CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Nineteenth meeting of the Conference of the Parties
Panama City (Panama), November 14 to November 25, 2022

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

To transfer *Epicrates inornatus* from CITES Appendix I to II. [The species does not meet the threatened with extinction criteria (Annex 1) established in Conf. 9.24 (Rev. CoP17 and does not appear to fit the "affected by trade" criteria (Annex 5)].

B. Proponent

The United States of America*

C. Supporting statement

1. Taxonomy

1.1	Class:	Reptilia
1.2	Order:	Squamata
1.3	Family:	Boidae
1.4	Genus, species or subspecies, including author and year:	*Epicrates inornatus* (Reinhardt, 1843)
1.5	Scientific synonyms:	*Boa inornata* Reinhardt 1843: 253; *Chilabothrus inornatus* Duméril & Bibron 1844: 563; *Epicrates inornatus* Boulenger 1893: 97; *Boella tenella* Smith & Chiszar 1992; *Chilabothrus inornatus* Reynolds et al. 2013, 2018
1.6	Common names:	Puerto Rican Boa, Yellow Tree Boa, Boa de Puerto Rico, Boa sobre, Gewone slanke boa, Puerto-Rico-Boa
1.7	Code numbers:	None

2. Overview

As part of the ongoing periodic review of the Appendices, the Animals Committee recommended that the status of the Puerto Rico Boa (*Epicrates inornatus*) be evaluated. The species was selected for periodic review between CoP15 and CoP17 by the Animals Committee at AC25; Geneva, 2011 in

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accordance with Resolution 14.8 (Rev. CoP15) on Periodic Review of the Appendices. The United States submitted the results of its review to the Twenty-seventh meeting of the Animals Committee (AC27 Doc. 24.3.7). At AC27, the Animals Committee supported the results of the U.S. review that the species no longer was threatened by trade and should be transferred from Appendix I to Appendix II in accordance with Resolution Conf. 9.24 (Rev. CoP16) (AC27 SR – p. 45).

Epicrates inornatus has a limited global distribution since it is endemic to the main island of Puerto Rico. This species is considered a habitat generalist with a wide distribution in Puerto Rico and more abundant than previously thought at the time of listing in 1970 (USFWS 2011). Although there is no international trade, these snakes continue to be affected mostly by habitat loss, exotic species, intentional killings and emergent diseases. Currently, the PR boa is considered to have recovered from the historical deforestation in the early 20th century (Reynolds and Henderson 2018), suggesting some degree of resiliency to natural and anthropogenic disturbances through long periods. The boa is protected under Puerto Rican Law as a Vulnerable species, the US Endangered Species Act and CITES. Also, the species is currently classified as *Least Concern* by the International Union for Conservation of Nature Red List, "due to its large distribution, lack of widespread threats, and ability to inhabit altered environments" (Rodriguez et al. 2018).

For *Epicrates inornatus*: (i) given the low volume of international trade, (ii) given that it is the only endemic boa, therefore trade in other similar species is non-existent, and (iii) given it is considered relatively common, and a habitat generalist with a widespread occurrence on Puerto Rico, we conclude that the species does not meet the criteria indicated in Resolution Conf. 9.24 (Rev. CoP17 *Criteria for amendment of Appendices I and II* and should be transferred from CITES Appendix I to II.

3. Species characteristics

3.1 Distribution

The PR boa is only found in Puerto Rico with a wide distribution, but not uniformly abundant across the island. It has been reported in all of the municipalities of the main island of Puerto Rico (Puente, UPRM, 2018, pers. comm). The species is more commonly found in the northern karst belt region that extends from the northwest municipality of Aguadilla towards the east to Bayamón (Gould et al. 2008). Although Henderson and Powell (2009) reported an elevation range from sea level to 1,050 m, PR boa records above 500 are considered rare. A lower elevation range limited to 480 m was reported by Rodriguez et al. (2018). There are no additional populations known outside of the main island of Puerto Rico, including Vieques, Culebra, nor any other offshore island or cay.

3.2 Habitat

Epicrates inornatus is considered a habitat generalist (Reynolds et al. 2016) and tolerates a wide a variety of habitats. For example, it occurs in moist forests, dry forests, montane and low land forests, karst landscape, caves, and even altered environments such as plantations, rural gardens, and urban areas (Gould et al. 2008, Rodriguez et al. 2018). Cave systems and their surrounding forests are identified as particularly important because of the ecological resources available (i.e., prey, shelter, thermal gradients, copulation) for the PR boa (Puente-Rolón and Bird-Picó 2004) and the high genetic diversity of PR boas using cave habitats (Puente-Rolón et al. 2013).

3.3 Biological characteristics

Epicrates inornatus is a semi-arboreal and nonvenomous snake. It is considered a nocturnal species that mostly remains concealed or basking during the day (Reagan 1996, USFWS 1986). The PR boa uses both ambush and active foraging modes, eating smaller prey when young (e.g. lizards) and mostly rats as they get larger (Henderson and Powell 2009, Puente-Rolón 2012, Rivero 1998, Wiley 2003). In general, other prey items also include mice, bats, birds (including domestic fowl), and frogs (Henderson and Powell 2009, Puente-Rolón 2012, Rivero 1998, Rodríguez-Durán 1996, Rodríguez and Reagan 1984, Wiley 2003). This boa feeds by seizing the prey in their jaws, wrapping several coils around the victim, and then constricting until the prey has suffocated.

Although the actual life span of PR boas in the wild is unknown, Rivero (1998) suggested they might live between 20 and 30 years. There is also one longevity record of 23 years and 11 months for a PR boa in captivity (Henderson and Powell 2009). The specific time for a PR boa to reach sexual maturity is also unknown, but its reproductive longevity is reported as high, with females still reproducing beyond 17 years of age or older (Tolson 1991).

Courtship and mating of the PR boa is seasonal and reproduction appears to be mostly biennial in the wild (Huff 1978, Tolson and Henderson 1993, Tolson 1994). The reproductive cycle of the PR boa is synchronized with the seasonal patterns of precipitation and temperature in Puerto Rico (Huff 1978, Tolson and Henderson 1993, Puente-Rolón 2012). Although there can be some variability on when the PR boa reproductive activity starts, research suggests that courtship for most *Chilabothrus* starts in February (Tolson 1994) and that mating for most PR boas is reported to occur at the beginning of the wet season, from late April to May (Tolson and Henderson 1993). Young PR boas are born after a gestation period of approximately 5-6 months (Huff 1978, Rivero 1998). Puente-Rolón (2012) reported PR boa courtship occurring between March and May, while most parturition occurs from August to November. Female PR boas do not lay eggs, but rather give birth to live young. Reported litter sizes for the PR boa range from 10 to 32 neonates (Huff 1978, Joglar 2005, Mulero-Oliveras 2019, Puente-Rolón 2012, Pérez-Rivera and Vélez 1978, Tolson 1992, Tolson and Henderson 1993, Wiley 2003).

The genetics of the PR boa was assessed with samples from 15 municipalities (not the entire range) in Puerto Rico and identified three clear haplogroups and no distinct phylogeographic structure across the island; which suggest a relatively high level of genetic diversity within the areas sampled, and an overall high haplotype diversity (Puente-Rolón et al. 2013). In addition, and although not genetically different from PR boas that occur in other habitats, this study emphasized the conservation of caves, as they harbor multiple genetic lineages and represent a large proportion of the genetic diversity of PR boas (Puente-Rolón et al. 2013). Additional genetic samples analyzed specify that PR boas move widely across Puerto Rico (both naturally and human-facilitated) and the northern karst region of the island contains the greatest genetic diversity for the PR boa (Reynolds and Puente-Rolón 2014).

3.4 Morphological characteristics

Epicrates inornatus is the largest snake that inhabits Puerto Rico, with the largest recorded sizes around 2 m in length (Reagan 1984, Wiley 2003) and capable of reaching larger sizes, particularly in captivity. Most adults in the wild will range between 1-2 m in length (Bird 1994, Mulero-Oliveras 2019, Puente-Rolón 2012, Reagan 1984, River 1998, Wiley 2003). Although there are no significant snout-vent length differences between males and females, females tend to be more corpulent than males (Puente-Rolón 2012). Dorsal coloration of the PR boas is variable and has been described from tan to reddish brown to very dark brown, with several dark bars or spots along its body, and juveniles may have reddish color (Rivero 1998). Body markings are usually more pronounced in neonates and juveniles, but those markings tend to fade with age (Tolson and Henderson 1993). The ventral scales also vary from gray to dark brown (Rivero 1998). Neonates measure approximately from 30 to 40 cm (Huff 1978, Joglar 2005, Mulero-Oliveras 2019, Puente 2012).

3.5 Role of the species in its ecosystem

There is little information on the PR boa's role in the ecosystem, but it may be summarized as one of the primary vertebrate consumers of mostly rats.

4. Status and trends

4.1 Habitat trends

In general, the PR boa is considered to have recovered from the historical deforestation in the early 20th century (Reynolds and Henderson 2018), as lands once used for agriculture reverted to secondary forest and thus forested areas in Puerto Rico have increased since then (Lugo and Helmer 2004, Kennaway and Helmer 2007, Parés-Ramos et al. 2008). However, habitat outside of protected natural areas is still being modified for urban growth (Castro-Prieto et al. 2017). Tucker et al. (2020) modeled several future habitat loss scenarios that resulted in a slow decrease of PR boa density and distribution over time as development continues to

increase at different rates and forested areas replaced by urban growth. Thus, habitat protection is one of the most important factors for the persistence of the PR boa as further habitat degradation and fragmentation can be expected (Castro-Prieto et al. 2017). Although the species is known to occur in a wide range of habitat conditions, areas like the northern and southern karst forests and El Yunque National Forest represent some of the most important habitats for the species.

4.2 Population size

The PR boa has cryptic coloration and habits, and attempting to determine a population estimate for this widely distributed species is challenging. In addition, the species is known to have a very low recapture rate (Mulero-Oliveras 2019, Puente-Rolón 2012, Tolson 1997, Wunderle et al. 2004), making mark and recapture estimates impracticable. However, the species has been described as common in undisturbed karst areas of northwestern Puerto Rico (Tolson & Henderson 1993). In general, the species is more abundant in the karst region of northern Puerto Rico, and less abundant in the dry southern region of the Island (Rivero 1998). Although the species is probably less abundant than it was in pre-Columbian times, recent accounts indicate that it is still widespread on Puerto Rico (Rodriguez et al. 2018). Available density estimates for the PR boa range from 1.24 to 5.6 boas/ha (Mulero-Oliveras 2019, Ríos-López and Aide 2007, Tolson 1997). A recent population model for PR boa suggests a current island-wide estimated population size of more than 30,000 PR boas (Tucker et. al 2020).

4.3 Population structure

A team of species experts agreed that the PR boa “should be considered a single population unit comprising the island of Puerto Rico, noting homogeneity in genetics, morphology, and behavior across the island” (Tucker et al. 2020). For example, it was described that historical clines in the population structure (genetic, morphological, intraspecific behavior) no longer exist (Bird, UPRM, 2018, pers. comm.). In addition, the artificial movement of boas through intentional releases has introduced a diversity of alleles across Puerto Rico, and today PR boas are a homogenous population with high genetic diversity (Puente, UPRM, and Reynolds, UNCA, 2018, pers. comm.). There is only one location in the north (municipality of Dorado) that may have reduced gene flow and may be experiencing genetic drift, potentially due to habitat fragmentation or isolation and possibly affecting the species ability to naturally disperse (Puente-Rolón et al. 2013). This may be the case for other areas where genetic samples were not obtained and where the species may occur within similar fragmented landscapes. However, the available information has not yet indicated that critical genetic differences currently exists across the range of the PR boa, for example, no evolutionary significant units nor unique genetic clusters were identified for the species (Puente-Rolón et al. 2013).

4.4 Population trends

In general, there is a lack of long-term population studies to compare past versus present population estimates. Although the actual population trend of the PR boa is unknown (Rodriguez et al. 2018), the species is considered to have recovered from the historical deforestation in the early 20th century (Reynolds and Henderson 2018). The 2011 PR boa 5-year status review previously described this species status as stable based on the broad distribution and apparent higher abundance (USFWS 2011). The PR boa was considered relatively rare by the 1900s (Stejneger 1904) and is probably less abundant now than it was in Pre-Columbian times, when Puerto Rico had an extensive forest cover (Reagan 1984). However, the PR boa is probably more abundant today than previously thought at the time of listing in 1970 (USFWS 2011), in part due to the increase in forested areas in Puerto Rico (Lugo and Helmer 2004, Kennaway and Helmer 2007, Parés-Ramos et al. 2008).

4.5 Geographic trends

Geographic trend characterizations are not readily available for this species however, the PR boa population was most likely negatively influenced by significant habitat loss as Puerto Rico was severely deforested by the early 20th century. Although the species has been reported in all of the municipalities of the main island of Puerto Rico (Puente, UPRM, 2018, pers. comm), we do not know the specific details for all of these accounts or if they represent isolated occurrences in some municipalities. As previously described, the species is currently

recognized to have a wide distribution and considered to have recovered from the historical overall deforestation in Puerto Rico.

5. Threats

The most influential threats for this species are habitat loss and fragmentation from human development, predation from exotic mammals (namely cats, *Felis catus*), and poaching and intentional killings. Other known threats include inappropriate management practices when translocating and handling PR boas, emergent diseases (i.e., snake fungal disease), hurricanes and climate change. These threats involve a variety of impacts, which reduce or degrade available habitat and may have direct impacts on the species, for example, mortality from road kill and human persecution.

6. Utilization and trade

6.1 National utilization

The illegal hunting of PR boas to extract their fat was reported since the 1930s due to the alleged medicinal properties of the snake “oil” (Grant 1933, Rivero 1998) and was identified as a factor contributing to the species’ decline (Pérez-Rivera and Vélez 1978). After conducting interviews with local people, other researchers report that the practice continued until the early 2000s (Reagan 1984, Joglar 2005). In addition, one research reported a case in which snake meat was used for human consumption in the 1990’s (Bird-Picó 1994), and there are reports of PR boas collected to be kept as pets (Joglar 2005). Based on the available information, the practice of hunting or capturing PR boas may still occur, but probably to a lesser degree.

6.2 Legal trade

During the period 1975-2014, there was no record of international trade out of Puerto Rico per CITES. However international trade from other non-range countries indicates that 195 specimens (74% live, 26% specimens/bodies) were traded during this time period (85% of trade was prior to 2000). Trade was in captive produced specimens with Canada (46%), United Kingdom (18%) and Germany (12%) being the biggest trading countries for scientific/zoological (54%) unknown/other (28%) and commercial (14%) purposes (UNEP-WCMC 2016). In correspondence with German CITES Authorities (March 2016 pers. Comm. I. Sprotte) the original German breeding stock came from imports into Germany from Canada in 1982 and 1983. Between 2014 and 2021 no further trade in this species has been recorded (UNEP-WCMC 2021). There is no additional information to suggest that the PR boa has been or is being significantly impacted by trade.

6.3 Parts and derivatives in trade

During the period 1975-2021, there was no international trade in parts or derivatives per CITES (UNEP-WCMC 2021).

6.4 Illegal trade

Although the species continues to be threatened by unregulated local hunting for the extraction of oil for medicinal purposes or to be kept as pets, this practice probably occurs at a small scale. In the five-year review (USFWS 2011), the Service concluded that this practice does not constitute over utilization of the species for commercial and recreational purposes. However, the extent or effect of illegal hunting is uncertain. The Service is aware of a reptile breeder in Florida that has offered PR boas for sale on his website, however this breeder only sold PR boas within Florida and not interstate or international. There have also been a few reported cases of locals collecting PR boas for sale within the island through the online classifieds reptile section. One particular person was caught and fined accordingly (L. Miranda, pers. comm.).

6.5 Actual or potential trade impacts

It appears that down listing from CITES Appendix I to II protection would not have any conservation impact on this species and would not be expected to affect the nature of the trade. Current overall use of *Epicrates inornatus* is minimal and future exploitation is not expected to increase significantlly, if at all, given access difficulties to those areas where the

species occurs, as well as the national and Puerto Rican legal protections for this species that discourage any commercial incentives to engage in international trade in this species. Currently as listed under the U.S. Endangered Species Act (ESA), take of this boa for commercial purposes is prohibited. CITES Appendix II protection, however, would still allow the United States and other Parties to monitor trade in *Epicrates inornatus*.

7. Legal instruments

7.1 National

In Puerto Rico, this snake is protected under the Commonwealth of Puerto Rico Law No. 241, known as the "*Nueva Ley de Vida Silvestre de Puerto Rico*" (New Wildlife Law of Puerto Rico). In 2004 the Puerto Rico Department of Natural and Environmental Resources (PRDNER) approved the "*Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico*" (Regulation 6766 to Regulate the Management of Threatened and Endangered Species in Puerto Rico). This regulation explicitly prohibits the possession, transportation, taking, destruction, hunting, and killing, of any wildlife species listed as threatened or endangered. Regulation 6766 also prohibits modifications of habitat designated by the PRDNER as critical and critical essential. The Puerto Rican boa was included in the list of protected species and designated as "vulnerable": A2 (c and e) under Regulation 6766 (USFWS 2011).

In addition, various other laws have been approved by the Commonwealth of Puerto Rico to protect the karst region of the Island. Law No.292, known as "*Ley para la Protección y Conservación de la Fisiografía Cársica de Puerto Rico*" (Law to Protect the Karst Physiography of Puerto Rico) was approved in 1999 and indirectly protects the PR boa and all other species that occur in the karst as well (USFWS 2011).

In the United States, including Puerto Rico, this snake had been listed on the Endangered Species Act (ESA) as Endangered since 1970. A 5-year Review in 2011 by the U.S. Fish and Wildlife Service found no change was needed in the endangered status of the species (USFWS 2011). A 5-year ESA Review was initiated again in 2016 to assess the ESA status of the species. As a result, for example, if the outcome of this review is that the species is recovered under the ESA the U.S. Fish and Wildlife Service may initiate rulemaking to propose to remove it from the Federal List of Endangered and Threatened Wildlife under the ESA. A potential proposal to delist the species due to recovery under the ESA criteria has been scheduled on the Service's National Workplan to Address Downlisting and Delisting Recommendations. A species inclusion on this workplan does not mean that a final decision has been made to downlist or delist under the ESA.

7.2 International

Epicrates inornatus was listed in CITES Appendix I in 1977 and in Annex A of the EU Wildlife Trade Regulations (UNEP-WCMC 2013).

8. Species management

8.1 Management measures

The Recovery Plan for the species was approved in 1986 and amended in 2019 to include measurable delisting recovery criteria (USFWS 2019) and have served as the basis to implement recovery actions. In addition, Federal agencies are mandated to carry out programs for the conservation of endangered species under section 7 of the Act to ensure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of a federally listed species. Therefore projects with federal nexus provide for the implementation of conservation measures for the PR boa. Although the PRDNER has developed similar conservation measures to avoid and minimize potential effects of development projects on the PR boa, these measures are implemented with varying degrees of success and oversight.

For example, the translocation of PR boas has been recommended and used as a management strategy to minimize conflicts with the public and minimize potential effects from development projects that disturb and modify PR boa habitat. It mostly consists of moving

boas outside of the human-boa conflict areas into areas where these conflicts would be potentially reduced (e.g., within suitable protected PR boa habitat). Although this strategy has been used for a long time, implementation has been poorly documented. However, research suggests that it has positively influenced the species genetic diversity (Puente-Rolón et al. 2013).

In addition, the U.S. Army Fort Buchanan harbors suitable habitat for the PR boa and have a conservation plan in place through their Integrated Natural Resources Management Plan in coordination with the Service and the PRDNER. They also implemented a translocation program within their property as well as provide outreach activities with the public.

8.2 Population monitoring

A number of population monitoring studies have been implemented for this species and most have been compiled in the 2011 species 5-year review (USFWS 2011). There are three studies that document density of the species (Mulero-Oliveras 2019, Ríos-López and Aide 2007, Tolson 1997). Snake fungal disease was recently confirmed for the PR boa population within Fort Buchanan (Allender et al. 2020). Additional samples and research is currently ongoing to establish baseline information of this disease in Puerto Rico and its potential effect on the PR boa population. There are also additional efforts by the academia to continue monitoring some PR boa populations within certain caves.

8.3 Control measures

8.3.1 International

Epicrates inornatus was listed in CITES Appendix I in 1977 and in Annex A of the EU Wildlife Trade Regulations (UNEP-WCMC 2013).

8.3.2 Domestic

See section 7.1 above.

8.4 Captive breeding and artificial propagation

According to the International Species Information Systems-Zoological Information Management System (ISIS 2013), zoo holdings for this species consist of 3.3.0 specimens in one zoo in Europe and 5.9.5 specimens in nine zoos in North America (all in US with none in PR). D. Barber, Curator of Ectotherms at Fort Worth Zoo, commented that the species is fairly easy to breed, but institutions do not breed them regularly. Apparently, PR boas in captivity tend to be aggressive and probably not a priority for captive breeding (L. Miranda, pers. comm.). In Puerto Rico, there is at least one organized group of (Puerto Rico Reptiles, Inc.) that promotes keeping reptiles as pets and may be an interested stakeholder for PR boa trade (L. Miranda, pers. comm.).

8.5 Habitat conservation

The Commonwealth of Puerto Rico protecs the karst region of the Island through legislation. Law No.292, known as "*Ley para la Protección y Conservación de la Fisiografía Cársica de Puerto Rico*" (Law to Protect the Karst Physiography of Puerto Rico), was approved in 1999 and indirectly protects the PR boa and all other species that occur in the karst as well (USFWS 2011). There is also a large area with stricter land regulations named the Karst Restricted Zone designated by the Puerto Rico Planning Board (Ortiz-Maldonado et al. 2019). This Zone represents 7.2 % (647 km2) of the total area of Puerto Rico, includes both public and private lands, and was designated as such for conservation purposes by prohibiting land exploitation of any type (Castro-Prieto et al. 2019).

Fortunately, the PR boa occurs within several protected areas, for example, El Yunque National Forest, the largest reserve in Puerto Rico. The PR boa is also presumed to occur in all Commonwealth forests managed by the PRDNER (Rivera, PRDNER, 2019, pers. comm.) although occurrence records are lacking for many of these areas, the PR boa has been reliably confirmed to occur within several these forests, particularly those that occur within the karst region. The Puerto Rico Conservation Trust, through its unit *Para La Naturaleza* (PLN),

also manages numerous protected natural areas throughout Puerto Rico where the PR boa has been confirmed in at least seven of their properties. Other areas that are important for the PR boa are the J.E. Monagas State Park, Mata de Plátano Nature Reserve (managed by the Inter American University of Puerto Rico), El Tallonal Private Reserve (managed by the non-governmental organization Citizens of the Karst), and the U.S. Army Fort Buchanan.

8.6 Safeguards

Safeguards in the form of national laws and regulations regarding wildlife conservation are already in place in Puerto Rico for *E. inornatus*. Furthermore, there is no evidence of an unsatisfied or unreported demand for subsistence uses or commercial trade in this species.

9. Information on similar species

There are two native Boid snake on the island, the PR boa and the Virgin Islands boa (*Chilabothrus granti*). The Virgin Islands boa in the main island of Puerto Rico has a very limited range where they co-occur with the PR boa and could be mistaken by the general public. There is an established population of Red-tailed boa (*Boa constrictor*) and a relatively recent invasion of Reticulated python (*Malayopython reticulatus*) in Puerto Rico, and although these species are distinct in size and color from the PR boa, they could still be mistaken by the general public and lack of knowledge.

10. Consultations

Range State consultation letters (dated Nov 29 and Dec 4, 2013) were sent to USFWS Region 4 and to the PRDNER. An email request for information was also sent on Jan 7, 2022, to the PRDNER Endangered Species Division. The following responses were received and incorporated into this document where appropriate:

- USFWS: Caribbean Ecological Services Field Office (CESFO) was consulted on this proposal and provided its input (dated January, 2021).
- PRDNER: The records show two PR boa export requests to Texas for breeding purposes. Both request were denied due to the scarce information that was provided by the applicant.

11. Additional remarks

No additional remarks.

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