 to May 2010 for the purposes of this study. Additionally, one of the authors (Stesha Pasachnik) contributed relevant data from sites visited May-July 2005, February-July and December 2006, January and May-July 2007, May-July 2008. At each local market and roadside vender site we recorded which species were for sale (either currently or normally), the condition of the iguanas (prepared, live, eggs, soup etc), the origin of the animals, and the quoted price or product. We asked hunters where they hunted, what methods they used and their typical daily capture rate. All interviews were conducted in Spanish, and attempts were made to keep the discussions as informal as was determined appropriate in order to gather reliable information. A formal questionnaire was not used as the investigators felt this might make respondents nervous and less willing to give accurate information. This study simply summarizes what data we were able to opportunistically gather, and should thus be seen as a starting place for more in depth and specific market surveys.

2.1.3. Farm Visits. From December of 2009 to June 2010, we visited 16 iguana farms in 3 countries, 10 in Nicaragua, 4 in Costa Rica, and 2 in El Salvador. We collected additional interview data from proprietors of 2 farms in Honduras and 3 in Guatemala. The type of facilities included family-owned farms, community cooperative farms, commercial pet breeding operations, conservation and tourism oriented facilities, and research facilities. For each site we interviewed the owner or representative of the farm, following a sheet of listed questions (Appendix A-II).

2.2. Trade Data.—To gather data on levels of trade and species involved in trade, information was requested from key government staff responsible for the management and supervision of iguana captive breeding and exporting in countries of interest. For this purpose, country visits, face-to-face interviews and communication via phone and email were undertaken by TRAFFIC. Extensive desk surveys were also undertaken to complement the information obtained and provide a more comprehensive review of the current situation.

2.2.1. International and Regional Trade. Information on trade in green and spiny tailed iguanas is presented and analyzed using available data such as the CITES Annual Report database of UNEP-WCMC. Considering the relevant role the United States of America plays in the international trade of the species of interest, a separate analysis was done using wildlife import data from the U.S. Fish and Wildlife Service's LEMIS (Law Enforcement Management Information System) database. This dataset also includes information on seizure of wildlife in addition to the legal trade records.

2.3. Legal Framework.— Laws and regulations pertaining to use and conservation of Iguaninae species were compiled and listed by country. Contact information for relevant authorities within each country were also compiled.

2.4. Literature Review.— We sought documentation and data relevant to exploitation and conservation of green and spiny tailed iguanas. This included research articles from the grey and scientific literature, reviews, book chapters, theses, reports, and personal communications.

Figure 1a. Distribution map of *Ctenosaura* species.

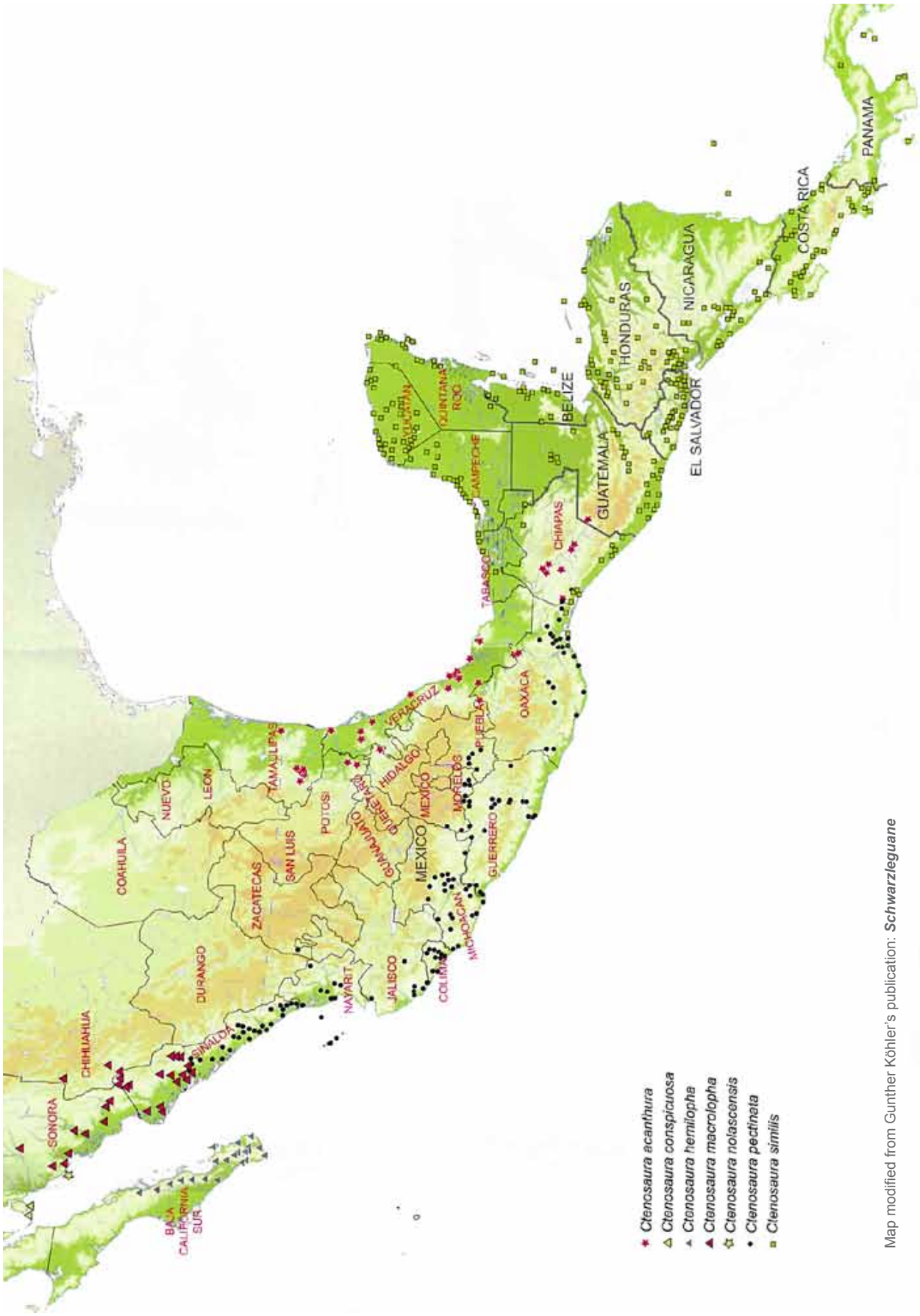
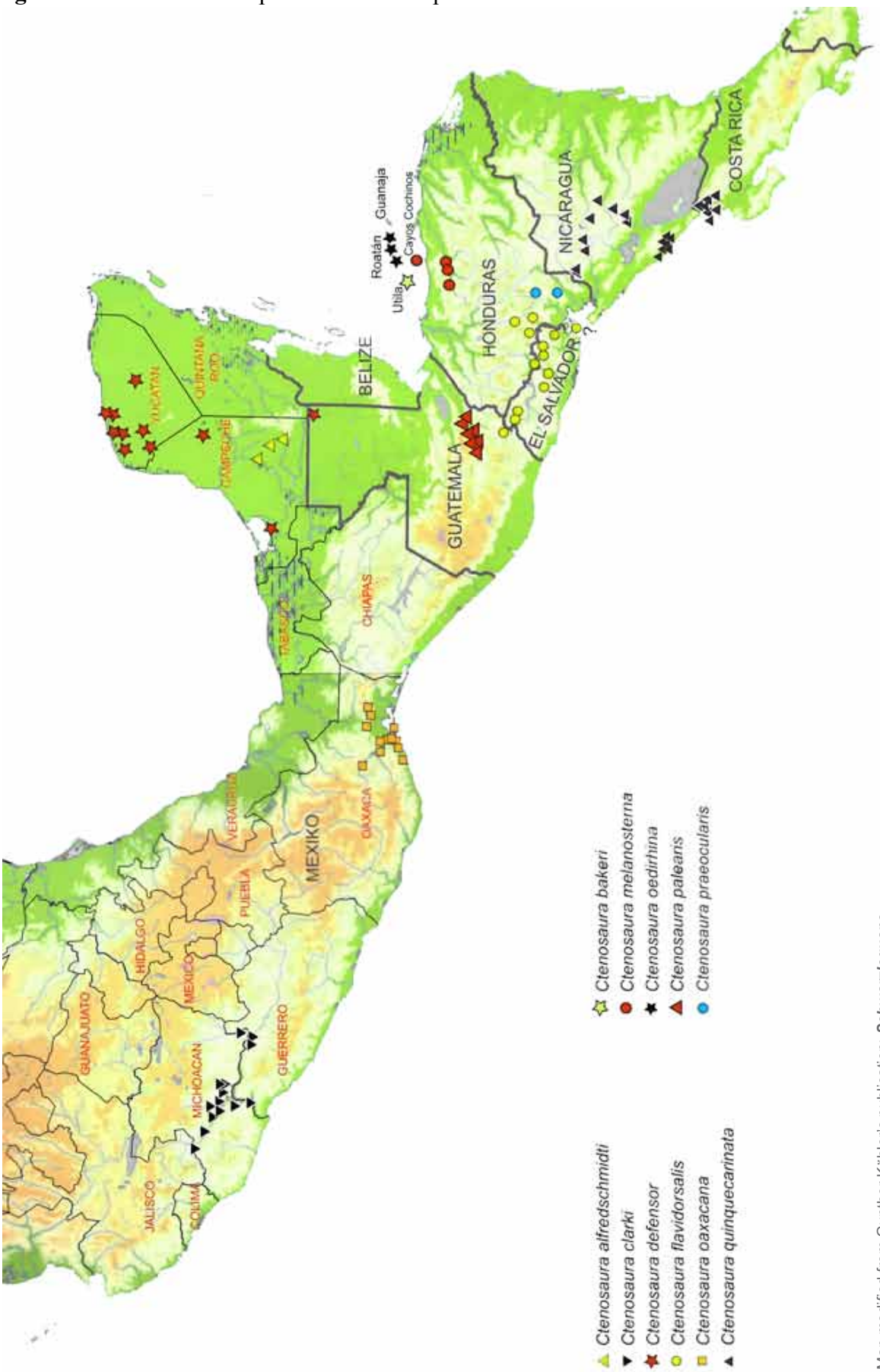


Figure 1b. Distribution map of *Ctenosaura* species.



Map modified from Gunther Köhler's publication: ***Schwarzleguane***

Data provided by Prof. Cesar Otero Ortuño (pers comm.), Heraldo Ramón Salgado Aráuz and Guillermo José Páiz Salgado (2002), and Gerardo Chaves (pers. comm.) resulted in a significant increase in the documented distribution of *C. quinquecarinata*.

3. RESULTS

3.1. Traditional and Modern Use of *Iguana* and *Ctenosaura*.— Throughout the world, people rely on reptiles as an important protein source (Klemens & Thorbjarnarson 1995). Iguanas, specifically *I. iguana* and *Ctenosaura* spp., have been part of the Central American diet for more than 7,000 years (Cooke 1981). Spiny tailed and green iguanas are commonly found in cultural expressions and symbolism of the diverse human ethnic and community groups. While some cultures ascribe medicinal qualities to the meat and/or eggs (Fitch *et al.* 1982) others simply consume iguanas as an additional protein source.

Green Iguana and species of *Ctenosaura* have been widely used for human consumption by all levels of society in Central America. Iguana dishes, particularly those with gravid females, are especially popular during the Catholic period of Lent which coincides with the iguana breeding season (Fitch *et al.* 1982). Both the meat and eggs are used as food items, and considered to have aphrodisiac and medicinal properties by some (Fitch & Henderson 1978, Ariano & Cotí 2007, Gutiérrez 1996, Esquivel 1999). Green iguana oil is used to treat rheumatism, bone strengthening, bruises, (both in humans and cattle), and swelling in cattle udders (Gutiérrez 1996, Esquivel 1999, Gómez 2007). These attitudes extend to some of the less common species as well. Belief in the special benefits of iguana consumption means consumers are willing to pay more for iguana meat and eggs than for equivalents of other commercially available options of domestic animals (National Research Council 1991). In fact, this belief seems to drive a lot of the modern day iguana consumption. In most of our conversations with those selling and consuming both green iguana and spiny tailed iguanas the high nutrition content and/or medicinal value was touted.

Iguanas are also killed solely for sport as is the case with *C. oedirhina* (Pasachnik pers obs.) and *I. iguana* (Sasa et al. 2011). Additionally, some *Ctenosaura* species are persecuted based on the belief they are poisonous, such as is the case frequently for *C. quinquecarinata* and occasionally for *C. flavidorsalis* (see below).

In Central America, particularly in Nicaragua and Costa Rica, there is a history of using iguana skin for the manufacture of leather handicrafts, purses, wallets, shoes and belts that are sold in local markets (FAO/PNUMA 1985, Vides 1993). However, based on our market surveys and the trade data, it appears the use of iguanines for leather is currently not common. We did see mounted specimens and a variety of curios made from iguanines in markets, but saw no evidence of significant trade in leather products made from iguanines, especially when compared to the scale of trade in iguanas for food and pets. Local market hunting and the international pet trade are clearly the drivers of iguana and ctenosaur exploitation in Central America.

3.1.1. Regional Variation in Use. There is regional variation in traditional use of iguana products and in preferences for iguana meat and eggs (Peters 1993).

3.1.1.1. Guatemala: Black iguana *Ctenosaura similis* is widely exploited. In the Peten region, locals reported that this species is taken opportunistically year round. The meat and eggs of the Guatemalan endemic *C. palearis* are preferred by locals; possibly indicating that this meat has a larger fat content and is more palatable. The fat of the spiny tailed iguanas in Guatemala is also used for medicinal purposes to treat ear swelling and pains (Ariano & Cotí 2007). *Iguana iguana* is widely hunted along rivers of both the east and west coasts. Both species are commonly found in the markets of major population centers (see section 3.3).

3.1.1.2. Honduras: In Honduras, iguana hunting and consumption is quite common along with other species such as the white tailed deer and the peccary (Terán 2006, Robles *et al.* 2000). *Ctenosaura similis* is sought after for meat as well as

attributed medicinal properties that cause hunting levels of this species to be high. It is also well known by locals that *C. bakeri* are hunted for consumption on Utila and also brought to the mainland for sale. Likewise *C. oedirhina* are hunted for consumption and even offered as the local iguana dish to cruise ship tourists arriving in Roatan.

Another Honduran endemic, *C. melanosterna* is the subject of the yearly Jamo Festival in Olanchito, which takes place in late April or early May. The mainland population of *C. melanosterna,* locally referred to as "jamo," is restricted to the 1000km^2 Rio Aguan Valley of which Olanchito is the regional population center. The festival celebrates the "jamo" by offering several different ways to eat the animals and is highlighted by an iguana-themed parade. The parade features people dressed in lizard costumes, vehicles decorated with slogans like "come jamo 100%", or iguanas tied up and placed on vehicles. In recent years, the Jamo Festival has become commercialized to the extent that it is not recognizable as a celebration of C. *melanosterna*. Advertisements for the festival utilize photos and cartoons of the *Iguana iguana* and interviewed attendees do not always seem to be aware of the difference.

Scenes from the Jamo Festival in Olanchito, Honduras

3.1.1.3. El Salvador: We observed that, although illegal, *Ctenosaura similis* and *Iguana iguana* are served openly at restaurants in San Salvador and at farmer's markets in many places around the country. The traditional dishes mentioned above are also common in this country. Additionally, the yellow fat of *C. flavidorsalis* is used to treat sprains and a broth of this species is thought to cure young children of illness (C. R. Hasbún pers. comm.).

3.1.1.4. Nicaragua: In Nicaragua, the use and trade in wildlife is commonplace (Robles *et al.* 2000). Robles reported people in northern Nicaraguan preferred black iguana (*C. similis*) rather than green iguana meat, and that consumption increases during the dry season. It is worth mentioning that this seasonal peak in iguana hunting and consumption also coincides with the closed season for iguana harvest in the country (January 1 to April 30). The policy is designed to protect gravid females, but demand and hunting is greatest when females are gravid. As such, because eggs are a delicacy, the closed season is in direct conflict with local traditional uses and demand and the policy is not effective. One well-known traditional dish called *Pinol de iguana* is a soup made of *C. similis* eggs taken from the gravid female. Other traditional dishes are the soup (*Consomé de garrobo)*, considered as medicinal and aphrodisiac, and the iguana barbecue (*Asado de iguana*). Seasonal increase in the consumption of these species also occurs due to the tradition to use iguana meat during Lent as a substitute for other types of meat (Gutiérrez 1996). A smaller spiny tailed iguana, *C.*

quinquecarinata, is commonly persecuted by local people, out of fear that they are poisonous, by the plugging tree and fence post holes they inhabit (L. Buckley, C. Ortuño pers. comm.).

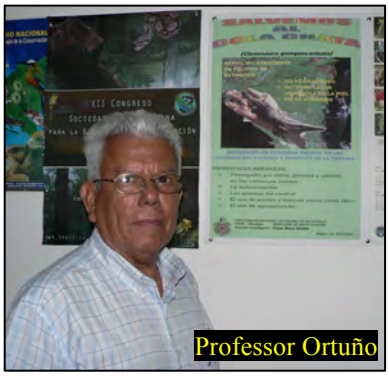
3.1.1.5. Costa Rica: Among the east coast natives, green iguana consumption has long been part of the culture (Sasa et al. 2011) and, from our many interviews with local people, we found it was still fairly common. As in other Central American countries, consumption of meat and eggs increases during the Christian holiday week of Semana Santa, coinciding with the nesting season and females with eggs are most desired. In the northwest region, a recent increase in *C. similis* consumption was reported to us by several locals, academics, and wildlife authorities. The increase was attributed to the growing immigrant population from Nicaragua. Additionally, Sasa and Bolaños-Vives (2004) found that locals of the northwest region of the country fed *C. similis* to their domestic animals.

3.2. Current Conservation and Research Activities.— On a national level, efforts towards the conservation of green and spiny tailed iguanas vary significantly, with some countries, NGO's, and individuals implementing specific projects to protect iguanas and their habitats, while others focus efforts on promoting sustainable use practices as a tool for conservation while improving human livelihoods (Table 2). Captive breeding and release, as a conservation measure, is discussed in sections 4.1.3 and 4.1.4 of this report.

Habitat preservation for the explicit purpose of conserving iguana species is not a current activity in any of the countries. However, iguana populations of many species exist within protected areas. Protected area maps for each country can be found in Appendices A-III.i through A-III.v.

3.2.1. Education and Outreach. There are many initiatives to educate local communities about the importance of conservation and help them find alternative ways of using their natural resources, without permanently harming them. Several programs include education of iguana natural history and some also support captive breeding and release of hatchlings. There are several formal programs that currently have funding for development of materials and support at least one personnel (Table 2). We also identified informal activities, where efforts for raising public awareness of the role of iguanas in the ecosystem or (when relevant) their threatened or endangered status are made opportunistically within the context of other activities, such as a research or general environmental education.

3.2.2. Research. Of the 11 species of iguana within the target countries, some aspect of research is ongoing for 9 of them (Table 2). Such research may include studies of life history, species boundaries, geographic distribution, and/or evolutionary relationships. There are currently no formal research studies on the impact of exploitation on populations of *Iguana iguana* and *Ctenosaura similis*.


Professor Ortuño

Education and Outreach efforts

Denys Roldán of Naturaleza Extrema

Dr. Pasachnik

Table 2. Research and *In Situ* Conservation Activities Aimed at Central American Iguanids.

Species	Research / Activity	Contact	Affiliations
C. acanthura	genetics	Victor Reynoso	UNAM, MX
C. bakeri	breeding and release	Andrea Martine	IRBS & FIB, HN
	education program	Helder Pérez	FIB, HN
	genetics	Larry Buckley Stesha Pasachnik	RIT, USA UTK, USA; FIB
C. defensor	genetics	Catherine Stephen Victor Reynoso	UVU, USA UNAM, MX
C. flavidorsalis	none	n/a	n/a
C. melanosterna	outreach program	Aristides Ponce Leslie Ruyle Chad Montgomery Tony Ives	Pro Crea, FIB, HN UGA, USA
	community studies	Edoardo Artunez Pineda	UNAH
	ecology & life history	Chad Montgomery Stesha Pasachnik Leslie Ruyle	TSU, USA UTK, USA UGA, USA
	species distribution	Stesha Pasachnik Jeff Cornell Edoardo Artunez Pineda	UTK, USA UNAH
	population genetics	Stesha Pasachnik	UTK, USA
C. oedirhina	ecology & life history	Stesha Pasachnik	FIB, HN
	education program	Stesha Pasachnik	FIB, HN
C. palearis	education program	Daniel Ariano	Zootropic, GT
	habitat preservation	Daniel Ariano	Zootropic, GT
	breeding center	Cristian Fernando Beza	ZooTropic, GT
C. praeocularis	none	n/a	n/a
C. quinquecarinata	species distribution	Cesar Ortuño	UNAN, NI
	habitat preservation	Richard Leonardi	Lost Canyon Reserve
	informal outreach	Richard Leonardi Prof. Cesar Ortuño	Lost Canyon Reserve UNAN, NI
C. similis	informal outreach	Roger Blanco Denys Roldán	Santa Rosa NP, CR Naturaleza Extrema, GT
	genetics	Larry Buckley Stesha Pasachnik	RIT UTK, USA; FIB
I. iguana	farms	see Table 5	
	breeding and release	Leonel Ubau	FundeVerde, NI MOPAWI, HN
	formal outreach	Edstart Besier	Iguana Verde, CR
	informal outreach	Sherman Arch Juanita Sánchez Juan Carlos Saborío Vega	Biotopo Montericco, GT Arch's Farm, HN Kekoldi, CR Turu Ba Ri, CR
	genetics	Catherine Stephen	UVU, USA

FIB Fundacion de las Isas Bahias, IRBS Iguana Research and Breeding Station, RIT Rochester Institute of Technology, TSU Truman State University, UGA University of Georgia, Athens, UNAM Universidad Nacional Autonoma Mexico, UT University of Tennessee, UVU Utah Valley University, UNAN Universidad Nacional Autónoma de Nicaragua

3.2.3. Legal instruments as conservation measures. Conservation measures affecting iguanas in Central America varies from country to country depending on existing legal frameworks and their implementation, and the level of threat to each species. Some particular instruments that can contribute to species conservation do apply for all countries considered, such as CITES and its international trade regulations described in more detail in section 3.10 but these only apply to certain species included in the CITES Appendices. Two of the countries have measure directly aimed at iguana conservation (Table 3).

Table 3. Measures Aimed at Iguana Conservation in Guatemala and Nicaragua.

Guatemala	• Conservation measures are addressed in Decree 4-89 or the Protected Areas Law, Articles 25, 26 and 27 (Appendix A-V). Guatemala has an Endangered Species List (*Listado de Especies Amenazadas de Extinción* LEAE) where flora and fauna considered to be threatened are included under one of three categories under certain criteria: Category 1 Almost extinct-no reports over the last 50 years; use is restricted to scientific purposes, with a priority on research focused on conservation. Category 2 In great danger-species in danger of extinction due to habitat loss, trade, or with small populations, and those endemic to the country or of limited regional distribution. Use restricted to scientific purposes or reproduction for conservation objectives. *Iguana iguana* and *C. similis* are in Category 2. Category 3 Special management, controlled use-includes species threatened by exploitation or habitat loss, buy with populations that allow for regulated use and management, regional endemic species are also included under this category. Use can be for scientific purposes, regulated trade, controlled hunting, and commercial breeding (2nd generation). *Ctenosaura palearis* is in category 3. (www.conap.gob.gt)
Nicaragua	• Nicaragua is the only country with a specific Law addressing green (*I. iguana*) and black iguana (*C. similis*) conservation. The green and black iguana conservation and protection law (Decree 547) prohibits cruel or damaging capture, handling and commercialization methods of green or black iguanas. This law also prohibits the hunting of these two species through the use of fire in their burrows and prohibits the export of these species, dead or alive, or their eggs. • Trade related, there is also a "Technical Norm for wildlife trade in Nicaragua" (*Norma Técnica Nicaragüense obligatoria de comercio interno de Fauna Silvestre* NTON 05 011-01), which was approved in November 2001 and officially published in *La Gaceta* No. 64, April 2002. This regulation establishes specifications, procedures, norms of conduct and requisites to be complied with by all persons trading in wildlife in any form including live or dead specimens, parts or derivatives within national boundaries. Specific mention of iguanas is made in the document (http://legislacion.asamblea.gob.ni/normaweb.nsf/($All)/98E1553CDEADCE620625764E005CFC5F?OpenDocument).

3.3. Market Visits.— The most common species found in markets and roadside vendors throughout Central America were *Iguana iguana* and *Ctenosaurs similis*. Other species reported or that we observed for sale include: *C. palearis* (Guatemala), *C. melanosterna*

(Honduras), *C. bakeri* (Honduras), and *C. flavidorsalis* (El Salvador). The degree to which iguana sales were observed and/or discussed varied greatly by country. In Nicaragua there were iguanas, in most cases *C. similis*, for sale at almost every market visited and they were commonly sold along roadsides. In contrast the sale of iguanas was never encountered in Costa Rica. Availability of iguanas in markets in Guatemala, Honduras and El Salvador varied by location. This is most likely correlated with the country specific laws and regional variation in enforcement (see legal discussion/section). For example, in Guatemala three recent news articles reported seizures of illegally traded iguanas (see Table 12). Temporal variation exists in the sale and consumption of iguanas. Gravid female iguanas are the most desired thus iguana sales peak during the reproductive season. In addition, the consumption of iguana meat and eggs is a cultural tradition surrounding Semana Santa (the week before Easter), thus there is a peak in consumption during this time. In some cases (e.g. Valle de Aguán, Honduras), the sale and consumption of additional species of iguanas (e.g *C. melanosterna*) increases during this time. Though some people seem to have strong preferences for certain species, there did not appear to be an overall trend towards consuming one species over another. Results are summarized in Table 4.

3.3.1. Guatemala. Two sites were visited in Guatemala, however local contacts provided recent data for eleven additional markets. Within the Valle de Motagua hunting and local consumption of *C. similis* and *C. palearis* is a common practice though recently conservation efforts by the NGO Zootropic have been able to dampen these actions in some areas. The southern region of the Valle de Motagua seemed to be where most havest is occurring. Hunters from areas around Arenal are capable of capturing large numbers of *C. palearis* on a daily basis, however this is one of the areas in which Zootropic's education and outreach efforts have had the greatest affect. Interviews indicate that people in this region have significantly decreased their consumption of iguana meat. The peak period of consumption coincides with the nesting season (Coti & Ariano 2008). People indicate that they prefer to eat *C. palearis* and that the species is used for medicinal purposes, however all these seem to be opportunistically consumed. The only area where we actually observed *C. palearis* and *C. similis* for sale was in the small village of Morazan. Live animals were available as well as meat from both species. We also were told that hunters use smoke to drive spiny tailed iguanas from their burrows, and this method is commonly used when foreigners from the USA and Europe visit the area to buy as many as can be captured for the pet trade. Although distributed in a relatively small area of the country, where the southern end of the Nenton Valley extends into Guatemala, *C. acanthura* is also exploited and reportedly can be purchased in the Nentón market.

3.3.2. Honduras. The entire country, with the exception of the northeastern portion, was surveyed. On the mainland iguanas are most commonly sold within the Valle de Aguán, the road between Puerto Cortez and El Progresso, the markets in Tegucigalpa and the southern departments of the country. Consumption of iguanas (*I. iguana, C. similis, C. melanosterna*) within the Valle de Aguán occurs year-round, with a peak in demand around Holy Week (Semana Santa). In addition, the area is known for The Jamo Festival (typically late May or early April) focused on the consumption of *C. melanosterna* (see section 3.1.1.2). However, *I. iguana* and *C. similis* are also consumed during this festival. Given the small size of the villages in this area, large market sales are not common or possible, however it is clear that certain homes and people are known to have iguanas for sale regularly, and those interested in making the most profit will bring their catch to Olanchito (the largest town in the area) for sale (Pasachnik *et al* in prep). Through interviews we determined that 81% of locals

consume *C. melanosterna* on a regular basis, and that gravid females are preferred (Pasachnik et al in prep). It seems that many people in the area prefer *C. melanosterna* and may use it for medicinal purposes, however all species (*I. iguana, C. similis, C. melanosterna*) are opportunistically consumed. The roadside site between Puerto Cortez and El Progresso always has *I. iguana* and *C. similis* for sale. These individuals could be connected with the trade route involving Guatemala but this has not been confirmed (see trade section). The markets in Tegucigalpa are known to have iguanas for sale however they are difficult to find in the open because of law enforcement efforts to combat this illegal action. A few vendors who had them in backpacks were observed walking through the market. The southern departments of Honduras are known for their iguana trade. While in this area it was very easy to encounter roadside vendors and iguanas being sold in markets. It was clear, however that some individuals were nervous about being caught with iguanas in their possession. Truckers that would stop by roadside vendors in this area would keep the iguanas in an area under the bed of their trucks. Within the Bay Islands extensive hunting for consumption occurs on Utila and Guanaja, however these are small communities without a formal market structure. On Guanaja, local fishermen often bring both *I. iguana* and *C. similis* in boats along with their catch of seafood for the day for sale to anyone interested. It is not clear if the fishermen also hunt the lizards on shore or if they obtain them from other hunters. This can be thought of as the equivalent of roadside vending for an island community. On Utila, hunting seems to support family subsistence, however recent reports indicate that immigrants from the mainland are now personally exporting large numbers of iguanas, including *C. bakeri*, to the mainland for sale. On Roatan hunting of *C. oedirhina* occurs at a low level and recent reports describe a new demand for iguana meat from tourists who want to try the local delicacy. Within Cayos Cochinos *I. iguana* is hunted and brought to the mainland for sale. When possible these individuals have been confiscated and released back to the island of origin. Though *C. melanosterna* has not been observed in this practice there is little reason to assume they would be exluded. In general, there seems to be overall knowledge among local residents that these actions are prohibited. Variation in the level of enforcement between localities seems to correlate with the level of openness concerning consumption and market behavior. It is not clear whether enhanced enforcement effort dissuades residents from the illegal activity, or whether a greater effort is made to conceal such activities from view.

3.3.3. El Salvador. Twenty-one sites were visited throughout the entire country. In ten sites we observed *C. similis* individuals or products and in five we observed *I. iguana* individuals or products. In most cases individuals were available live, however prepared meat was also common. Iguana eggs are a delicacy in the region and they are generally obtained from purchasing gravid females, which are more expensive. Interestingly, the San Miguel market in El Salvador was the only place in Central America where we observed bagged iguana eggs for sale. There was a great deal of variation in the overall attitude of people we encountered towards openly sharing information with us. It was clear that certain areas were subject to some level of law enforcement, while other were not. An entire village has been established along the Panamerican Highway South of San Salvador where both *I. iguana* and *C. similis* of both sexes were sold along with parrots, armadillos, and other live wildlife. Overall people seemed to know that the action of selling iguanas was prohibited. The majority of the time if iguana could not be observed in the market we were directed to another area where we should be able to find them and this was often a roadside location. Overwhelmingly, the most prominent places to encounter iguana products were on the

roadside near San Miguel and in the market in San Salvador.

3.3.4. Nicaragua. The survey area for this country consisted of the entire Pacific region and the Corn Islands off the eastern coast. Seven areas on the mainland were located where iguanas could be encountered either in markets or for sale roadside. The vast majority of these iguanas were live *C. similis*. In the markets the vendors were happy to prepare the meat for you but prepared meat kept refrigerated or on ice was not observed. Sale of iguanas was not observed on the Corn Islands, however both *I. iguana* and *C. similis* were observed in the wild in these areas. It appeared to be the case that the communities on these islands did not incorporate this item into their diet, at least to a noticeable degree. The overall attitude towards hunting and the sale of iguanas for local consumption was consistent across the country; in markets and on the roadsides all individuals selling iguanas seemed comfortable with having pictures taken, openly discussing where the iguanas were from and techniques for capture. Missing data for this country is a result of vendors not wanting to waste their selling time talking with us, and not a result of nervousness about the situation as was the case in other countries.

3.3.5. Costa Rica. The survey area for this country consisted of the entire Pacific Coast inland to the highlands and the Caribbean Coast from Limon east to the Panamanian border. No iguana sales were observed along the roads or within markets throughout the entire survey area. Various individuals referenced the consumption of iguana meat from both *I. iguana* and *C. similis*, but such actions were not observed. In many cases those being interviewed would refer to the consumption of iguana meat as being something that only those from another ethnic background would do. On the Caribbean coast at Iguana Verde Ecopark we were told that *I. iguana* adults have been stolen from the facility and sold for approximately $15 per large adult. Similarly in an area near Tarcoles we were told that hunting does occur and that the area is patrolled by rangers. Two interviewees recalled a recent (2007) event where a large quantity of iguanas (~70) were observed offloaded from a boat at the Tarcoles dock, on their way to being sold. The overall attitude towards hunting and the consumption of iguana meat at the local scale was similar throughout the country. Most individuals seemed to recognize iguana consumption is common but is not a staple component of the normal daily diet for any community. It was continuously stated that the majority of consumption occurs around Semana Santa. Lastly, it seems to be a custom that has not been passed down or accepted by most individuals of the younger generations in this area.

Roadside Vendors and Hunters

Table 4. Results From Market and Roadside Vendor Visits. Prices are reported as given to observers and compared to those reported by Fitch and Henderson (1983). Values were not adjusted for inflation.

Location	Year	Fitch and Henderson Species	Species Exploited	Condition	Present Cost	Fitch and Henderson (1983) Cost	Information from locals and observations
El Salvador							
La Union	2009	*I. iguana*				$1.60-2.40	
San Salvador	2009	*I. iguana, C. similis*	*I. iguana, C. similis*	live, prepared	$2-6	$0.60-5.20	approximately 80 individuals, 7 stalls
Usulutan	2010						*"can be found on road"*
El Transito	2010						*"can be found on road"*
Santa Rosa de Lima	2010		*I. iguana, C. similis*	prepared, frozen	unknown		*"vendors with baskets can be found in the streets" "iguanas imported from HN"*
Santa Ana arriba	2010						*"prohibited, maybe in Santa Ana abajo"* no evidence of market sales
Metapan	2010						*"none available"*
Santa Ana abajo	2010	*I. iguana*	*C. similis*	prepared, on ice	unknown	$1.40, female w/o eggs	*seemed nervous about showing meat "prohibited"*
Ahuachapan	2010						*"prohibited" "sold on road to Sonsanate"*
Sonsanate	2010		*C. similis*	live	$7.50		2 females with eggs, *"prohibited, but found" "other woman with prepared legal meat"*
Acajutla	2010						*"can be ordered" "I. iguana preferred"*
Santo Thomas	2010						*"prepared meat can be found" "Central Market better"*
Libertad	2010						*"normally sold in cafeteria as a meal"*
San Luis	2010						*"can be ordered, but expensive"*
Zacatecaluca	2010		*I. iguana, C. similis*	soup, live	$1.25-1.50/portion; $15-35/ind		soup with eggs, both species together
Quetzaltepeque	2010						*"prohibited" "difficult to find"*
Apopa	2010						*"prohibited"* no evidence of marketsales
Chaltenango	2010		*I. iguana, C. similis*		$15.00		none present during visit *"hunter brings to market daily"*
San Miguel	2010	*I. iguana, C. similis*	*C. similis*	eggs, live, prepared	$6.00 prepared	$1.60	> 50 eggs
Road to San Miguel	2010		*C. similis*	live	$6.00		*"caught far away in the bush"*
1 hr. North of San Miguel on Panamerican Highway	2010		*I. iguana, C. similis*	live	$15.00-25.00		20-30 seen, more in houses nearby
Near Tierra Blanca	2010		*C. similis*	live			

Curios for Tourists

Prepared iguana soup - *I. iguana* and *C. similis*

Live Iguanas Encountered in Markets

Table 4 (continued)

Location	Year	Fitch and Henderson Species	Species Present	Condition	Present Cost	Fitch and Henderson (1983) Cost	Information from locals and observations
Honduras							
Utila	2006-2010		*I. iguana, C. similis, C. bakeri*				all species consumed, hunting pressure and consumption is increasing, *C. bakeri* preferred,
Roatan	2005, 2006, 2009		*I. iguana, C. oederhina*		$6 - 7 plate		no evidence of selling *"eaten by locals and often cooked for tourists in large numbers"* hunting very prevalent
Guanaja	2007		*I. iguana, C. similis*	live	$5.00-$15.00		vender traveling by boat
Cayos Cochinos	2009-2010		*I. iguana*	live	$12.00-17.00		4 occasions when individuals were confiscated
Olanchito	2007-2009		*I. iguana, C. similis, C. melanosterna*	live, prepared	$2.50-25.00		cost dependent on species and size
Tegucigalpacolon market, south side (La Venta)	2006	*I. iguana, C. similis*	*C.similis*	live	$5.00	$1.25-3.00	
San Jose de las Conchas	2006		*C. similis*	live			two males and one females being sold on the road, N 13 22.121, W 87 17.401
8 Km from above location	2006		*C. similis*	live			two boys seling on road *"only catch males because females produce eggs"*
Namasigue	2006		*I. iguana, C. similis*	live			sold by children to truckers on road
La Bonanza N 13 06.916, W 87 06.810	2006		*I. iguana, C. similis*	live			sold by children to truckers on road *"truckers put iguanas in storage below trailer for hiding"*
Choluteca	2006						nothing seen but told that iguanas could be found there
San Marcos de Colon	2006						nothing seen but told that iguanas could be found there
Triunfo	2006						nothing seen but told that iguanas could be found there
Pigeon Cay off Utila	2006						told that "iguanas" are sold there
Santa Rita	2010						not in market, *"can be found in La Barca"*
Rd. from Progresso	2006-2009		*I. iguana, C. similis*	live			
El Progresso	2010						*"not sold in 5 years in market"* no evidence of market sales
Puerto Cortez	2010						*"not currently available" "can order in advance" "available on streets, in soup during easter"*
Morales	2010		*I. iguana, C. similis*				can be found on road, *"no garrobos" "can order anything"*
Chiriqua	2010						*"none available, prohibited"* no evidence of market sales
Piste	2007			dead			only toe recovered/signs of hunting
Sambo Creek	2008		*unknown*		$5-10		
Pico Bonito Sur	2008		*I. iguana*	live	$10-15		taken by park military from local
Guatemala							
Morazon	2007		*C. similis, C. palearis*	live, frozen			5-6 ind. in small tienda *"every 15 days hunters sell up to 500 C. palearis to a trader from the USA or Europe"*
Rio Dulce	2010		*I. iguana*				*"can order in May"*
Rio Sarstun	2010		*I. iguana*	live	unknown		females with eggs *"can catch 10/day"*
Guatemala City	2010		*I. iguana, C. similis*	live, prepared	unknown		*"males and females are sold"* no eggs
**Markets in Livingston, Chisec, Nenton, Guastoya, Las Morales, Las Chinamas, Champerico, El Trebol, Santa Catrina Mita, Sipacate, and Rio Azul have all been reported by staff at Zootropic to sell live iguanas but no further details were available.							

Table 4 (continued)

Location	Year	Fitch and Henderson Species	Species Present	Condition	Present Cost	Fitch and Henderson (1983) Cost	Information from locals and observations
Honduras							
Utila	2006-2010		*I. iguana, C. similis, C. bakeri*				all species consumed, hunting pressure and consumption is increasing, *C. bakeri* preferred,
Roatan	2005, 2006, 2009		*I. iguana, C. oederhina*		$6 - 7 plate		no evidence of selling *"eaten by locals and often cooked for tourists in large numbers"* hunting very prevalent
Guanaja	2007		*I. iguana, C. similis*	live	$5.00-$15.00		vender traveling by boat
Cayos Cochinos	2009-2010		*I. iguana*	live	$12.00-17.00		4 occasions when individuals were confiscated
Olanchito	2007-2009		*I. iguana, C. similis, C. melanosterna*	live, prepared	$2.50-25.00		cost dependent on species and size
Tegucigalpacolon market, south side (La Venta)	2006	*I. iguana, C. similis*	*C.similis*	live	$5.00	$1.25-3.00	
San Jose de las Conchas	2006		*C. similis*	live			two males and one females being sold on the road, N 13 22.121, W 87 17.401
8 Km from above location	2006		*C. similis*	live			two boys seling on road *"only catch males because females produce eggs"*
Namasigue	2006		*I. iguana, C. similis*	live			sold by children to truckers on road
La Bonanza N 13 06.916, W 87 06.810	2006		*I. iguana, C. similis*	live			sold by children to truckers on road *"truckers put iguanas in storage below trailer for hiding"*
Choluteca	2006						nothing seen but told that iguanas could be found there
San Marcos de Colon	2006						nothing seen but told that iguanas could be found there
Triunfo	2006						nothing seen but told that iguanas could be found there
Pigeon Cay off Utila	2006						told that "iguanas" are sold there
Santa Rita	2010						not in market, *"can be found in La Barca"*
Rd. from Progresso	2006-2009		*I. iguana, C. similis*	live			
El Progresso	2010						*"not sold in 5 years in market"* no evidence of market sales
Puerto Cortez	2010						*"not currently available" "can order in advance" "available on streets, in soup during easter"*
Morales	2010		*I. iguana, C. similis*				can be found on road, *"no garrobos" "can order anything"*
Chiriqua	2010						*"none available, prohibited"* no evidence of market sales
Piste	2007			dead			only toe recovered/signs of hunting
Sambo Creek	2008		*unknown*		$5-10		
Pico Bonito Sur	2008		*I. iguana*	live	$10-15		taken by park military from local
Guatemala							
Morazon	2007		*C. similis, C. palearis*	live, frozen			5-6 ind. in small tienda *"every 15 days hunters sell up to 500 C. palearis to a trader from the USA or Europe"*
Rio Dulce	2010		*I. iguana*				*"can order in May"*
Rio Sarstun	2010		*I. iguana*	live	unknown		females with eggs *"can catch 10/day"*
Guatemala City	2010		*I. iguana, C. similis*	live, prepared	unknown		*"males and females are sold"* no eggs
**Markets in Livingston, Chisec, Nenton, Guastoya, Las Morales, Las Chinamas, Champerico, El Trebol, Santa Catrina Mita, Sipacate, and Rio Azul have all been reported by staff at Zootropic to sell live iguanas but no further details were available.							

Dr. Fitzgerald in Market

3.4. Hunting, Transport, and Treatment of Iguanas.— Iguanas and ctenosaurs are typically captured alive and held in captivity for varying amounts of time before being butchered in the markets or by the buyer (Terán 2006). Hunters capture iguanas and ctenosaurs with a variety of methods including: shooting with sling shots or firearms; extracting them from burrows by hand, digging, or with smoke; tracking them with dogs; and diving after iguanas that have fled underwater in streams and lakes.

When transported alive, iguanas and ctenosaurs are restrained by binding their legs and mouths. The legs are tied across their backs and their mouth is sewn shut. It is not uncommon to see live animals restrained by tying the tendons of their toes together. We have also observed captured individuals with limbs and backs broken as a means to subdue. Animals are also transported in large numbers in bags, which can cause physical harm, dehydration, asphyxia and stress to the animals.

3.5. Iguana Farming.—

3.5.1. History of Iguana Farming. Burghardt and Rand (1982) suggested green iguanas should be considered for management or ranching due to their high reproductive potential, evidence of captive raised feasibility (Braunwalder 1979), and sustainability of raising animals over generations (Mendehlson 1980). They questioned whether iguana meat could compete economically as a protein source against other domesticated animals, but pointed to specialty foods, pet trade, and laboratory supply animals as possible markets (Burghardt and Rand 1982). In the same year, Fitch, Henderson, and Hillis (1982) suggested iguana farming as an alternative to hunting. To counteract economic and space issues, they proposed a compromise of keeping a breeding population of adults while releasing the hatchlings. Sites would be chosen based on the suitability of habitat with a lack of natural populations, and predators would be managed for optimal iguana survival (Fitch et al. 1982).

The widespread implementation of iguana farming in Central America originated from the Green Iguana Management project at the Smithsonian Tropical Research Institute (STRI) in Panama. The STRI hired Dr. Dagmar Werner to lead a project promoting a way to link iguana conservation, forest protection, and alleviation of poverty and protein deficiency under one umbrella implemented at the level of individual family farms. This model sought to increase nesting success and hatchling survival rates to 95% (Werner 1987), and release juveniles into the wild near family farms. High survivorship achieved from raising eggs and hatchlings in captivity would presumably result in sufficiently large enough increases in population sizes to allow hunting. The model called for local farmers to keep breeding stock, release juvenile animals into nearby forest, and provide supplemental feeding stations to increase carrying capacity and keep animals close for later harvest. Ideally, local farmers would have the incentive to protect the forest that provided iguana habitat. Additionally, the project provided farms with brood stock (Werner 1987). The project began in 1983 as the Iguana Management Project, continued as Fundación Pro Iguana Verde in 1985 and moved to Costa Rica in 1988, where the concept eventually expanded into other Central American countries (Cohn 1989).

The reptile enthusiast magazine, “Reptiles,” featured a photo of green iguana on its debut issue of October 1993. By the mid-1990s, green iguanas were booming in popularity en route to become one of the most recognizable pet reptiles in the world. Hatchling iguanas were in high demand, and small-scale farms in Central America provided an excellent place for buyers to find them. Central America, being relatively close to the United States, had a readily available market of hatchlings for purchase helping fuel the pet trade. Selling iguana hatchlings gained traction first in El Salvador

with small farmers. Larger scale commercial pet farms soon followed.

The original conservation model for keeping iguanas and releasing them into the wild transformed with the international market for farmed iguana hatchlings. It became much more profitable for farms to sell hatchling iguanas to exporters in the pet trade than to simply release them. In Honduras, iguana farming projects were originally initiated by foreigners and animals trans-shipped through El Salvador into the global market. Soon thereafter, the Honduran government and NGOs encouraged farmers to sell hatchlings into the pet trade by providing permits allowing collection and incubation of eggs from wild females. Farms that were designed specifically to produce hatchlings, "6-month farms" proliferated during the pet iguana market boom years with at least 10 farms sanctioned at some level by government specifically for the raising of *I. iguana* hatchlings for the pet trade (pers. comm. Gustavo Cruz).

3.5.2. General Results from Farm Visits. We visited family and community cooperative farms of three basic categories: 1) operating for many years (e.g. 20 years), 2) as recent start ups (e.g. 3-4 years), or 3) converted to tourist operations (Table 5). Nicaragua and Costa Rica were the two countries where family and community cooperative were located. Costa Rica's farms have been converted to tourist operations. Nicaragua, Honduras, and Costa Rica each had sites with iguana conservation or tourist operations. We found pet breeding facilities selling iguanas in every country, with El Salvador having the largest farms by orders of magnitude (see Trade data section for export data).

Handling of iguana hatchlings has changed since the inception of iguana farming. Farms originally released all hatchlings, then were required to release 10-30% of their stock, and now are instructed not to release any animals. We heard varying reports from various individual and community cooperative farms as to whether animals were still being released and at what percentage they were being released.

Two of the three family farms have been operating for close to twenty years and are experiencing a severe cutback in profits with the decline in iguana demand for the pet trade. The owners from the older family farms told us of other local farms that had stopped iguana production due to the lack of a market for hatchlings. The community farms were all relatively new, operating between three and four years. Two of those three farms, Linda Vista and El Cacao, had not sold any adults for either meat or breeding stock, neither had they sold any hatchlings into the pet trade since their inception. However, they did report releasing 100 and 34 hatchlings, respectively, into the wild. Another farm, Pochote reported selling twelve males a year and releasing an undisclosed number of offspring. No farms reported used of iguanas for regular source of protein.

3.5.2.1. NGO and Government Involvement in Farms. Non-government organizations initiated the six non-research farms in Nicaragua using Pro Iguana Verde protocols and founding stock. The family farms currently sell hatchlings into the pet trade when (and if) there is a buyer and will sell adults for meat or for founding animals for other farms. Virtually all of the individual and community cooperative farms were initiated and or supported by one or more NGOs, government agencies, or private donations. A medium sized pet farm, Faumarnica, received veterinary assistance from the local university. So far as we could determine, only the large-scale commercial breeding operations operated without government or NGO funds.

3.5.3. Species in Iguana Farms and Other Captive Breeding Facilities. The majority of farms raised *Iguana iguana*. Only four of the twenty-one farms we visited bred other

iguana species, specifically, *Ctenosaura quinquecarinata, C. similis,* and *C. bakeri*. The Universidad Nacional Autónoma de Nicaragua (UNAN) maintains a research farm for both *I. iguana* and *C. similis* and was the only facility we visited with *C. similis*. The UNAN raises *C. similis* experimentally for research purposes. When we asked the UNAN researchers why *C. similis* was not commonly raised in farms, even though there was a demand for meat, as we witnessed in local markets, we were told that *C. similis* is much more difficult to manage due to their aggressive nature and lifestyle. Farm owners and NGO staff also cited *Ctenosaura* spp. aggressiveness as a major deterrent for any sort of farming activities or captive rearing project support. One of the cooperatives tried raising *C. similis* but lost their founding animals citing refusal to eat as cause of death. Most of our interviewees told us there is a higher demand for *I. iguana* versus *Ctenosaura*.

Two farms in Nicaragua, Ranica and Faumarnica, raise *Ctenosaura quinquecarinata* for the local, regional, and international pet trade. *Ctenosaura bakeri* is only raised in Utila, Honduras, where it is an endemic species. The center hosts guest researchers, provides environmental education for both tourists and the island residents, and breeds *C. bakeri* to release hatchlings into the wild to supplement natural populations.

3.5.4. Pet Breeding Facilities. The PIs interviewed proprietors of five commercial breeding facilities for the pet trade, two in El Salvador, two in Nicaragua, and one in Costa Rica. The majority of these facilities focus solely on exporting hatchlings to the USA and Europe, while in Costa Rica, one start-up farm is exploring the local pet trade as well. Most of the facilities concentrated their efforts on *I. iguana*, however two Nicaraguan farms, Faumarnica and Ranica had found a market to sell *Ctenosaura quinquecarinata* on the international scene, with one farm self reporting an export of 6,000+ individuals per year.

Large commercial farms originally purchased breeding stock from local farms. For example, five local farms were absorbed to supplement *I. iguana* breeding stock for Fluker Farms, a large-scale pet supplier. If orders surpass supplies in these pet breeding operations, additional animals are simply purchased from local farmers.

We were also able to gather comparable information from several breeding facilities in Guatemala. Although the authors were unable to visit any iguana farms in Guatemala, Franklin Herrera and Mygdalia Garcia Reyes (Consejo Nacional de Areas Protegidas (CONAP)), informed us of four farms registered with CONAP in 2010 selling into the pet trade: Ecological Gardens, Finca Jutiapa, Zooservicios, and Mundo Exotico. Finca Jutiapa does not export directly but rather supplies *I. iguana* to Mascotas Exclusivas for exportation.

3.5.4.1. Value of Specimens. The average declared value of *I. iguana* specimens exported by Guatemala from 2005 to 2009 was of approximately $2.70 USD per live specimen, and $5.00 USD from El Salvador (farm selling price in 2009), depending on the importing country. Farmers we interviewed in Nicaragua reportedly earn $1.00 - $3.00 USD per *I. iguana* individual and $3.00 USD for *C. quinquecarinata*.

Leslie Ruyle Interviewing Owners of Captive Breeding Facilities

3.5.5. Tourism and Conservation Farms. There are many iguana breeding centers for the purposes of conservation, education, and tourism in Costa Rica, Honduras, Guatemala, and Nicaragua (Table 5). The oldest farm in this region is Kekoldi, an indigenous community iguana farm in southeast Costa Rica, converted from meat production into a tourist attraction. The original project in the Kekoldi area started with five farms and now only one remains. This farm has dwindled in size and support of the community, being maintained almost exclusively by the efforts of two local individuals. It is financially supported by private donations by tourists and a Canadian NGO. The owners report releasing several hundred iguana hatchlings and excess adult males into the adjacent forest each year, but no specific records are currently being kept. Additionally, they report that during the 1990s, when the farm was much larger many thousands of hatchlings were released into the forest each year. No research on the efficacy of these efforts was ever carried out. The Iguana Station operated by the indigenous Bay Islands Foundation on Utila Island, Honduras is aimed specifically for conservation of the island endemic, *Ctenosaura bakeri.* The farm serves as a breeding facility, conservation education and outreach center, and tourism attraction. Arch's Iguana Park in Roatan, Honduras (the largest of the Bay Islands) is a major tourist attraction supporting large numbers of free roaming *I. iguana* by providing supplemental food and protection for the species. The park also provides a breeding area and headstart iguanas in cages before releasing them onto their property, and rescues injured iguanas of both local species, *C. oedirhina* and *I. iguana*. The park takes in revenue by conducting tours. At the Cerro Negro reserve, a park at the foot of the volcano by the same name in Nicaragua, recently started raising *I. iguana* as a tourist attraction and to augment wild populations. They recently released 400 hatchlings and kept 200 to supplement their breeding stock.

On the mainland of Honduras, Fundación Islas de la Bahia, through PROcrea and have proposed plans for a breeding center for *C. melanosterna*, which is based on the facility operating on Utila. The objective for this proposed breeding center is to supplement the wild population and serve as an education center (Aristide Ponce, pers. comm.).

Country	Name	Type	Years operating	Iguana Spp kept	Selling for meat/ # for 2009	Selling for pets 2009	Released into wild 2009	Total animals in farm	NGO/ Gov support
Costa Rica	Tarcoles	Commercial	2	*I. iguana*	no	not yet	no	35 adults, 600 eggs	No
Costa Rica	Kekoldi	Tourism	20	*I. iguana*	no	no	300	50-80 adults	Yes
Costa Rica	Iguana Verde	Tourism	6	*I. iguana*	no	no	20-50	no data	Yes
Costa Rica	Turu Ba Ri	Tourism	2	*I. iguana*	no	no	80	40 adults	No
El Salvador	Arauca	Commercial	14	*I. iguana*	no	250,00	no	15,000 -20,000 adults	No
El Salvador	Fluker Farms	Commercial	18	*I. iguana*	no	400,000	no	25,000 adults	No
El Salvador	Granja La Única S.A. de C.V.	Commercial	no data	no data	no data	no data	no data	no data	no data
El Salvador	Granja El Pantano	Commercial	no data	no data	no data	no data	no data	no data	no data
El Salvador	FFI Reptile Division S.A. de C.V.	Commercial	no data	no data	no data	no data	no data	no data	no data
El Salvador	Iguanas Tropicales S.A. de C.V.	Commercial	no data	no data	no data	no data	no data	no data	no data
Guatemala	Ecological Gardens	Commercial	10	*I. iguana*	no	3,420	no	no data	No
Guatemala	Finca Jutiapa/ Mascotas Exclusivas	Commercial	4	*I. iguana*	no	7,900	yes	no data	No
Guatemala	Zooservicios*	Commercial	3	*I. iguana*	no	5,850	no	no data	No
Guatemala	Biotropo Monterrico	Tourism	no data	*I. iguana*	no	no	no data	no data	
Honduras	Utila Iguana Station	Research	13	*C. bakeri*	no	no	50-100	11 adults + wild gravid females	Yes
Honduras	Sherman Arches Iguana Farm	Tourism	18	*I. iguana*	no	no	kept wild	>500 adults	No
Nicaragua	Faumarnica	Commercial	10	*I. iguana* *C. quinquecarinata*	no	3,000 I.i., 6,300 C.q.	yes	290 adult I.i., 350 adult C.q.	No
Nicaragua	Ranica	Commercial	8	*C. quinquecarinata*	no	200	no	135 adults	No
Nicaragua	Linda Vista	Community farm	3	*I. iguana*	not yet	no	100	100 adults, no hatchlings	Yes
Nicaragua	El Cacao	Community farm	4	*I. iguana*	not yet	no	10%	100 adults, 140 juv, 340 hatchlings	Yes
Nicaragua	Pochote	Community farm	4	*I. iguana*	12 males a year	no	yes	105 adults, 30 juveniles	Yes
Nicaragua	Paso lo Solera Santa Teresa Curaco	Family farm	2	*I. iguana*	not yet	no	no	45 adults, 85 juveniles	Yes
Nicaragua	Finca de braziles	Family farm	20	*I. iguana*	very few	no	for every 500 release 20-30	80 adults	Yes
Nicaragua	San Nicolas	Family farm	17	*I. iguana*	very few	300	no (previously 10%)	100 adults, 420 hatchlings	Yes
Nicaragua	UNAN	Research	13	*I. iguana/ C. similis*	only male iguanas	no	no	138 adults, 600 hatchlings	Yes
Nicaragua	Cerro Negro	Tourism	1	*I. iguana*	no	no	400	102 adults, 200 hatchlings	Yes

*Started in 90s closed for a decade and reopened in 2008, closed down by CONAP in 2010.

3.6. International Trade in *Iguana iguana* and *Ctenosaura* spp.

3.6.1. World Trade in *Iguana iguana*. Trade in spiny tailed and green iguanas for the pet trade increased significantly in the 1990s. This trend is associated with the general increase in popularity of keeping reptiles as pets**.**

Trade data from CITES records allow for analyses of world-wide trade in green iguanas, although the reality of imperfect record-keeping and national reporting, and the presence of illegal trade mean that records of recognized trade databases reflect an under-count of actual trade levels; for some countries the undercount could be significant, although the degree of inaccuracy is largely conjectural. International imports in *Iguana iguana* were examined from 2001 to 2008, based on data from UNEP-WCMC trade database (which reflects CITES reporting by the Parties). Import data were used to ascertain the number of exports from exporting countries determined by listed country of origin.

The total number of imports and re-exports of complete specimens (e.g. live animals, bodies) of *Iguana iguana* during 2001-2008 was 4,649,617 (Table 6; Fig. xx). Of these, 99.9% were live specimens exported for the pet market, and 0.01% were bodies and 92.5% (4,300,891) were imports and 7.5% (349,126) re-exports.

Of all the *I. iguana* re-exports globally (349,126), 80% (277,735) originated in the countries considered in this study, with all of them being live specimens. The international trade in *I. iguana* (complete specimens) peaked in 2004 at 506,248 animals, and decreased since 2005 to 365,744 in 2008 (Table 6, Figure 2). Numbers provided by CITES Management Authorities in El Salvador, Guatemala and Nicaragua differed from the WCMC dataset used for the analysis (Supplements xx, xx, xx).

Exports of *Iguana iguana* originating from CR, GT, SV, HN, and NI accounted for 78% (3,369,462) of world trade in green iguanas (not including re-exports), of which 99.9% (3,368,869) were traded for commercial purposes (Figure 3). Mexico, Spain, Italy, and Korea each reported imports of iguanas totaling more than 100,000 animals in 2010 (Table 7, Figure 4).

Table 6 and Figure 2. Trade data based on world-wide imports of green iguanas with country of origin listed as CR, HN, SV, GT and NI. The 2008 data in the WCMC database may not be complete.

Year	World-wide Imports
2001	414,536
2002	373,196
2003	425,721
2004	506,248
2005	442,911
2006	428,760
2007	412,550
2008	365,474

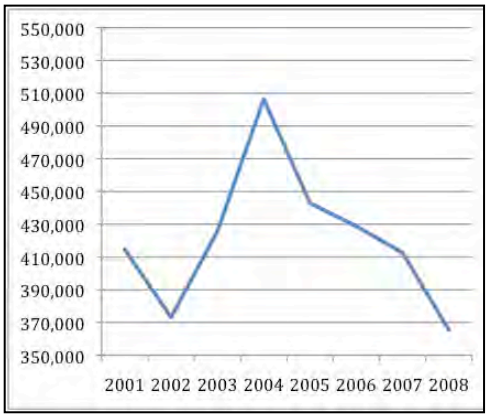


Figure 3. Proportion of exports of *Iguana iguana* from Central America (i.e., CR, HN, GT, CR and NI) and other important exporting countries for the 2001-2008 period (Source: UNEP-WCMC database 2010).

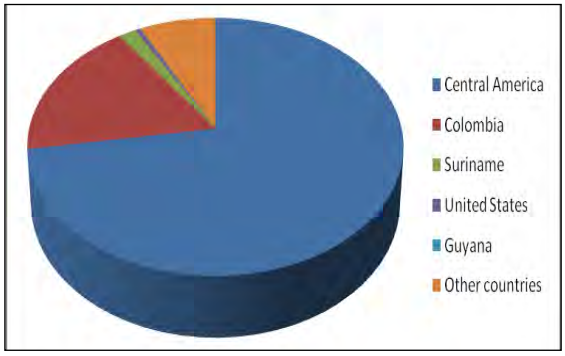
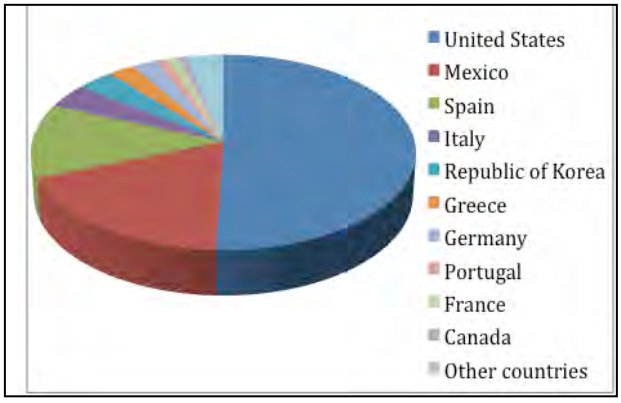


Table 7. Main importers of specimens that originated in CR, HN, GT, CR or NI between 2001-2008 (Source: UNEP-WCMC database 2010).

Import country	Number of specimens	Percentage
United Sates	1,703,010	51
Mexico	625,883	19
Spain	411,557	12
Italy	135,145	4
Republic of Korea	119,020	3

Figure 4. Proportion of imports of *Iguana iguana* per country for the 2001-2008 period (Source: UNEP-WCMC database 2010).



Interestingly, information for 2009 that was not yet available from UNEP-WCMC showed a decrease in trade from El Salvador and an increase of exports from Guatemala, although the Guatemala exports were only 17,170 compared to 264,788 from El Salvador (Table 8). Ninety-seven percent of iguanas originating from the Central American countries were from captive breeding operations (Table 9).

Table 8. Exports of *Iguana iguana* reported by government authorities of El Salvador, Guatemala, and Nicaragua, 2004-2009.

Years	El Salvador	Guatemala	Nicaragua
2004	N.A.	44,900	N.A.
2005	N.A.	8,700	N.A.
2006	586,305	4,500	N.A.
2007	563,399	3,200	N.A.
2008	562,399	15,000	1450
2009	264,788	17,170	1750

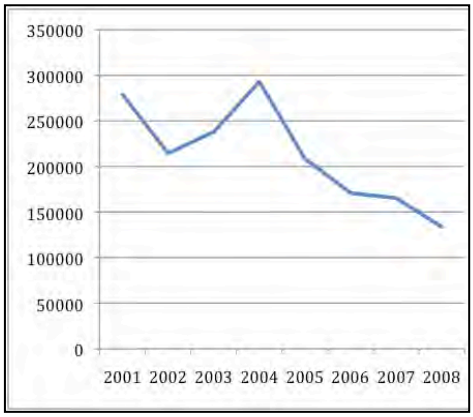
Table 9. Number of legal specimens of iguanas and ctenosaurs exported 2001-2008, their source, and country of origin (Source: UNEP-WCMC database 2010).

	Costa Rica	Guatemala	El Salvador	Honduras	Nicaragua	Total
Captive bred		79,044	3,164,166		13,133	3,256,343
Captive born			14,604			14,604
Ranching operations			2,000		1,000	3,000
Wild			91,386	66	1,264	92,716
Unknown			2,000		260	2,260
Personal	1					
Scientific	1					
Total	**13**	**79,051**	**3,274,674**	**66**	**15,658**	**3,369,462**

3.6.2. Iguana Trade in USA. The USA is the major importer of *Iguana iguana*, importing more than 50% of all global exports from the five countries considered in this study during 2001-2008. Essentially 99.9% of this trade was live specimens for the pet market, and the vast majority came from captive breeding operations. Trends in green iguana trade in the USA reflect the global trade and drive it to a certain extent. Import of *I. iguana* specimens by the USA between 2001 and 2008 showed a tending increase from 2001 until 2004 (with a slight decrease in 2002), and from then on, a consistent decrease (Table 10, Figure 5).

Table 10 and Figure 5. Imports of *Iguana iguana* specimens by the USA during 2001-2008 (Source: UNEP-WCMC database 2010)

Year	Imports
2001	279,069
2002	214,434
2003	237,905
2004	292,937
2005	208,757
2006	170,907
2007	165,335
2008	133,666



3.6.3. International Trade in *Ctenosaura spp.* There are currently no records of *Ctenosaura* spp. traded globally in the UNEP-WCMC CITES Annual Report database, given that no species had been included in the CITES Appendices until 2010. The only available database with this type of information is the USFWS LEMIS database, with the limitation that it only includes movements to and from the USA. In the case of *Ctenosaura* spp., wildlife import data from the USFWS LEMIS database were analyzed for the period 2001-2008. Species of *Ctenosaura* imported to the USA from the five countries considered were *C. similis*, *C. quinquecarinata*, *C.palearis*, and *C. melanosterna*. *C. palearis* and *C. melanosterna* were recorded in LEMIS for the first time in 2008, although the

database includes prior records of *Ctenosaura* spp. (species not identified). Direct interviews with locals in the reporting countries revealed that individuals of several species were being moved but not recorded because the activity was illegal. Information provided by the USFWS, confirmed by Honduran authorities, indicated that in 2004 and 2008, 28 live specimens classified in LEMIS as *Ctenosaura* spp. were *C. melanosterna*.

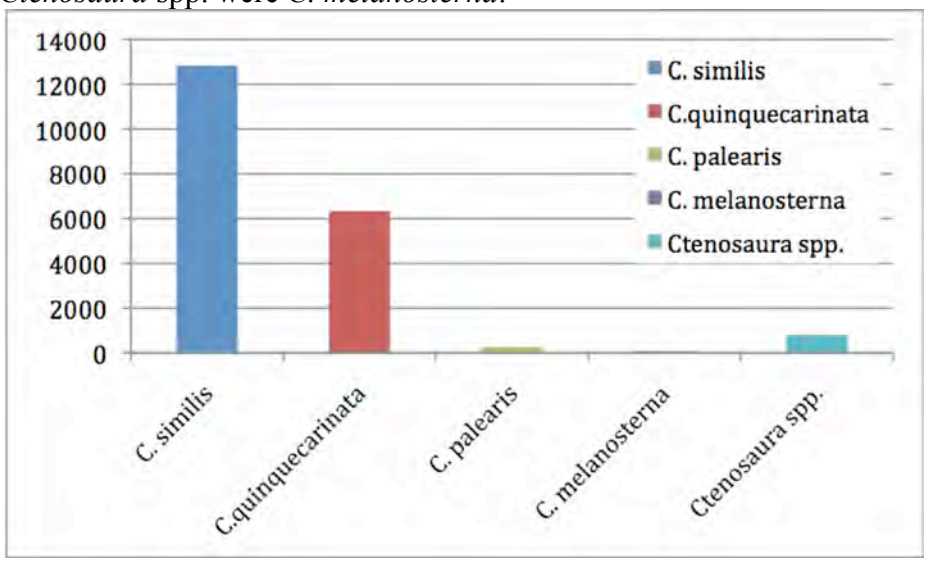


Figure 6. Imports to the USA of spiny tail iguanas by species from Guatemala, Honduras, El Salvador, Nicaragua and Costa Rica from 2001-2008.

Of the total of *Ctenosaura* spp. exported from countries to the USA and registered by LEMIS, 63% were *C. similis*, 31% *C. quinquecarinata*, 4% *Ctenosaura* spp., with less than 1% *C. palearis* and *C. melanosterna* (Figure 6). Information provided by Nicaraguan authorities showed an increase in export of *C. quinquecarinata* to the USA from 2007 to 2009 (Table 11). All exports were from captive breeding facilities, according to Nicaraguan authorities.

A much larger number of *C. quinquecarinata* are being exported to countries other than the United States. One captive breeder reported to us that he exported more than 6,000 individuals in a year. In addition to the USA, these specimens were mainly exported China, Europe and Japan.

Table 11. Exports of *Ctenosaura quinquecarinata* from Nicaragua to the USA from 2007 to 2009 based on information provided to TRAFFIC by the Nicaragua CITES Management Authority.

Year	2007	2008	2009	Total
Individuals exported	307	804	1,680	2,791

The most significant contribution to imports by the USA during this period was from Honduras, responsible for 56% of the total number of ctenosaurs imported (most of which were *C. similis* specimens), followed by Nicaragua (18%, and mainly of *C. quinquecarinata*), El Salvador (14%, all *C. similis*), and Guatemala (12%, mainly *C. similis*). Costa Rica did not export specimens of these lizards for commercial purposes, and contributed less than 0.5% of all imports into the USA, all of which were for scientific purposes (Figure 7).

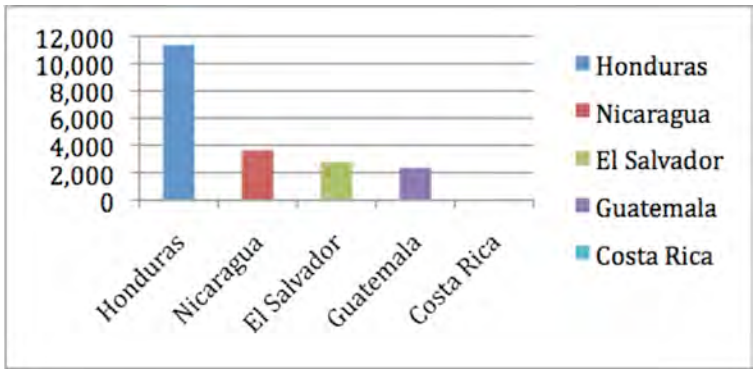


Figure 7. Imports of *Ctenosaura* spp. specimens to USA by Country of origin (2001-2008).

Of all *Ctenosaura* imports recorded in LEMIS, 92% from the countries considered were live specimens. From 2001 to 2008, 70% of all *Ctenosaura* spp. imported to the USA were of wild origin, with 29% from captive breeding operations. It is important note that if the source of the species is not declared upon import, the data may be reported as 'WILD' in LEMIS even if they may have been from a captive source. Consequently, there may be some inaccuracies in determining sources of specimens when origin is not properly declared.

Ctenosaura similis and *C. quinquecarinata* comprised 94% of all imports into the USA during 2001-2008, with *C. similis* accounting for the majority. Of these, 79% were logged as wild specimens and 21% as captive bred. Of those captive bred animals, El Salvador exported more than 99% (2,655 individuals) and Honduras less than 1% (15 individuals).

Ctenosaura quinquecarinata was the second most commonly imported spiny tailed iguana in the USA from 2001-2008, with 50% of the specimens registered as wild in origin and the other 50% from captive breeding operations. Nicaragua was the exporting country for all captive bred *C. quinquecarinata* (3,171), which represented 99% of its exports of this particular species. In all, 95% of the *Ctenosaura* specimens exported to the USA by the five countries considered were exported for commercial purposes, 4% for scientific purposes, and less than 1% as personal belongings.

Information on value of specimens traded to and from the USA (and originated in Nicaragua, Costa Rica, Honduras, Guatemala or El Salvador) was only registered from 2001 to 2003. During these 3 years, *Ctenosaura* spp. specimens exported legally to the USA fetched an average price of $4.00 USD per individual, with *C. similis* averaging $3.89 and *C. quinquecarinata* $4.40 USD.

There is a clear decline in the trade in *Ctenosaura* spp. to the USA over the past few years. The number of specimens traded increased from 2001 to 2004, peaking with 3,296 *C. similis* and 2,153 *C. quinquecarinata* specimens, respectively. Since 2005, the number of *Ctenosaura* traded has decreased, with only 76 *C. similis* and 134 *C. quinquecarinata* imported by the USA in 2008 Numbers of captive bred *Ctenosaura* spp. also decreased over the same time. period (Figure 8). However, 2008 was the first year that both *C. palearis* (240 from Guatemala) and *C. melanosterna* (49 from Honduras) were recorded as imports in the United States.

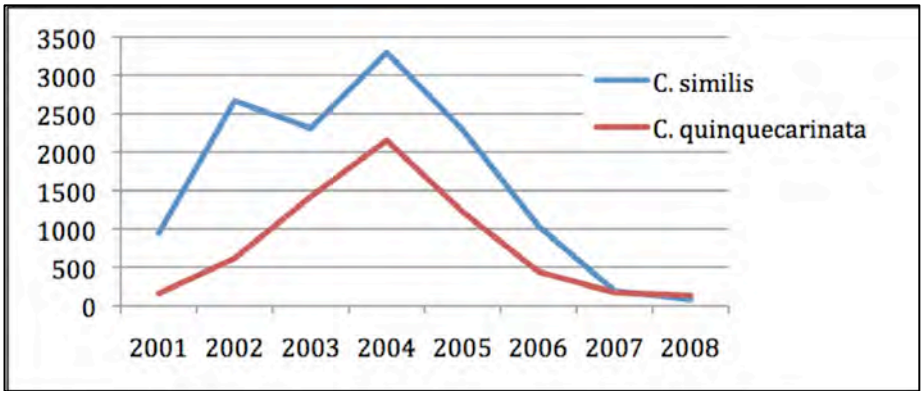


Figure 8. Total imports of *C. similis* and *C. quinquecarinata* by the USA from 2001-2008, including wild-caught and captive-bred individuals.

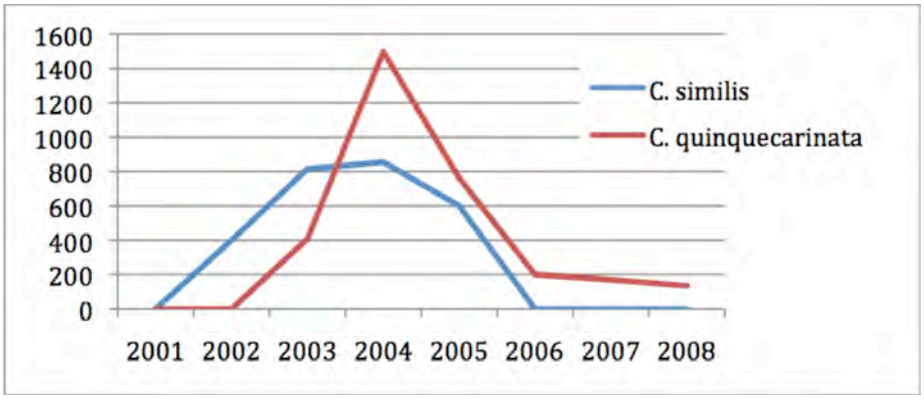


Figure 9. Imports of captive-bred *C. similis* and *C. quinquecarinata* by the USA from 2001 to 2008.

3.6.4. USA as Exporting Country of *Ctenosaura*. The USA plays a significant role as exporter and re-exporter of Ctenosaurs to other countries. Out of a total of 5,329 specimens exported by the USA over the eight year period, 4,431 specimens were re-exports that originated in the Central American countries covered by this study. These re-exports represented 83% of the total exports of *Ctenosaura* from the USA. All re-exports from the USA consisted of live specimens and were mainly destined to Germany (22%), Japan (12%), Canada (12%), Taiwan (10%), and Czech Republic (8%) (Figure 10).

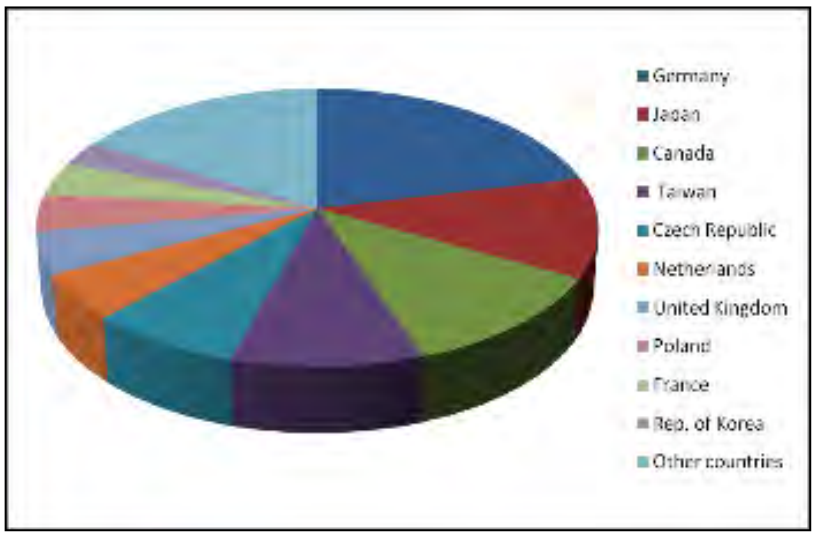


Figure 10. *M*ost significant import countries of *Ctenosaura* spp. originated in Central American countries considered that were re-exported from the US from 2001 to 2008

Of the 897 specimens exported by the USA that actually originated in the USA, 493 were recorded collected from the wild (55%), 351 as captive bred, and 53 farmed (jointly 45%). As previously mentioned, if the source of the species is not declared, the shipment will generally be logged as WILD in LEMIS even if the individuals might have been bred in captivity.

Although no *Ctenosaura* species naturally occur in the USA, some species have been introduced. The USA exports are identified only to genus or to *C. similis*. Both *C. similis* and *C. pectinata* are introduced in Florida, and *C. pectinata* is established in south Texas (Townsend et al. 2003).

3.6.5. International Iguana Meat Trade.— During the 2001-2008 period, a total of 9,218kg of meat was exported to the USA, 95% of it originating in El Salvador, 4% in Mexico, and 1% in Guatemala, Honduras and Nicaragua. It was not clear for meat shipments how species were identified. Thus, we do not know if all the meat was *I. iguana* or if some was also *Ctenosaura* spp. Other exports recorded were eggs, skin pieces, skins, leather products, shoes, bone carvings, garments, oil, skeletons and soup.

3.7. Internet Pet Trade in *Ctenosaura* spp.— As can be seen in the examples of internet based advertisements (Appendix A-VII), availability of *I. iguana*, *C. similis*, *C. pectinata*, and to a certain extent *C. quinquecarinata* for the pet trade is commonplace. Based on web searches, specimens of *C. palearis* that had averaged $70, increased in price to $150 USD an animal (a 214% price increase) after its inclusion in CITES Appendix II, according to the Appendix II listing proposal for this species submitted by Guatemala to the CITES CoP15 in 2009. One web advertisement mentioned the CITES listing (Appendix A-VII). It is common in the pet trade that when species are listed by CITES the price increases. Conservationists raise the concern that CITES listing may thus generate increased interest in species that might pose a threat if trade controls are not effective.

3.8. Reptile Pet Expositions.— A visit to one reptile fair (Texas Reptile Expo, San Antonio, TX, USA, Nov. 7-8 2010) provided the opportunity to talk to several vendors and other relevant actors indicated that most of the USA trade with Central American iguana species involves green iguanas from captive breeding facilities.

There appeared to be limited interest among traders for *Ctenosaura* spp. Vendors reported this seems to be due to the "difficult" (aggressive) character of some species of *Ctenosaura* compared to *Iguana iguana* or other common pet lizards (e.g., bearded dragons, *Pogona vitticeps*). Among the approximately 50 vendors at the fair, one had four young *C. quinquecarinata* for sale at $37 USD each. The vendor indicated he had obtained them from a wholesaler about a year earlier who imported them from Nicaragua, but that there had not been a lot of interest among potential buyers since he had them. None were sold during the 2 days of the fair, which had an estimated attendance of 1,000 people per day according to the organizers.

Our interviews with iguana farm owners and web searches suggest that there is a difference between pet trade markets of the USA and those in Europe and Asia. For example, our search of online European reptile sales and discussion boards for this study seem much more active with regards to a variety of *Ctenosaura* spp than

discussion boards in the USA. Additionally, one farm owner reports an export rate of 6,000+ captive bred juveniles of *C. quinquecarinata* in 2009 to Europe, Asia, and the USA while export records do not reflect those numbers.

3.9. Illegal Trade.— Illegal hunting and harvesting of spiny tail and green iguanas for local consumption and intraregional trade is commonplace in the Central American region. According to Guatemala's IV Report to the Convention on Biological Diversity (CBD), international trade of flora and fauna registers revenue of $11.5 million USD, and is estimated that illegal trade surpasses that amount and includes illegal trafficking with neighboring countries and the internal markets. Though difficult to quantify, illegal trade in green iguanas from Guatemala to Honduras is recognized to exist (CONAP 2009). Unfortunately, information on illegal trade probably does not represent the actual levels of illicit activities, but more an indication that such activities occur. Table 12 lists some examples that confirm the allegations of an existing local, intraregional and international illegal trade of these species in the countries considered.

Enforcement activities usually take place in either the harvest sites, in places where goods are gathered prior to their distribution, during the transportation of the animals, products or derivatives, or at trade/selling hotspots.

Table 12. Example Cases of Illegal Activity of *Iguana* and *Ctenosaura* in Central America.

Country	Date	Seizure/Legal action
El Salvador		Official data indicates the seizure of at least 550 green and spiny tailed iguanas (live specimens) in 2006, 345 in 2007 and 2716 in 2008 (See Supplement xxx)
	Sep 2008	One person was found guilty for illegal take of protected fauna, with the seizure of 1380 iguanas in his possession. Sentence of 3 years imprisonment was suspended by the judge, and exchanged for the following: A trial period of 2 years, in which the person is not to leave the country, and is not allow to transport any protected fauna (http://www.jurisprudencia.gob.sv/exploiis/indice.asp?nBD=1&nItem=48756&nModo=3).
	Mar 2009	Seizure of 241 spiny tail iguanas from Nicaragua by the Anti-Drug Division in El Salvador at the border inspection (http://www.elsalvador.com/mwedh/nota/nota_completa.asp?idCat=6375&idArt=3426034).
	Apr 2010	Seizure of 45 black and 5 green iguanas by the National Police (PNC) (http://www.laprensagrafica.com/el-salvador/social/110801-comercio-con-vida-silvestre-opaca-categoria-i.html).
Guatemala	Nov 2008	Illegal export of 240 iguanas to the USA by a business under the name of Zooservicios (http://www.informador.com.mx/tecnologia/2010/194244/6/demanda-de-iguanas-y-ranas-activan-el-trafico-ilegal-en-guatemala.htm).
	Dec 2009	Illegal shipment of 300 green iguanas to Bruce Edelman Reptiles Imports and Exports Inc in Miami (http://www.conap.gob.gt/news/la-fauna-silvestre-de-guatemala-esta-a-merced-de-los-traficantes).
Honduras	2005	Total estimated seizures of 991 iguanas during 2005 by the National Police (PNC)

		(http://www.elsalvador.com/noticias/2006/09/24/nacional/nac6.asp).
	Mar 2006	Seizure of one iguana and 3 fresh water turtles in San Pedro Sula (http://www.periodicos-de-honduras.com/2006/03/02/281/).
	Feb 2008	Seizure of 21 black and green iguanas in Montaras destined for the food market in El Salvador (http://www.elrincondelascuatropatas.com/2008/02/incautacion-de-garrobos-e-iguanas-en-un-autobus/).
Nicaragua	Feb 2005	Seizure of almost 200 animals during the closed season, including black and green iguanas (http://archivo.laprensa.com.ni/archivo/2005/marzo/01/nacionales/nacionales-20050301-08.html)
	Mar 2006	Seizure of 7 black iguanas among 500 wildlife specimens by the National Police and MARENA in the Mercado Municipal "Ernesto Fernández", Masaya (http://impreso.elnuevodiario.com.ni/2006/03/24/nacionales/15722).
	Dec 2006	Seizure of 60 spiny tailed and green iguanas by the Morazan Police in Chinandenga (http://impreso.elnuevodiario.com.ni/2006/12/07/contactoend/35826).
	Summer 2008	Seizure by MARENA of some 214 green and 16 black iguanas (www.cancilleria.gob.ni/boletines/docs/rimatutino24marzo08.pdf)
	2009	A total of 1308 black and 203 green iguanas seized in 2009 according to Commissioner Vilma Reyes of the National Police (http://webcache.googleusercontent.com/search?q=cache:BZRnJoWmaM0J:impreso.elnuevodiario.com.ni/2010/02/06/nacionales/118571+operativo+iguanas+garrobos+guatemala&cd=18&hl=es&ct=clnk&gl=mx)
	Jun 2009	Seizure of 40 spiny tail iguanas and armadillos along the Matagualpa road by MARENA and the National Police (http://webcache.googleusercontent.com/search?q=cache:wFun0rlOvH0J:www.spanish.xinhuanet.com/spanish/2009-06/18/content_894814.htm+ilegal+iguanas+garrobos&cd=35&hl=es&ct=clnk&gl=mx).
	Sep 2009	Seizure of 65 black and 4 green iguanas by MARENA and the National Police in the Walter Ferreti neighborhood (http://webcache.googleusercontent.com/search?q=cache:xYgHGW-hoxQJ:www.marena.gob.ni/index.php%3Foption%3Dcom_content%26task%3Dview%26id%3D747%26Itemid%3D267+ilegal+iguanas+garrobos&cd=75&hl=es&ct=clnk&gl=mx).
	Feb 2010	Seizure of 42 black and green iguanas by MARENA and National police staff in 10 establishments at the Mercado Oriental in Managua (http://webcache.googleusercontent.com/search?q=cache:u0jn8RALb2QJ:www.conamornicaragua.org.ni/DOCUMENTOS%25202010/FEBRERO%25202010/El_19_Noticias_Martes_2_febrero_de_2010.doc+ilegal+iguanas+garrobos&cd=68&hl=es&ct=clnk&gl=mx).
	Apr 2010	Seizure of 64 black and 17 green iguanas seized by authorities in an inspection point at the Chinandenga-El Guasaule road, that were being transported to a wholesale Market Managua (http://webcache.googleusercontent.com/search?q=cache:YaQE1iXBx4cJ:ww

	Jun 2010	w.elnuevodiario.com.ni/contactoend/46397+incautacion+iguanas+garrobos&cd=6&hl=es&ct=clnk&gl=mx) Seizure of 13 green and 1 black iguana in Marcovia by police (http://webcache.googleusercontent.com/search?q=cache:QqBeagH629QJ:archivo.elheraldo.hn/ez/index.php/plain_site_user/ediciones/2008/02/08/maqueta_pais+decomisa+iguanas+garrobos+guatemala&cd=16&hl=es&ct=clnk&gl=mx)

Table 13. Locations Where Illegal Trade in *Iguana* and *Ctenosaura* is Known to Occur.

Country	Locality
Costa Rica	Border crossings: Peñas Blancas (with Nicaragua), Sixaloa, San Vito, Paso Canoas (with Panama), Los Chiles Turrialba, Las Gemelas, San José (TRAFFIC Norteamérica 2009)
El Salvador	El Litoral highway (on the roadsides), particularly near San Agustín Municipality, in Usultán and San Miguel Cantón Hacienda Cantora http://biologosdeelsalvador.blogspot.com/2010/04/plantean-cazadores-crear-zoo-criaderos.html Estero El Tamarindo Beaches at the Gulf of Fonseca Mercado Central, San Salvador, San Miguel-El Delirio Road, Carretera Panamericana San Vicente (Río Lempa area), Bahía de Jalisquillo, Estero de Jaltepeque, Los Cóbanos, Estero Bahía La Unión Border crossings: La Tachadura, El Amatillo, Anguiatú, Chinamas, Candelaria de la Frontera, El Poy "*Blind point*" at the Río La Paz (between Guatemala and El Salvador) (TRAFFIC Norteamérica 2009)
Guatemala	According to Ariano and Cotí (2007), Morazan, El Progreso and Las Morales, Gustatova, El Progreso, are towns where foreigners buy *Ctenosaura palearis* individuals for international trade. Mercado de Quetzaltenango, La Democracia, Minerva, Coatepeque, Petén, Cobán, Southeast Border crossings: El Carmen (San Marcos) (MX), Tecún Umán (MX), Gracias a Dios (MX), La Mesilla (Hueuetenago) (MX), El Ceibo (MX), Melchor de Mencos (BZ), 3 banderas (illegal), El Florido (HN), Pedro de Alvarado (SV) (TRAFFIC Norteamérica 2009)
Honduras	Honduran Mosquitia Honduras-Nicaragua border Border crossings: Las Manos, Guasaule, Agua Caliente, El Amatillo, Las Mataras (TRAFFIC *Norteamérica* 2009)
Nicaragua	On the roadside between Nagarte and Mateare (http://impreso.elnuevodiario.com.ni/2007/03/18/especiales/94117) Mercado Oriental, Managua, Isla Zapatera, Gulf of Fonseca Border crossings: El Guasaule, Peñas Blancas, Las Manos, El Espino (TRAFFIC Norteamérica 2009)

3.9.1. Illegal trade to CITES Importing Countries.— International illegal trade in *Iguana iguana* is insignificant. Globally, during 2001-2008, a total of 49 specimens originating in the countries of interest were registered as illegal (Table 14). There is no information available on records of illegal trade in *Ctenosaura* spp. for any country other than the USA. In 2001 one individual *Ctenosaura* spp. (WILD, BODIES) was reported as abandoned. In 2002, one shipment of 44 specimens of *C. similis* (WILD, BODIES) was seized by the USFWS. Additionally, the many *Ctenosaura* species are difficult to identify and therefore it is possible that seized individuals are given the most commonly known name.

Table 14. Illegal exports of a total 49 *I. iguana* specimens from the countries considered in this study during the period 2001-2008 (registered in the UNEP-WCMC trade database).

Year	Importer	Exporter	Import Quantity	Item
2001	HU	CR	11	live
2002	US	NI	1	bodies
2005	US	SV	2	bodies
2005	US	SV	1	live
2006	US	GT	7	bodies
2006	US	SV	2	bodies
2007	US	HN	12	bodies
2007	US	SV	13	bodies

3.10. LEGAL FRAMEWORK

3.10.1. International Legal Framework: CITES. – The most relevant instrument related to the international trade in live iguanas and iguana products is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

CITES went into effect in the five Central American countries considered in this study at different times between 1975 – 1987: Costa Rica, September 1975; Nicaragua, November 1977; Guatemala, February 1980; Honduras, June 1985; El Salvador, July 1987. In these countries there are a number of different government ministries that are involved in managing wildlife, fisheries, and timber in domestic and international trade (see Tables 15 and 16). Contact information for CITES authorities is in http://www.cites.org.

3.10.2. CITES and Iguanas. Various species of *Iguana, Cyclura,* and *Ctenosaura* are listed on CITES, although the majority of *Ctenosaura* species remain unlisted. Several endangered endemic species are prohibited from commercial trade. All *Cyclura* species (ground iguanas from the Caribbean) and all *Iguana* species are listed on CITES Appendix I or II. Among Central American iguanas, *I. iguana* has been included in Appendix II since 1977 (as has *I. delicatissima* native to various islands in the Caribbean), and during the last meeting of the Conference of the Parties to CITES (CoP15 Doha, Qatar, April 2010), *C. bakeri, C. oedirhina, C. melanosterna,* and *C. palearis* - endemic to Honduras and Guatemala - were included in Appendix II.

Several CITES Parties have set national export quotas (limits) for *Iguana iguana* since 1997. In this An export quota system is a management tool generally used to ensure that exports of specimens, in this case of *I. iguana*, do not exceed a

level previously determined through a CITES "non-detriment finding" to have no detrimental effect on the survival of the species in the wild. Some CITES Parties may use export quotas as management tools to assist in the implementation or enforcement of the Convention for other (eg. non-biological) reasons.

3.10.2.1. Iguana Trade and CITES CoP 15. CITES recently considered two proposals to include Honduran Spiny-tailed Iguanas *Ctenosaura bakeri, C. melanosterna* and *C. oedirhina* in Appendix II and the Guatemalan Spiny-tailed Iguana *C. palearis* in Appendix II. The proposals were debated during the last Conference of the Parties CoP15, in Qatar, March 2010 and were accepted by consensus. Documented international trade of the four species, difficulty in identifying them by trade officials, and the threat to vulnerable populations were the reasons for listing the species in Appendix II. As with all Appendix II species, international trade in these ctenosaurs may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild. (www.cites.org) The Appendix II listing entered into force on June 23, 2010.

3.10.3. National Laws and Regulations. Each country has in place national legal instruments considered relevant to iguana conservation and trade (Table 15).

Table 15. Relevant legal instruments that might directly or indirectly affect iguana conservation and trade (Source: CAFTA-DR 2007-2008).

Country	Legislation	Description of Legislation
Costa Rica	Wildlife Conservation Law (Law No 7317)	The State can subscribe contracts, grant use permits, licenses, concessions or any other legally established figure for sustainable conservation and/or use of wildlife. Art. 14 prohibits the hunting, fishing and extraction of threatened continental or insular flora and fauna with the exception of that originated sustainably in registered captive breeding or facilities or nurseries and have undergone the appropriate scientific studies. Registration of these facilities is done by the *Dirección General de Vida Silvestre*-MINAE. Art. 15 MINAE will designate wildlife inspectors, honorary wildlife inspectors and natural resources surveillance committees (non government employees). Wildlife inspectors have police authority and should have a MINAE identification. Art.18 All trade and activities involving wild fauna and flora, products or derivatives except for those approved by the *Dirección General de Vida Silvestre*-MINAE and based on prior scientific studies is prohibited. Exports, imports and activities affecting any threatened wildlife species as established by the Executive are prohibited. Art. 25 Threatened species should only be scientifically managed in order to improve the condition of the species. Art. 26 MINAE has the faculty to grant import permits for wildlife species. Art. 27 The *Dirección General de Vida Silvestre* has the faculty to grant export permits of species from registered captive breeding operations. Art. 76 All international wild fauna and flora related activity in transit through national territory should have all the required permits according to this Law. Art. 77 If CITES specimens are seized, these will be returned to the country of origin, or act according to the text of the Convention. If from national origin, live specimens will be relocated according to their natural habitat and the instruction of the scientific authority, this Law and its regulations; or be assigned to

		national zoos or botanical gardens according to the situation and best opinion of authorities. Art. 78 Legally authorized ports of import, export or transit of wildlife are: Aeropuerto Juan Santamaría, Puntarenas, Caldera, Limón, Peñas Blancas, Paso Canoas or any other in the future which complies with the requisites of this Law and its regulations. Art. 79 Imports, exports and movement of CITES wildlife specimens with non-CITES countries is prohibited. Art. 81 For each CITES permit, the user will deposit 10% of the CIF value in the case of animals, and 5% in the case of plants to the Wildlife Fund account, resources which will be utilized to support the structural local operation of the Convention.
Costa Rica	General Customs Law (Law No 7557)	Art.2 All vehicles, merchandise and people entering or leaving the national territory are subject to this Law. Art. 20. Officers from other public institutions, within their competences, should support custom authorities in the compliance of their functions, and must communicate custom authorities on potential facts and acts in contravention of the customs judiciary regime and hand them the merchandises involved if in their possession. If a non customs authority wants to inspect merchandises or vehicles subject to customs control, previous authorization from the customs authority should be obtained. Exceptions to this can occur during prohibited substances/drugs controls, for national security reasons, in the case of natural disasters or emergencies. The inspection must however, be immediately communicated to the customs authority. Art. 21. All authorities with any control responsibility on trans-border movement of merchandises, vehicles or people should act collaboratively in a coordinated manner so as to implement existing legal and administrative dispositions. If special control by another authority needs to take place, custom authorities will inform the respective institution and will not accept the customs declaration until the requisites are fulfilled. Art. 22 Defines customs control. Art. 24 Lists Customs functions Art. 25 Indicates that Customs authority can request national and international assistance to prevent and investigate related crimes, seize merchandise and detain suspects when caught in an illicit act. Suspects are to be handed over to the judiciary within 24 hrs.
Costa Rica	National Animal Health Service General Law (Law No 8495)	States that the *Servicio Nacional de Salud Animal* (SENASA) is responsible to establish the necessary health measures for the national and international transit or exchange of domestic, wild, aquatic and other animals, its genetic or biotechnological material, products, byproducts, derivatives, remains, hazardous substances, food or veterinary use medicines. This, to avoid plagues or illnesses that could pose a risk to public or animal health. SENASA is instructed to respect CITES dispositions and other related laws and regulations.
Costa Rica	Decree No 28522	Designates the National Conservation Areas System as CITES Management Authority. Determines the scientific committee and the roles of the authorities.
Costa Rica	Wildlife Conservation Law Regulations Decree No 32633-MINAE/2005	Establishes specific requisites for hunting, fishing, recollection and extraction of wild fauna and flora permits for commercial, sport, subsistence, scientific and educational purposes; as well as for the export of wildlife specimens from zoos, captive breeding/propagation facilities, and aquaria.

Costa Rica	Prohibition for the import and itinerant exhibition of circus animals (Decree No 30580-MINAE-MAG)	Regulates the import and exhibition of wild animals that belong to circuses.
El Salvador	Constitution of El Salvador (Articles 117)	Article 117 of the Constitution of the Republic of El Salvador is of particular importance, because it states that it is a duty of the State to protect natural resources and the integrity of the environment, in order to guarantee sustainable development. This article declares the social interest regarding the protection, conservation, rational use, restoration or substitution of natural resources, according to the Law.
El Salvador	Constitution of El Salvador (Article 144)	According to Article 144 of the Constitution of the Republic of El Salvador, international treaties signed by El Salvador become national laws and enter into force once they have been ratified and published in the National Gazette (*Diario Oficial*). El Salvador has signed 11 international and six regional conventions related to the environment that directly or indirectly address the themes of biodiversity, forest and water resources. CITES was ratified in 1986 and has the goal to protect many species of animals and plants to ensure that commercial trade does not threaten their survival in the wild.
El Salvador	Wildlife Conservation Law	This law focuses on the protection, restoration, management, use and conservation of wildlife. This law regulates activities such as hunting, harvesting and commercialization, and any other types of use of this resource.
El Salvador	Forestry Law	This law establishes those controls that allow for the development, management and sustainable use of forestry resources and the development of the timber industry. This law considers forestry resources as part of the natural wealth of the Nation and it is the Nation's role to protect and manage them. This Law also aims to establish the conditions so as to stimulate private sector participation in the reforestation of the national territory with productive goals; protected areas are not considered under this regulation.
El Salvador	Natural Protected Areas Law	This law regulates the establishment of the legal regime, administration, management and development of Natural Protected Areas, in order to conserve biological diversity, ensure the functioning of essential ecological processes and guarantee the perpetuity of natural systems, through sustainable management for the benefit of the inhabitants of the country.
El Salvador	Regulation for the Establishment and Management of Captive Wildlife Breeding Centers	This regulation establishes the required norms and dispositions for the establishment and development of captive breeding and restoration projects of wild fauna.

El Salvador	Penal Code	This code establishes the penal norms and penalties generally for El Salvador. Article 259 of the Penal Code establishes a prison sentence of 1-3 years for anyone cutting, burning, taking, trading or illegally trafficking species or subspecies of protected flora, or severely destroying or modifying its natural environment. The same sanction will be applied to whoever severely damages any of the elements in a Protected Natural Area that are used to define it as such. Article 261 of the Penal Code imposes a 3-5 year prison sanction to anyone illegally hunting, fishing, trading animals or their parts, or pursuing activities that make it difficult for species to reproduce in contravention of the laws and regulations protecting wild fauna. The sentence will be increased by 1/3rd of the maximum term indicated if the status of the species affected is endangered.
Guatemala	Constitution	Article 64 declares the national interest in the conservation, protection and improvement of the Nation's natural heritage. The State will promote the creation of national parks, reserves and natural refuges and the protection of its flora and fauna will be guaranteed by a Law Article 97 indicates that the State, Municipalities and inhabitants in Guatemala are to support social, economic and technological development that prevents environmental pollution and maintains the ecological balance. All norms necessary will be developed so as to guarantee the rational use of fauna, flora, land and water to avoid any negative impacts. Article 119 states that it is an obligation of the State to adopt necessary measures for the conservation, development and efficient use of natural resources
Guatemala	Protected Areas Law (Decree 4-89 and its reforms)	Aims at ensuring: a) optimal functioning of essential ecological processes and vital natural systems for the benefit of Guatemalans b) achieving the conservation of biological diversity in the Country c) reaching the capacity for a sustainable use of species and ecosystems in the Country d) defending and preserving the Nation's natural heritage e) establishing the necessary protected areas in Guatemala for social and public interest Article 23 Considers as urgent and as a national need the restoration of threatened fauna and flora species and the protection of endemics. Article 24 Mandates CONAP to prepare the Guatemalan endangered species lists on a yearly basis, and also for endemic species and those that even not having the status mentioned before, require from authorization for their use and trade. All modifications, additions, deletions, reservations or changes will be published in the Official Gazette (*Diario Oficial*). Article 25 indicates that CITES Appendices I, II and III will be considered as official for Guatemala unless an expressed reservation by the Guatemalan CITES Management Authority exists. Article 26 Prohibits the free export and trade of endangered flora and fauna species from wild origin. Only 2nd generation specimens from authorized captive breeding operations that comply with all legal requisites will be allowed for export. Article 27 Prohibits the harvest, hunting, fishing, transportation, exchange, trade and export of endangered fauna and flora species according to CONAP lists, unless for scientifically proven species survival, rescue or protection activities. Article 73 The Executive Secretary of CONAP represents the CITES Management Authority, and has the ability to designate Scientific Authorities as he/she considers appropriate, as well as mechanisms that improve the conventions implementation.

Guatemala	General Hunting Law	The objective of this law is to regulate and control hunting activities, either for sport or subsistence in order to ensure its sustainability.
Guatemala	Hunting calendar	This is a matrix containing the species subject to hunting, the approved quotas, gender of animals to be hunted, and allowed hunting seasons (months, days), so as not to affect the survival of species involved.
Honduras	General Environmental Law and its regulations	Establishes, in chapters II and IV, the general guidelines for wildlife use and conservation.
Honduras	Animal and Plant Health Law (Decree 157-94 and Quarantine and Farming Regulations Agreement 1618-97)	Establishes norms for the application of fauna and flora health measures for the export and import of animal and plant species, products and sub products.
Honduras	Technical and administrative norms manual on wildlife use (Resolution 138-2) ICF	Establishes national guidelines and norms for the use of wildlife.
Honduras	Regulation on the procedures for the implementation of CITES (Decree 966-03)	Establishes the legal, administrative and technical ordinances for the effective implementation of CITES in Honduras.
Honduras	Approval of the Manuals on Technical and Administrative norms for the management of Protected Areas in Honduras, and the use of wild fauna (Resolution 138-2) ICF	Establishes the legal, administrative and technical dispositions for the management of Protected Areas in Honduras and the use of wild fauna.
Honduras	Approval of a new Manual on Technical and Administrative norms for the management and sustainable use of Honduran wildlife (Resolution No. CD-256-003-2008)	This Manual incorporates the Flora component which was not included in the 1994 version, and establishes norms and specific procedures to follow on the next themes: Harvesting/capture of flora and fauna for commercial and non commercial purposes Hunting (sport, subsistence, control) Closed seasons and scientific research Captive breeding operations (for CITES, non CITES species, and scientific purposes)
Nicaragua	General Environmental and Natural Resources Law (Law 217)	Mandates MARENA as the entity in charge of listing endangered species in accordance to international agreements; also to grant the right to utilize natural resources through concessions, permits, licenses and quotas.
Nicaragua	Regulations of the General Environmental and Natural Resources Law (Decree 9-96)	Establishes general norms for environmental management and sustainable use of natural resources under the framework of the General Environmental and Natural Resources Law.

Nicaragua	Norms and procedures for the export and import of wild flora and fauna species of Nicaragua (Decree 8-98)	Under Article 6, individuals involved with wildlife trade activities should be registered with the Management Authority. The responsibility of the Management Authority includes the roles indicated under the CITES convention, plus, among others: supervising in coordination with Customs, the packaging of live specimens to be transported according to International Air Transport Association (IATA) regulations. Article 14 indicates that the General Customs Directorate should establish, in coordination with the Management and Port authorities, the entry and exit ports (land or sea) for international trade of species, their parts, and also products from the sea.
Nicaragua	Animal and Plant Health Basic Law (Law 291)	In Article 4 this law addresses the prevention, control and eradication programs for plagues and illnesses affecting animals and plants, in order to avoid negatively affecting food, agricultural, fisheries, forestry and international trade. Article 8 focuses on the supervision, inspection and certification of areas, herds, slaughterhouses, processing plants of products and sub products of animal origin, as well as packaging and transportation operations. Article 32 addresses agricultural quarantine and the seizure, destruction or repatriation of items entering the country illegally.
Nicaragua	Hunting Law (Decree 206)	According to this law, hunting may be practiced in all parts of the national territory, as long as it complies with this law, its regulations, and any resolutions by the respective authorities, on closed seasons, off-limits hunting areas, hunting methods and systems, as well as trade of products resulting from hunting activities.
Nicaragua	Special law against environmental and natural resources crimes (Law 559)	The objective of this law is to illustrate as crimes against the environment and natural resources those actions or omissions that violate or alter existing laws and resolutions related to environmental and natural resource conservation, protection, defense and improvement, and establishes the civil responsibility to those actors whose participation/involvement in such crimes is confirmed.
Nicaragua	Regulations to the Forestry Law (Decree 45-93)	The scope of these regulations includes all activities related to land use of forests, sustainable management of forests and their exploitation, industrialization and marketing of forest products, including its services and infrastructure. Its objectives are: a) ensure use and development of land that is consistent with its capacity without being degraded, b) ensure a rational and sustainable exploitation of the forest resources of the country c) ensure the supply of raw material for the forest industry and contribute to the generation of financial resources for the country, d) stop the destruction of remaining forests and restore forest land, e) prevent soil erosion and degradation of ecosystems, deterioration of watersheds and improve water quality; f) avoid the loss of biodiversity, and g) ensure an efficient and appropriate land use of forests.
Nicaragua	Green and black iguana conservation and protection law (Decree 547)	This law prohibits cruel or damaging capture, handling and commercialization methods of green or black iguanas. This law also prohibits the hunting of these two species through the use of fire in their burrows and prohibits the export of these species, dead or alive, or their eggs.

3.10.4. Relevant Actors and Institutions. Diverse actors play a role in the trade of green and spiny tailed iguanas in Central America, from those capturing or hunting specimens in the wild, those who gather specimens from different sources prior to their distribution and sale in local markets, those breeding specimens in captivity, and those exporting iguanas internationally. Additionally, governmental institutions are responsible for developing, establishing, implementing and

enforcing the legal frameworks and policies aimed at the conservation and sustainable use of wildlife including green and spiny tailed iguanas. Principal institutions were identified for each country (Table 16).

Table 16. Government institutions relevant to iguana conservation and management in the Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica (TRAFFIC Norteamérica 2009).

Country	Institution	Role
Costa Rica	Ministry of Environment and Energy *Ministerio de Ambiente y Energía* MINAE	Responsible for the conservation, control and use of continental wildlife, through its National Conservation Areas System (SINAC), which, since 1992 was assigned the role of Management Authority of CITES by Decree 28522.
Costa Rica	National Conservation Areas System *Sistema Nacional de Areas de Conservación* SINAC	The *Sistema Nacional de Areas de Conservación* (SINAC) is a participatory management system decentralized from MINAE that integrates components of forestry, wildlife and protected areas matters. Its role is to dictate policies, plans, and implement processes aimed at achieving a sustainable management of Costa Rica's natural resources.
Costa Rica	General Customs Directorate *Dirección General de Aduanas*	According to its web site, the *Dirección General de Aduanas*, is responsible for managing international trade operations, promoting the facilitation and voluntary compliance of the norms, with an intensive use of information technology and communications, through risk management, and in the benefit of the Costa Rican society. (https://www.hacienda.go.cr/Msib21/Espanol/Direccion+General+de+Aduanas/BIENVENIDA.htm)
Costa Rica	Department of Agriculture *Ministerio de Agricultura* MAG	MAG aims to promote the efficiency, sustainability and competitiveness of agricultural and livestock production in the country, allowing the economic actors of the production a better and more significant integration to the markets. Among its functions the following are of interest: Protect and procure health and improvement of animals, products and derivatives beneficial to humans, through research, surveillance, prevention, control and eradication of illnesses, implementation of quarantine measures to imports, transit as well as national and international trade products, byproducts, secretions, excretions and remains. Establish controls of imports and national production of all kind of medicaments, biological/hormonal pesticide products, growth promotion products, food additives and food for domestic or wild animals. Prevent the introduction of plagues and exotic pathogenic agents of economical importance for plant species, through the establishment and maintenance of quarantine measures and agricultural defense programs. Contribute to the protection of crops and animals, as well as imports and exports of the country, through plant and animal health diagnosis.
Costa Rica	Public Safety Ministry *Ministerio de Seguridad Pública*	The *Ministerio de Seguridad Pública*, to which the different police bodies belong, is the institution responsible to protect national sovereignty, undertake surveillance, keep public order and ensure the safety of inhabitants. The *Ministerio* develops effective deterrents for the prevention of crime, collaborates in its role, and supports actions to defend natural resources in strict compliance with judiciary ordinances. As is the case for any other public servant, the police are also responsible to ensure the compliance with international conventions that Costa Rica is part of, such as CITES.

El Salvador	Ministry of Environment and Renewable Natural resources *Ministerio del Medio Ambiente y Recursos Naturales Renovables*	MARN is responsible to promote the protection of the environment and sustainable use of natural resources, including wildlife, through the development of public policies, strategies, legal frameworks and other instruments.
El Salvador	Republic of El Salvador Attorney General	Among its functions, include directing investigation of crimes with the collaboration of the National Civil Police, and of the criminal facts in particular subject to penal jurisdiction.
El Salvador	National Civil Police, Environmental Division *Policía Nacional Civil, División del Medio Ambiente*	The authority in charge of enforcing wildlife related laws and regulations in El Salvador, is the National Civil Police that has a specific Environment Division, one of the specialized divisions created through Article 11 of the National Civil Police Organic Law in June 1994. Among the functions of this Division are to investigate, prevent, and combat: Illegal extraction of timber species; illegal hunting, harvesting, commercialization, national and international trafficking of wildlife; and fishing with illicit methods both in marine and freshwater environments. This Division has a total of roughly 140 staff.
El Salvador	General Environmental Inspectorate *Inspectoría General de Medio Ambiente*	This inspectorate belongs to MARN, and its role is to implement inspection, surveillance and verification of compliance policies of the judiciary's disposition and environmental norms related to ecological zoning at the national level, and in a timely manner resolve citizen requirements on actions or omissions against nature and the environment.
El Salvador	Rangers *Guardarecursos*	Field staff in charge of surveillance and protection of cultural and natural resources in protected areas. In the case of El Salvador, given that in some cases Protected Areas are co-managed with NGOs, rangers sometimes belong to government institutions or NGO's.
El Salvador	Farming and Environmental Tribunals *Tribunales Agroambientales*	This is an initiative that is currently under development that aims to improve the effectiveness of the implementation of the Environmental Legislation in El Salvador through specialized courts on this topic.
Guatemala	National Protected Areas Council *Consejo Nacional de Areas Protegidas*, CONAP	This is the entity in charge of directing and implementing the protected areas law, has juridical personality and is directly dependant from the Republic's Presidency of Guatemala. The main instruments CONAP uses to comply with its mandate are the Guatemalan Protected Areas System Policy and the National Strategy for the Conservation and Sustainable Use of Biodiversity, which aims to guide, coordinate and organize actions of relevant related actors, so as to jointly achieve the conservation and sustainable use of the country biodiversity.
Guatemala	Ministry of Environment and Natural Resources *Ministerio de Ambiente y Recursos Naturales* MARN	Created by Decree 90-2000, its mandate is the formulation and execution of policies related to the compliance of the regime concerning conservation, protection, sustainability and improvement of the environment and natural resources in Guatemala, and the human right to a healthy and ecologically balanced environment, through preventing environmental pollution, diminishing environmental degradation and the loss of natural heritage. MARN's attributions are: a) Formulate and implement conservation, protection, environment and natural resource improvement policies b) Define the environmental norms related to non renewable resources

		c) Implement normative, control and supervision functions d) Control the environmental quality, approve environmental impact assessments, put them into practice in case of environmental risk and ensure of their compliance, and impose sanctions if this is not the case e) Promote and bring about a balanced male and female participation, natural or private persons, and the local and indigenous communities in the sustainable use of natural resources f) Prepare and present the State's Environmental Report annually
Guatemala	National Forests Institute *Instituto Nacional de Bosques* INAB	This is a State institution, autonomous, decentralized, with juridical personality, its own resources and administrative independence, in charge of the direction and authority of the Agricultural Public Sector on forestry issues.
Guatemala	Ministry of Agriculture, Livestock and Food *Ministerio de Agricultura, Ganadería y Alimentación* MAGA	Among other things, this Ministry is responsible to formulate and implement the policies on agriculture development, hydro-biological and renewable natural resource sustainability according to the legal frameworks.
Guatemala	Ministry of Economy *Ministerio de Economía* MINECO	This Ministry is responsible for the compliance of the judiciary regime related to non agricultural and livestock production activities, internal and external trade, and also conducts the negotiations of bi-national and multilateral trade agreements and treaties, and implement once approved and ratified.
Honduras	Natural Resources and Environmental Ministry *Secretaría de Recursos Naturales y Ambiente* SERNA	Promote sustainable development in Honduras through the formulation, coordination, execution and evaluation of policies related to renewable and non renewable natural resources; also coordinate and assess policies in relation to the environment, ecosystems and pollution control, so as to improve the living quality of its inhabitants.
Honduras	Nacional Institute of Forest Conservation *Instituto Nacional de Consevacion Forestal* ICF	Responsible for managing and implementing the Forestry Law, being a semi-autonomous institution which depends on the Livestock and Agriculture Ministry (SAG) responsible to determine forestry policies as the head of this sector.
Honduras	Livestock and Agriculture Ministry *Secretaría de Agricultura y Ganadería SAG*	Develop strategies and implement actions to increase the competitiveness of the livestock and agriculture sectors in Honduras. Undertake actions aimed at coordinating the formulation, design and evaluation of the agro-alimentary production sector policy in Honduras. Implement and coordinate public sector actions directed to increasing primary production and also generating value added processing. Represents the Honduran livestock and agriculture sectors regionally and internationally.
Honduras	Attorney for the Protection of the Environment *Procuraduría para la Protección del Medio Ambiente*	Responsible for the follow up on civil and criminal actions related to the environment according to Article 199 of the General Environmental Law (Decree 104-93).
Honduras	Regional International Organization for Plant Protection and Animal Health	Provides technical supports to Livestock and Agriculture Ministries of its member countries, specifically, for protection and development of agricultural resources for healthy food production to improve livelihoods of the population.

	Organismo Internacional Regional de Sanidad Agropecuaria OIRSA	
Nicaragua	Natural Resources and Environmental Ministry *Ministerio de Recursos Naturales y Ambiente* MARENA	Dictates the norms, determines quotas and closed seasons. In charge of administrative follow up, control and sanctioning.
Nicaragua	National Forestry Institute *Instituto Nacional Forestal* INAFOR	Decentralized government entity that functions through Delegations in 10 Forestry Districts nationally, with some delegations responsible for more than one department. Their goal is to promote, regulate and control the sustainable use of forestry resources. They are also responsible for assessing management plans, issuing harvest permits, performing inspections, and establishing agreements with public or private organizations to delegate surveillance, control and/or development functions.
Nicaragua	Environmental Attorney *Procuraduría Ambiental*	This is a specialized branch of the General Attorney's Office, created through the General Environmental and Natural Resources Law on June 6, 1996.The Environmental Attorney mainly promotes administrative actions, however, with the new Law on Environmental Crimes the trend is to make the administrative process a legal tool to support penal and civil cases against criminals.
Nicaragua	General Attorney's Office *Fiscalía General de la República*	The Attorney General is the authority responsible to follow up on denounces made on violations to the Special law against environmental and natural resources crimes (*Ley especial de delitos contra el medio ambiente y los recursos naturales; Ley* 559)
Nicaragua	Environmental and Natural Resource Protection Attorney *Procuraduría para la Defensa del Ambiente y los Recursos Naturales* PDARN	Specialized branch of the General Justice Attorney, representing and defending the interests of State and the society on environmental matters
Nicaragua	National Police, Army and Navy *Policía Nacional (Minsterio de Gobierno), Ejército y Fuerza naval (Minsterio de Defensa)*	These institutions contribute to surveillance and control actions in relation to natural resources and biodiversity in coordination with MARENA, the Environmental Attorney, co-managing NGO's and other governmental institutions. The National Police helps control the illegal trafficking of specimens while the navy supports the National Fisheries and Aquaculture Administration (ADPESCA) in the monitoring and control of the fisheries fleet as well as the adequate use of Turtle Excluding Devices (TED's).

4. DISCUSSION AND RECOMMENDATIONS

4.1. Overarching Conclusions.— The traditional value of iguanas as a source of food, and for medicinal purposes is clearly recognized throughout Central America. The use and trade in iguanas and ctenosaurs in Central America has persisted for as long as there are historical records. We can reach a number of overarching conclusions from our field research and trade studies:

4.1.1. Traditional Use. Harvest of wild *Ctenosaura similis* and *Iguana iguana* continues throughout the region. The Pacific coastal area from Nicaragua through

Honduras and into El Salvador is a large area where *C. similis* continues to be hunted and sold on roadsides and in markets. We observed *C. similis* for sale along roadsides at historically documented selling points in the countries, and we often observed wild *C. similis* on rock walls and along roadsides in the same region where exploitation was reported as very heavy. The exception to these observations was El Salvador where *C. similis* was not as readily observed along the primary roads, relative to other equally disturbed areas in Guatemala, Nicaragua, and Costa Rica. It is thus encouraging that at least for the habitat generalist *C. similis*, traditional use has not endangered populations. Of course habitat loss and degradation may pose a threat to any species of iguanas, but a detailed analysis of population response to changes in land-use was beyond the scope of this trade study.

4.1.2. Commercial iguana farms. Essentially all green iguanas in international trade are for pets, and are produced on a few large commercial farms. Nagging questions about commercial farms are what happens to excess animals and adults that are no longer part of active breeding stock, and what level of offtake from the wild is needed to support the farming industry?

4.1.3. Small-scale iguana farms. Small farms do not appear economically viable at present. The majority of small-scale farms do a good job of breeding and caring for their iguanas, but apparently have no market for or network through which to sell hatchlings. Nor do small-scale iguana farms function well based on selling meat. Essentially, all of the small-scale farms we visited were subsidized by NGOs or the government. The idea that iguana farming is an alternative livelihood strategy that is good for the environment may not be viable at present. An earlier study of iguana farms in Nicaragua, Costa Rica, and Panama also reached this conclusion (Eilers et al 2002). Small farms in some cases operate to a certain extent as tourist centers, but it is not clear if they are economically viable or if tourism to the site really depends on the existence of the iguana farm.

4.1.4. Conservation Value of Iguana Farms. It is abundantly clear that iguana farms do not stop wild harvest. The conservation value of iguana farming is dubious. Although we did not conduct ecological studies, common sense dictates that it is extremely unlikely that releases of iguanas have benefited local populations, or that such effects could be measured without great effort. We learned that presently and over many years, green iguanas were released into the wild without much planning and no post-release monitoring. The potential for spread of disease into wild populations, genetic mixing of populations, and the outright futility of releasing captive-bred iguanas and ctenosaurs into areas where they already exist are issues that merit consideration as they may have a negative impact on iguana conservation.

4.1.5. International Trade. The international trade in green iguanas is declining, presumably due to less demand for green iguana hatchlings for the pet trade. The current international trade in *Ctenosaura* species is not alarming and mostly originates from captive-bred animals, although we cannot conclude that wild-caught *Ctenosaura* do not also enter trade. Additionally, juvenile *Ctenosaura* are difficult to identify to species level. The recent inclusion of four *Ctenosaura* species on CITES Appendix II should further reduce international imports of *Ctenosaura* and allow for better monitoring.

4.2. Conservation Education and Outreach.— Important formal, active outreach materials and programs exist for several endemics *C. bakeri, C. oedirhina*, and *C. palearis*. Within Guatemala the local nongovernmental organization Zootropic has done considerable outreach within the Valle de Motagua to reduce the harvesting of *C. palearis.* They have been able to convert local hunters into guides and guards for the areas and are continually organizing outreach activities in the area for children in order to raise awareness and promote pride in this unique species. The Iguana Research and Breeding Station on Utila Island, Honduras has a very active outreach and education program focusing on environmental issues in general, with emphasis on *C. bakeri.* Students participate in community level conservation activities and visit the on-site classroom to learn about the endemic iguana and other conservation issues. Recently, the Fundación Islas Bahias has begun environmental education activities on Roatan Island, Honduras focusing efforts on the endemic *C. oedirhina*. For example, there are weekly classes at some local schools, training of guides to promote awareness to both tourists and locals, a monthly column in the "Bay Islands Voice". On Cayos Cochinos, Honduras development of a formal outreach and education program for *C. melanosterna* has begun. Brochures and posters are now readily available and additional outreach activities are planned for the near future.

Not only should such programs continue to be supported but they can serve as excellent examples for other projects. There are several opportunities for additional conservation education and outreach programs to be implemented without a large amount of infrastructure development.

For example, Honduras is already focused in celebration of the regional endemic, *Ctenosaura melanosterna* during the annual Jamo Festival in Olanchito. The festival provides an ideal platform for disseminating educational information about the different iguana species and presenting a conservation agenda. Emphasis could be placed on the uniqueness of *C. melanosterna* to this region of Honduras and how the numbers have dwindled. Efforts could be made to convert pride in eating these animals into pride for conservation of this species that are indeed emblematic of the area. A second species with ready outlets for educational materials is *C. quinquecarinata.* Within the core of their range there are several organizations that focus on environmental education and outreach. These include Amigos de la Terra, Lost Canyon Preserve, Zona Costeras, and Universidad Centro Americana, Santa Rosa National Park (Table 2, Appendix A-I).

There is a striking lack of educational materials on the most widespread and familiar species, *C. similis* and *I. iguana.* Given their dominance in a variety of habitats in all 5 countries this is an unfortunate reality, but reflects the common approach to conservation of focusing most efforts on highly endangered species. However, modern environmental education programs such as that on Utila through the IRBS and that in Guanacaste, Costa Rica through Santa Rosa National Park encourage focus on the students' local environments and sustainable use of intact ecosystems. Development of materials that incorporate the role of iguanas in ecosystem dynamics for such programs

would have broad use and impact. Additionally, a large proportion of tourists will come across one or both of these species when visiting Central America and thus, even simple fact sheets for this audience would go a long way in raising awareness.

4.3. Markets.— Market and roadside vendor surveys, as well as interviews with locals basically confirmed that *Ctenosaura similis* and *Iguana iguana* can be obtained for local consumption without much difficulty in all the countries visited, except perhaps Costa Rica. We noted that enforcement has driven the overt sale of these animals more underground than reported in the past (e.g. Fitch and Henderson 1983). In Guatemala, for example, vendors of meat and fish in markets were aware that selling iguanas is illegal and most did not have any for sale. But a number of individuals were willing to place orders for iguana meat under special request. *Ctenosaura similis* and *I. iguana* were more openly for sale in markets in El Salvador and Nicaragua. Little, if any, evidence of sale of iguanas and ctenosaurs was observed in Costa Rica. We also noted evidence of trade in green iguanas on the Caribbean coast of Guatemala and Honduras. There apparently is trade in green iguanas from Honduras to Guatemala, especially around Holy Week when gravid females are in high demand for traditional dishes. It does not appear that Honduras and Guatemala issue CITES permits for these shipments, as they did not appear in the Wildlife Conservation Monitoring Center statistics.

4.4. Iguana Farming.— Visits to farms revealed that small family green iguana farms and community farms are not viable enterprises at the time of this writing. The trade analysis herein demonstrates a decline in world-wide trade in green iguanas, presumably linked to decreasing demand for iguana hatchlings. We did not find any evidence that small-scale iguana farms were successful at selling hatchlings to pet-trade buyers. We did learn from visits to large scale iguana farms in El Salvador that these commercial enterprises can produce 400,000 to 500,000 hatchlings annually if demand exists. As the world-wide trade in iguanas is less than this, we surmise that commercial breeders are able to meet world market demand. This makes the outlook bleak for small-scale farmers producing only hundreds or a few thousand hatchlings. Nor did we find evidence that small farms make profit by selling meat, even though it was clear that some iguana farmers will sell iguanas on special order for special occasions or medicinal purposes.

4.5. Recommendations.—

Recommendation: Because demand for iguana hatchlings is decreasing and apparently met by large-scale commercial farms that have access to international trade networks, NGOs and other aid groups should temper their promotion of small-scale iguana farms as a means of alternative livelihood for campesinos. Furthermore, the conservation value of farming is anything but clear. Therefore we recommend that governmental agencies and NGOs be re-educated about the pros and cons of captive breeding for conservation of iguanas and ctenosaurs.

Recommendation: Historically used and well-known trade routes, markets and roadsides continue to be used in the local and regional trade in *Iguana iguana* and *Ctenosaura similis*. If governments want to control local commerce in *I. iguana* and *C. similis*, enforcement should target markets and traditional roadside selling points.

Recommendation: It is necessary for governments and NGOs to cooperatively develop and distribute awareness materials and programs to effectively disseminate key messages and incentives to reduce human impacts on iguana populations and habitats. Communication campaigns through the media and the internet, development of school education kits, informative posters and handouts, are typical approaches that could be employed in close coordination with relevant authorities, and with the involvement of local organizations and communities. Educational materials can be separated into three categories: 1) materials targeted for those areas where rare species occur human threats are having significant impact on wild populations in the short term and 2) general ecology educational units for local schools with the role of iguanas highlighted and 3) educational material to disseminate at parks and tourist centers where *I. iguana* and/or *C. similis* are readily visible.

Recommendation: In the particular case of iguana farms/breeding facilities, it is also very important for the appropriate government agencies in each country to monitor them effectively to ensure that the legal frameworks are complied with, and that these facilities are not used to launder animals from illegal sources.

Recommendation: On the international regulatory front, besides *Iguana iguana* which has been included in CITES Appendices since 1977, a few species of *Ctenosaura* spp. were recently included as well in Appendix II. This means that CITES permits for any exports of specimens of these species (*C. bakeri, C. melanosterna, C. oedirhina* and *C. palearis*) will have to be issued and verified by importing countries. In order to guarantee that authorities in all CITES Parties can effectively identify *Ctenosaura* species recently listed under CITES, it would be advisable for Guatemala and Honduran Government agencies to develop specific and comprehensive identification materials to make available through the CITES Secretariat to all Parties.

Recommendation: Most information on international trade of green iguanas has been incorporated to the UNEP-WCMC trade database. However, many species lack a system that could help monitor trade trends in the countries and the region. Continuation and refining of the regional harmonized recording system for species (including non-CITES species) in national and international trade will provide increasingly valuable information. We also note that intra-regional trade is still international trade, so for listed species, a CITES permit is required. A trade record system would enable the region's countries to monitor trends and serve as an alert system on particular species that could be threatened by unsustainable trade. This could serve as a warning system to highlight the species that

would benefit from stricter control and regulatory measures. A trade record system would be quite important to allow monitoring for newly emerging species in trade (or those whose trade has been mostly limited to the local or national level), determine trade trends, as well as to identify information gaps and needs. This would help pinpoint where further research is needed on particular species that could become threatened by unsustainable use driven by trade. Information from a national trade system could feed into the broader regional information system. A regional system could help contribute to decision making processes both national and regional levels, and promote the development of strategic regional initiatives on species of shared concern (TRAFFIC Norteamérica 2009).

Recommendation: Countries considered in this study share some *Iguana* and *Ctenosaura* populations. Because of this, comprehensive management plans for commonly traded species are needed to ensure the conservation of wild populations and habitats, as well as to ensure that any use or harvest is within sustainable limits. These plans need to explicitly incorporate trade and use monitoring components. These plans should be developed with input from other institutions such as those that deal with forestry. Additionally, the development of management plans and specific utilization practices for wildlife commodities must take into consideration input from the prosecutors in order to ensure activities "in the field" are carried out according to existing legal frameworks, both national and international. In instances when management plans are already in place, emphasis should be made on explicitly including trade related monitoring and management measures, which are often neglected. It is extremely important also to highlight the need to link *ex situ* efforts and operations involving wildlife to *in situ* conservation and management efforts (TRAFFIC Norteamérica 2009).

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