

Indicative 10 Project National Resource Material

Boa Constrictor
(Boa constrictor)

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2017

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An Invasive Animals CRC Project





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Summary

Species on VPC List 2007?	Yes
Species on the live import list (EPBC Act 1999)?	Yes (<i>Boa constrictor occidentalis</i> only)
Risk of establishment:	Extreme (Page et al. 2008)
Pathways:	Intentional (illegal trade) Unintentional (stowaway)

Key Messages

Introduction pathway - Intentional via legal wildlife trade. Possibility of accidental stowaway

Impact to Economy - Risk to livestock and poultry aquaculture industries.

Impact to Environment - predated on native species and potentially transmits disease

Classification

Boa constrictor (Linnaeus 1758)

Class:	Reptilia
Order:	Squamata
Family:	Serpentes
Genus:	<i>Boa</i>
Species:	<i>constrictor</i>

There are 11 recognised sub-species of *Boa constrictor*:

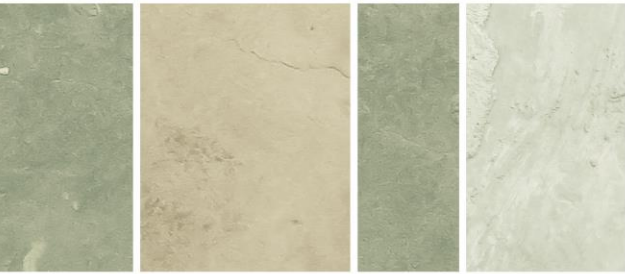
amarali, *constrictor*, *imperator*, *longicauda*, *melanogaster*, *Mexicana*, *nebulosa*, *occidentalis*, *orophias*, *ortoni* and *sabogae* (Peters and Orejas-Miranda 1986; Price and Russo 1991; Reed and Rodda 2009)

Common names

Red-tailed boa, common boa, ampalagua, bigoya, masacuate



Figure 1. *Boa constrictor* Photo: Eduardo Santos (CC BY 2.0)



Biology and Ecology

Identification

The *Boa constrictor* is one of the world's largest snakes. Adults typically reach 3 m in length in the wild (Boback 2006; Savage 2002), although captive individuals can attain up to 5 m and weigh in excess of 45 kg (Bartlett and Wagner 2009; Martins and Oliveira 1998; Reed and Rodda 2009). At birth, young are 0.3 to 0.6 m long, with length varying according to the size of the mother (Bertona and Chiaraviglio 2003). They generally grow rapidly and reach reproductive age within 2 years (Schuett et al. 2005). Growth usually stops at age three in males, and age five in females (Bertona and Chiaraviglio 2003).



Figure 2 *Boa constrictor* Photo: Carlos Díaz (CC BY 2.0)

There are currently no longevity records from wild populations (Reed and Rodda 2009), though they are potentially long-lived, with estimates of around 20 years (Lindemann and Harding 2009). Captive boas tend to live longer than wild ones, sometimes by as much as 10 to 15 years (Stafford 1986). Records indicate that captive individuals can live around 39-40 years (Greene 1983; Snider et al. 1992).



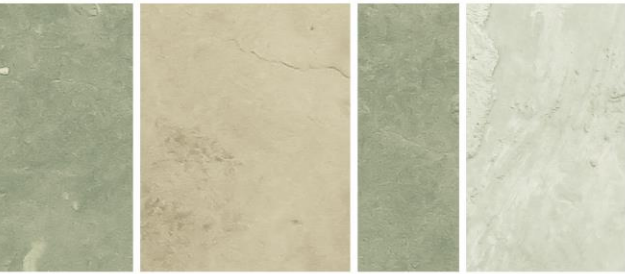
Colouration is varied particularly between subspecies, however, identification from other large-bodied constrictors is straightforward (Reed and Rodda 2009). Most have a dorsal stripe that runs from the snout to the back of the head (Boback and Siefferman 2010). They also have a dark triangle between the snout and eye then extends downward towards the jaw. Dorsal background is typically cream or brown and occasionally tan, green, red or yellow (Ernst and Ernst 2003). Prominent reddish-brown saddle-shaped dorsal markings edged in black or cream becomes more conspicuous towards the tail (Langhammer 1983). Dark rhomboid-shaped markings are present along the sides of the body, and smaller spots may be present over the entire body. Neonate and juvenile boas have similar markings to the adults, although the colour saturation and contrast is usually greater (McDiarmid et al. 1999). Colouration changes over multiple shedding cycles. However, there are no visible thermoreceptive pits that open to the environment and no enlarged scales on the top or lateral head surfaces, other than slightly enlarged nasals near the tip of the snout (Henderson 2004).

Boas on islands tend to be smaller than their mainland conspecifics and have different head shapes and patterns. Island boas are generally half the length and 20% the mass of mainland boas (Boback 2006; Boback and Siefferman 2010; Porras 1999).

The species is sexually dimorphic and females are generally larger than males. Males also have more prominent pelvic spurs (remnant hind legs) and proportionally longer tail (Page et al. 2008).



Figure 3. *Boa constrictor* Photo: Jens Raschendorf (CC BY-SA 2.5)



Behaviours and Traits

Like most snakes, boas rely on strong vomeronasal senses. This is produced through a patch of sensory cells (Jacobson's organ) within the main nasal chamber that detects heavy moisture-borne odour particles (Zug 2016). The boa's continual tongue flick exposes the organ to the scent or pheromone. As a result, they constantly sense chemical cues in their environment (Ernst and Ernst 2003).

Boa constrictors have good vision, even into the ultraviolet spectrum (Sillman et al. 2001). In addition, they can detect both vibrations in the ground and sound vibrations through the air through their jaw bones. They do not have external ears, and, unlike most birds, boa constrictors lack thermosensory pits (Mattison 2007).

Food and Foraging

Boa constrictors use their sharp, backward-curving teeth to grasp prey and their bodies to kill by coiling and constricting, cutting off the blood supply to vital organs (Bartlett and Wagner 2009; Reed and Rodda 2009). This causes almost instantaneous unconsciousness and death (Lindemann and Harding 2009; Montgomery and Rand 1978; Smith 1999).

They are carnivorous, non-venomous generalist predators, taking a variety of terrestrial vertebrates (Bartlett and Wagner 2009; Quick et al. 2005). All prey are swallowed whole, and take about four to six days to fully digest (Lindemann and Harding 2009; Stafford 1986).

Their main prey items include small mammals, birds and their eggs, small lizards, and occasionally amphibians. Larger individuals may also feed on mammals such as rabbits, monkeys, wild pigs, the Central American agouti, the Cozumel raccoon and coati, and deer (Boback 2005; Greene 1983; Henderson 2004; Lindemann and Harding 2009; Quick et al. 2005). Examination of stomach contents of Boa Constrictors on Aruba Island showed that birds comprised 40% of prey taken, lizards 35% and mammals 25%. In the study, 52 separate prey items were identified (Lindemann and Harding 2009).

Reproduction and Lifecycle

Breeding typically occurs during the dry season (around April to August in much of its native range. Depending on local temperatures, gestation can last five to eight months (Bertona and Chiaraviglio 2003).

Boa Constrictors often have multiple mates (polygynous), although only half the female population breeds in a given breeding season. This is often attributed to condition whereby females reproduce when they are in good physical condition (Stafford 1986). Furthermore, females can store sperm for up to 21 months.

The Boa constrictor is highly fecund, meaning they are capable of producing many offspring (McDiarmid et al. 1999). They are also ovoviviparous, giving birth to live, fully developed young who are independent within minutes of birth (Bertona and Chiaraviglio 2003). It is not uncommon for a female to give birth to several dozen individuals in a single litter, occasionally up to 80 individuals depending on condition and sub-species (Andrade and Abe 1998).



Parthenogenesis (reproduction of viable young without fertilisation) has been reported in this species (Booth et al. 2011; Booth and Schuett 2011, 2016), although further research may be required to support this finding.

Habitat

Boa Constrictors occur in a wide range of habitats from sea level to moderate elevations, including inhabit lowland, tropical rainforest, arid grasslands and scrub, mountainous tropical rainforest, coastal scrubs and marshes, and secondary-growth forests (Greene 1983; Smith 1999). The species is commonly found in or along rivers and streams, and is a capable swimmer (Greene 1983). It is frequently found close to human habitation and has been observed in urban and agricultural areas, including cultivated fields (Reed and Rodda 2009). This snake is unlikely to make long distance movements provided food and shelter are locally available. They have been known to occupy all forest strata where their primary prey (birds) are found (Boback 2005), overgrown fields, rocky outcrops as well as trees and logs (e.g., Holtzman and others, 2007).

The Boa Constrictor will occupy the burrows of medium-sized mammals, where it can hide from potential predators (Mattison 2007).

Global Range

The Boa Constrictor has a wide natural range, larger than any other neotropical Boa, estimated at approximately 15 million km (Page et al. 2008). Each subspecies occupy distinct and restricted ranges from northern Mexico, through Central America (Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama), to South America (including Colombia, Ecuador, Peru, Venezuela, Guyana, Surinam, French Guiana, Brazil, Bolivia, Uruguay and north-western Argentina)

The Boa Constrictor has successfully colonised at least 43 marine islands throughout its range, including Dominica and St Lucia islands in the Lesser Antilles; San Andres and Providencia Islands (Colombia), Taboga Island (Panama), Trinidad and Tobago. In addition, it has established on many other continental islands along the Atlantic and Pacific coasts of Mexico, Central and South America as well as continental USA, particularly Florida (Albino and Carlini 2008; Boback 2005; Davis and Smith 1953; Henderson 2004; McDiarmid et al. 1999; Price and Russo 1991).

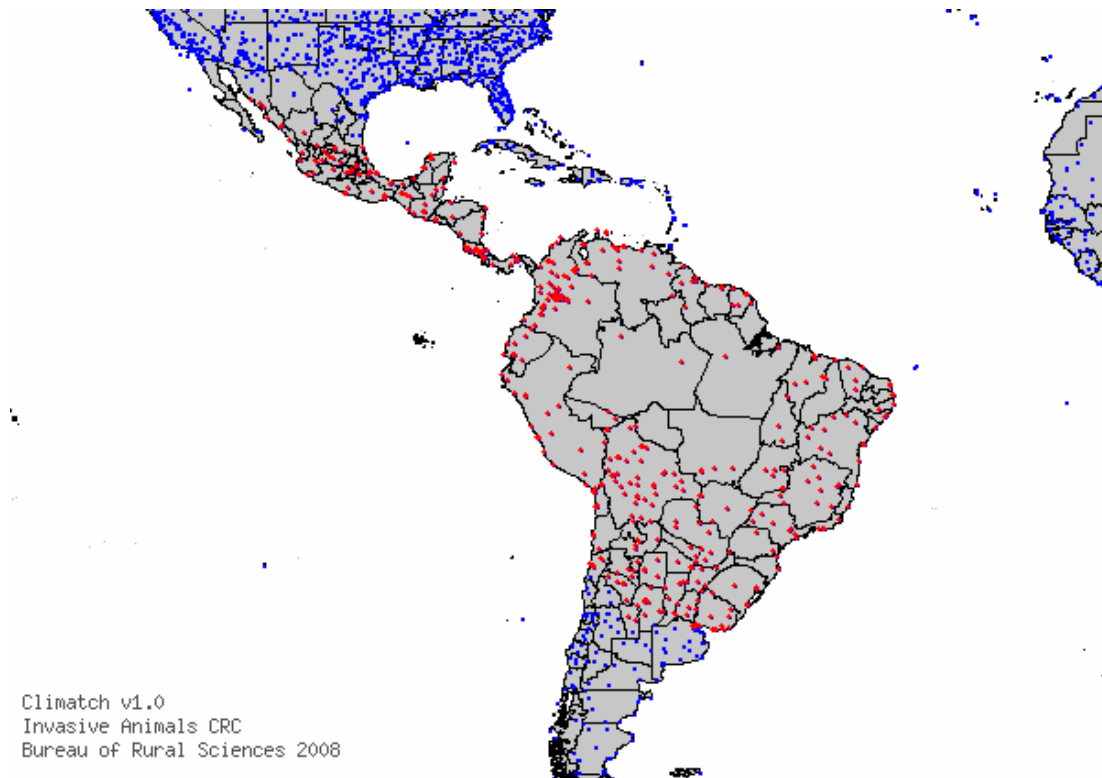
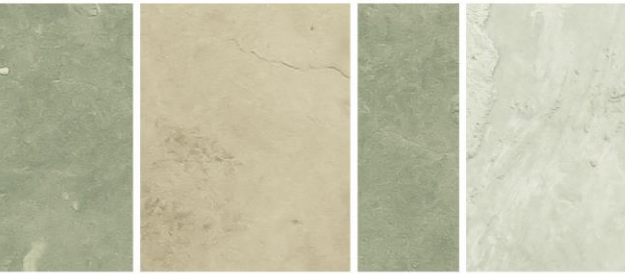


Figure 4. Map showing natural range of *Boa constrictor*. Image taken from. Red dots are native range, blue dots are introduced range. Global Biodiversity Information Facility [http://data.gbif.org/species/boa constrictor/](http://data.gbif.org/species/boa%20constrictor/) August 2017.

Potential for Introduction

The boa constrictor is a robust species, and tend to be shipped using methods that ensure high survival, probably approaching 100 percent (Reed and Rodda 2009).

The primary introduction potential comes from the illegal wildlife trade, although the species has been known to be unintentionally transported, usually in fruit shipments (Reed and Rodda 2009). Almost all known incidents of boa constrictors in Australia have been the result of illegally kept individuals. Based on information from the United States where importation of the species is legal, it is considered “highly prized” as a pet (Reed and Rodda 2009). Therefore there is likely a significant risk of introduction to Australia. However, abundance and densities in the wild are unknown.

Although *Boa constrictors* have not yet established in Australia, future Incursions are highly likely based on the number of incursions that have occurred in the past. Christy and Quinn (2017) reported 17 boa constrictors were discovered post-border between 2013 and 2015, 13 of which were actively held snakes; the remainder are snakes found in the wild, presumably escaped or dumped pets.



Potential for Eradication

Existing control tools appear inadequate for the eradication of large established populations of boas (Reed and Rodda 2009). In the absence of proven control tools, an effective prevention program will be more effective (e.g., Vice and Pitzler 2002), combined with a well-organized, rapid response to sightings of colonisers (Stanford and Rodda 2007). A multi-agency rapid response capacity for giant constrictors was recently developed in the Florida Keys and resulted in capture of a large female boa constrictor in early 2009 (Reed and Rodda 2009). This example offers evidence that developing such capacity maybe effective.

Impacts

Economic

Boa constrictors may prey on small livestock, particularly juveniles (Quick et al. 2005). However, the snake is more likely to impact the poultry industry, either through direct predation of eggs, chicks and adults, or control (Schuett et al. 2005). Since the large species is a good climber, strong fencing would be required to protect livestock and poultry. Other methods of control, such as trapping and shooting, will also have an economic impact.

Boa constrictors rarely attack humans except in self-defence as humans (even children) are outside the usual range of prey size taken by boas. Boa constrictor bites are painful but are not considered dangerous unless they become infected.

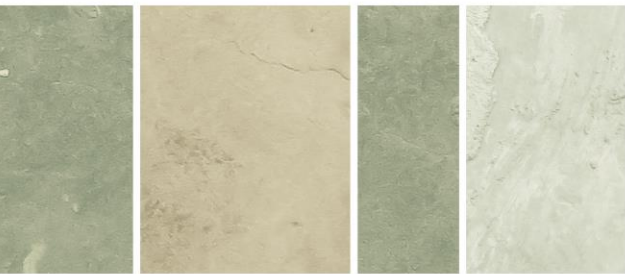
Environmental

Boa constrictors are predators on birds and small mammals, including bats (Ernst and Ernst 2003; Greene 1983; Quick et al. 2005) and have the potential to exert high predation pressure on our native fauna.

Although in captivity boas are subject to a wide variety of ailments (Bartlett and Wagner 2009; Ernst and Ernst 2003; Smith 1999), very little is known of the pathogens in the wild in their native range. Whether or not these pathogens exert demographic effects on boa populations, or pose a disease risk to Australia's native fauna is also unclear. The species is known to host a variety of parasites which could negatively impact native fauna (Reed and Rodda 2009)

Social

As with many of the large constricting snakes, boas would be capable of attacking and consuming a variety of companion animals, from caged birds to cats and dogs (Reed and Rodda 2009). Such an attack would almost certainly create extensive media attention and anxiety among pet-owners.



Legislation

The high risk and potential pest status of the Oriental garden lizard is recognised throughout Australia, as indicated in Table 1.

Boa constrictors are not listed on the IUCN Red List of Threatened Species (IUCN 2017), although all but one are listed in Appendix II - not threatened but may become so unless trade is closely controlled (CITES 2007). The exception is the Argentine subspecies (*occidentalis*) which is included in CITES Appendix I- most endangered among CITES-listed species (Page et al. 2008).

There is little impediment to the application of the control methods, given that most known techniques (e.g., trapping, visual searches) are available for use in Australia, with the exception of baiting. However, available methods will not discriminate between *Boa constrictors* and native snakes, particularly pythons.

Table 1: Current status of the Oriental garden lizard under jurisdictional legislation

Jurisdiction	Legislation	Status
Australia	Biosecurity Act 2015	included
Australia	List of specimens taken to be suitable for live import	not included
Western Australia	Biosecurity and Agriculture Management Act 2007	prohibited
South Australia	Natural Resources Management Act 2004	prohibited
New South Wales	Non-Indigenous Animals Regulation	Category 2 high risk
Queensland	Land Protection (Pest and Stock Route Management) Act 2002	Class 1 declared animal
Victoria	Catchment and Land Protection Act 1994	prohibited
Tasmania	Tasmanian Nature Conservation Act 2002	controlled



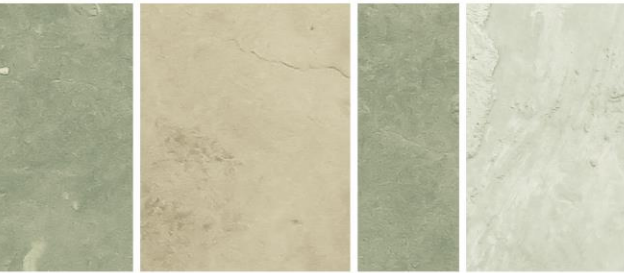
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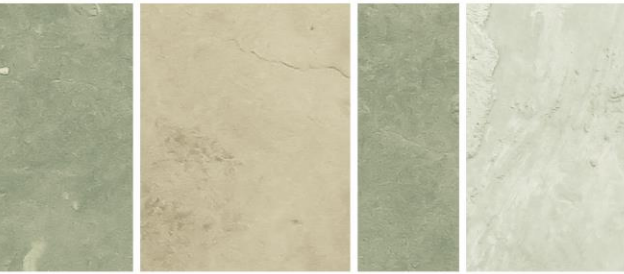
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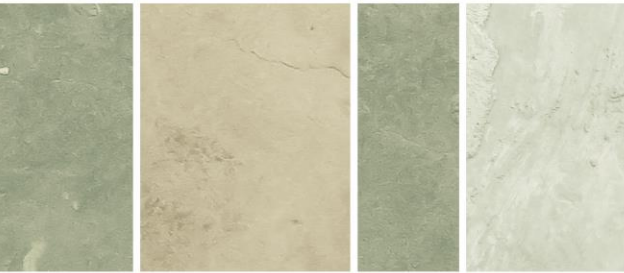
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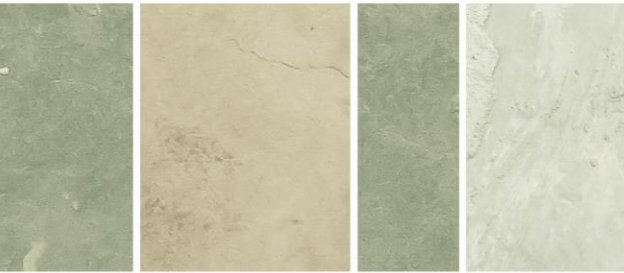








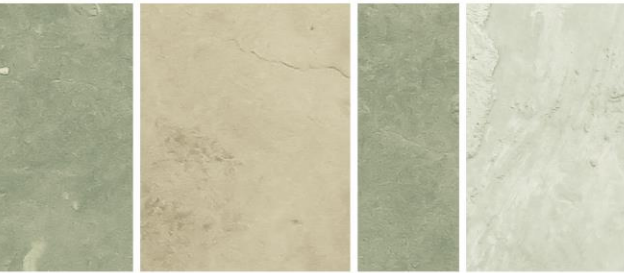
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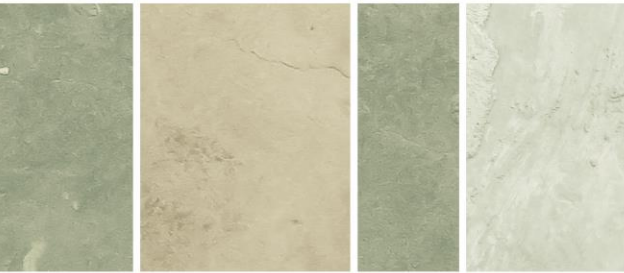
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5		Claude Valette	2560 x 1440	Attribution - No Derivs 2.0 Generic (CC BY-ND 2.0)	https://creativecommons.org/licenses/by-nd/2.0/legalcode	5 Boa Constrictor Claude Valette.jpg
6		Claude Valette	2160 x 1440	Attribution - No Derivs 2.0 Generic (CC BY-ND 2.0)	https://creativecommons.org/licenses/by-nd/2.0/legalcode	6 Boa Constrictor Claude Valette.jpg






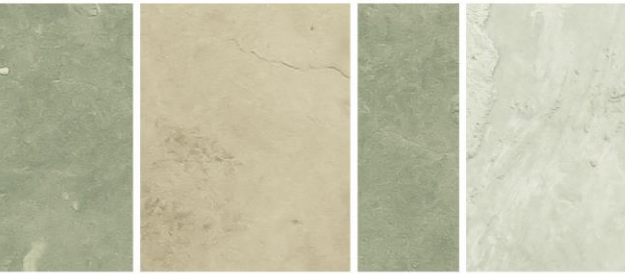
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7		B. Mairlot	1000 x 666	Attribution-Share Alike 2.0 Generic (CC BY-SA 2.0)	https://creativecommons.org/licenses/by-sa/2.0/legalcode	7 Boa Constrictor B. Mairlot.jpg
8		Florida Fish and Wildlife	3008 x 2000	Attribution - No Derivs 2.0 Generic (CC BY-ND 2.0)	https://creativecommons.org/licenses/by-nd/2.0/legalcode	8 Boa Constrictor Florida Fish and Wildlife.jpg
9		Department of Environment & Primary Industries	2560 x 1920	Attribution 2.0 Generic (CC BY 2.0)	https://creativecommons.org/licenses/by/2.0/legalcode	9 Boa Constrictor Department of Environment & Primary Industries.jpg



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10		Eduardo Santos	1943 x 2274	Attribution 2.0 Generic (CC BY 2.0)	https://creativecommons.org/licenses/by/2.0/legalcode	10 Boa Constrictor Eduardo Santos.jpg
11		Belizian	1245 x 1146	GNU General Public License, version 2	https://www.gnu.org/licenses/old-licenses/gpl-2.0.html	11 Boa Constrictor Belizian.jpg



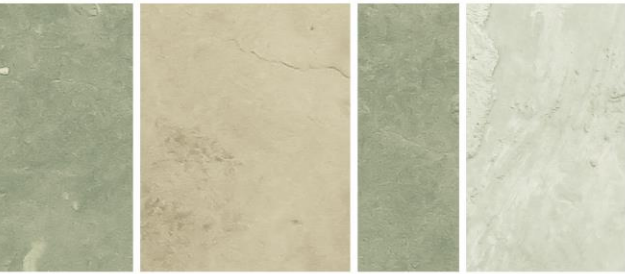
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12		Jens Raschendorf	2000 x 1500	Attribution - ShareAlike 2.5 Generic (CC BY-SA 2.5)	https://creativecommons.org/licenses/by-sa/2.5/legalcode	12 Boa Constrictor Jens Raschendorf.jpg
13		Flávio Eiró	2592 x 1294	Attribution - Non Commercial 2.0 Generic (CC BY-NC 2.0)	https://creativecommons.org/licenses/by-nc/2.0/legalcode	13 Boa Constrictor Flávio Eiró.jpg
14		Robert Reed, USGS	1180 x 1573	Public Domain	https://www2.usgs.gov/visual-id/credit_usgs.html#copyright	14 Boa Constrictor in situ puerto rico Robert Reed.jpg



References

- Albino AM, Carlini AA. 2008. First record of *boa constrictor* (serpentes, boidae) in the quaternary of south america. *Journal of Herpetology* 42:82-88.
- Andrade DV, Abe AS. 1998. Abnormalities in a litter of boa constrictor amarali. *Snake-Nittagun* 28:28-32.
- Bartlett P, Wagner E. 2009. *Pythons: Complete pet owner's manual: Barron's Educational Series*. 96 pp.
- Bertona M, Chiaraviglio M. 2003. Reproductive biology, mating aggregations, and sexual dimorphism of the argentine boa constrictor (*boa constrictor occidentalis*). *Journal of Herpetology* 37:510-516.
- Boback SM. 2005. Natural history and conservation of island boas (*boa constrictor*) in belize. *Copeia* 2005:879-884.
- Boback SM. 2006. A morphometric comparison of island and mainland boas (*boa constrictor*) in belize. *Copeia* 2006:261-267.
- Boback SM, Siefferman LM. 2010. Variation in color and color change in island and mainland boas (*boa constrictor*). *Journal of Herpetology* 44:506-515.
- Booth W, Johnson DH, Moore S, Schal C, Vargo EL. 2011. Evidence for viable, non-clonal but fatherless boa constrictors. *Biology Letters* 7:253-256.
- Booth W, Schuett GW. 2011. Molecular genetic evidence for alternative reproductive strategies in north american pitvipers (serpentes: Viperidae): Long-term sperm storage and facultative parthenogenesis. *Biological journal of the Linnean Society* 104:934-942.
- Booth W, Schuett GW. 2016. The emerging phylogenetic pattern of parthenogenesis in snakes. *Biological journal of the Linnean Society* 118:172-186.
- Christy MT, Quinn J. 2017. National incursion prevention and response: Incursion data summary. Invasive Animals Cooperative Research Centre. Canberra, ACT, Australia. 32 pp.
- Davis WB, Smith HM. 1953. Snakes of the mexican state of morelos. *Herpetologica* 8:133-143.
- Ernst CH, Ernst EM. 2003. *Snakes of the united states and canada: Smithsonian Books*. Washington, DC. 668 pp.
- Greene H. 1983. *Boa constrictor* (boa, béquer, boa constrictor). In: Janzen D, editor. *Costa rican natural history* University of Chicago Press Chicago, IL pp 380-382.
- Henderson RW. 2004. Lesser antillean snake faunas: Distribution, ecology, and conservation concerns. *Oryx* 38:311-320.
- IUCN, (International Union for Conservation of Nature) 2017. The iucn red list of threatened species. Version 2017-1. .International Union for Conservation of Nature (IUCN). <http://www.iucnredlist.org>.
- Langhammer JK. 1983. A new subspecies of boa constrictor, *boa constrictor melanogaster*, from ecuador (serpentes: Boidae). *Tropical Fish Hobbyist* 1980:70-79.
- Lindemann L, Harding J. 2009. *Boa constrictor: Animal diversity web*. University of Michigan and Museum of Michigan. Ann Arbor, MI. http://animaldiversity.org/accounts/Boa_constrictor/.

- Martins M, Oliveira ME. 1998. Natural history of snakes in forests of the manaus region, central amazonia, brazil. *Herpetological Natural History* 6:78-150.
- Mattison C. 2007. *The new encyclopedia of snakes*: Princeton University Press. Princeton, NJ. 272 pp.
- McDiarmid RW, Campbell JA, Touré TSA. 1999. *Snake species of the world: A taxonomic and geographic reference*. Vol. 1: Herpetologists' League. Washington, DC
- Montgomery GG, Rand AS. 1978. Movements, body temperature and hunting strategy of a *boa constrictor*. *Copeia* 1978:532-533.
- Page A, Kirkpatrick W, Massam M. 2008. Risk assessments for exotic reptiles and amphibians introduced to australia - *boa constrictor (boa constrictor)* (linnaeus, 1758). Department of Agriculture and Food. South Perth, WA. 10 pp.
- Peters J, Orejas-Miranda B. 1986. *Catalogue of the neotropical squamata, part i, snakes*: Smithsonian Institution Press. Washington, DC. 347 pp.
- Porras L. 1999. Island *boa constrictors (boa constrictor)*. *Reptiles* 7:48-61.
- Price R, Russo P. 1991. Revisionary comments on the genus *boa* with the description of a new subspecies of *boa constrictor* from peru *The Snake* 23:29-35.
- Quick JS, Reinert HK, Eric R, Odum RA. 2005. Recent occurrence and dietary habits of *boa constrictor* on aruba, dutch west indies. *Journal of Herpetology* 39:304-307.
- Reed RN, Rodda GH. 2009. *Giant constrictors: Biological and management profiles and an establishment risk assessment for nine large species of pythons, anacondas, and the boa constrictor*. US Geological Survey. Report nr 2331-1258. 302 pp.
- Savage JM. 2002. *The amphibians and reptiles of costa rica: A herpetofauna between two continents, between two seas*: University of Chicago Press. Chicago, IL. 934 pp.
- Schuett GW, Hardy DL, Earley RL, Greene HW. 2005. Does prey size induce head skeleton phenotypic plasticity during early ontogeny in the snake *boa constrictor*? *Journal of Zoology* 267:363-369.
- Sillman AJ, Johnson JL, Loew ER. 2001. Retinal photoreceptors and visual pigments in *boa constrictor imperator*. *Journal of Experimental Zoology Part A: Ecological Genetics and Physiology* 290:359-365.
- Smith C. 1999. *Boa constrictors* Siar Anthranir Reptiles. Austin, TX. 20 pp.
- Snider AT, Bowler JK, Amphibians SftSo, Reptiles. 1992. *Longevity of reptiles and amphibians in north american collections*: Ssar Publications.
- Stafford P. 1986. *Pythons and boas*: T.F.H. Publications, Inc. Ltd. Neptune City, NJ.
- Stanford JW, Rodda GH. 2007. The brown treesnake rapid response team. In: Witmer G, Pitt W, Fagerstone K, editors. *Managing vertebrate invasive species: Proceedings of an international symposium*. USDA-APHIS Wildlife Services, National Wildlife Research Center. Fort Collins, CO. pp 175-217.
- Vice DS, Pitzler ME. 2002. Brown treesnake control: Economy of scales. In: Clark L, Hone J, Shivik J, Watkins R, Vercauteren K, Yoder J, editors. *Human conflicts with wildlife: Economic considerations*. Proceedings, Third National Wildlife Research Center Special Symposium, National Wildlife Research Center. Fort Collin, CO. pp 127-131.



Zug GR. 2016. Jacobson's organ. Encyclopedia britannica. Encyclopedia Britannica Inc. Chicago, IL

