

Draft Terms of Reference – Yellow Anaconda

- **Provide information on the taxonomy of the species**

Kingdom: Animalia
Phylum: Chordata
Class: Reptilia (reptiles)
Order: Squamata (lizards and snakes)
Suborder: Serpentes (snakes)
Family: Boidae (boas)
Subfamily: Boinae (true boas)
Genus: *Eunectes*
Species: *notaeus*

Common name: Yellow Anaconda

The Yellow Anaconda was first described as *Eunectes notaeus* by Edward Drinker Cope in 1862.¹ The only other synonym for the species is *Epicrates wieningeri* (Steindachner, 1903).² There are no valid subspecies.³ The Yellow Anaconda is also sometimes known as the Paraguay Anaconda or Southern Anaconda.

The family Boidae formerly also included pythons (in a subfamily Pythoninae, now usually treated as a full family), but this was largely based on similarity in appearance rather than phylogenetics.⁴

There are three other extant species in the genus *Eunectes*, namely the Green Anaconda *E. murinus* (Linnaeus 1758), the De Schauensee's or Dark-spotted Anaconda *E. deschauenseei* Dunn & Conant 1936, and the Beni or Bolivian Anaconda *E. beniensis* Dirksen 2002.⁵

¹Walach, V., K.L. Williams, and J. Boundy (2014) "*Snakes of the World: a catalogue of living and extinct species*" CRC Press: Boca Rattan, Florida (USA)

²Walach *et al* (2014), *op. cit.*

³O'Shea, M. (2007) "*Boas and Pythons of the World*" New Holland Press: London (UK)

⁴O'Shea (2007), *op. cit.*

⁵Walach *et al* (2014), *op. cit.*

- **Provide information on the status of the species under CITES**

CITES Listing: Appendix II

IUCN Red List Status: not assessed

The Yellow Anaconda is listed on CITES Appendix II⁶ which permits trade when issued with an export permit. The species is not listed on the IUCN Red List.⁷

The Yellow Anaconda has a distribution covering a large part of south-eastern South America centred on the Paraguay Basin. Waller *et al* describe the distribution as encompassing "the Paraguay River drainage, from the Pantanal region in Bolivia, Paraguay, and Brazil to northeastern Argentina, where it reaches its southernmost distributional limit."⁸

Population figures are unknown but the species is considered common throughout its range,⁹ and in Argentina is subject to commercial harvesting for skins.¹⁰

⁶ <http://www.cites.org/eng/app/appendices.php>

⁷ <http://www.iucnredlist.org/>

⁸ Waller, T., P.A. Micucci, and E. Alvarenga (2007) "Conservation Biology of the Yellow Anaconda (*Eunectes notaeus*) in Northeastern Argentina", pp 340-362, in Henderson, R.W. and R. Powell (eds) "*Biology of the Boas and Pythons*" Eagle Mountain Publishing: Utah (USA)

⁹ Waller *et al* (2007), *op. cit.*

¹⁰ McCartney-Melstad, E., T. Waller, P. A. Micucci, M. Barros, J. Draque, G. Amato and M. Mendez (2012) "Population Structure and Gene Flow of the Yellow Anaconda (*Eunectes notaeus*) in Northern Argentina" *PLoS One*, vol. 7 (5)

- **Provide information about the ecology of the species.**

There have been no proper studies into longevity of anacondas in the wild,¹¹ although they are generally quoted as reaching an average age of 10 to 15 years in the wild and up to 30 years in captivity. Rivas and Corey (2008) report a recapture of a wild adult Green Anaconda *Eunectes murinus* after 13 years.¹² There is a captive record for a Green Anaconda of over 31 years at the Basle Zoo (Switzerland),¹³ and there are captive records of a wild-caught adult Yellow Anaconda living for almost 14 years at the National Zoo (Washington, USA) and a captive-bred one for at least 24 years at the Lincoln Park Zoo (Chicago, USA).¹⁴ The maximum length of Yellow Anacondas is given by O'Shea (2007) as 2.5-3.0 metres¹⁵ and by Waller *et al* (2007) as 3.35 metres snout-to-vent length (SVL) or 4 metres total length (TL).¹⁶ The latter authors give the maximum weight as 29-30kg.¹⁷ Internet sources give larger maximum sizes but these can be considered unreliable. However very large individuals are not a major component of wild populations - studies in Argentina show that they represent less than 4.5% of captured animals, with most individuals (72%) being in the range of 1.4 to 2.2 metres SVL.¹⁸ Females are larger than males, on average being 20% longer and about twice the weight.¹⁹ Males reach sexual maturity at SVL of 128-143cm, and females at SVL of 145-185cm.²⁰ Yellow Anacondas are easily sexed due to the males possessing longer pelvic spurs and longer tails (as measured from the vent).²¹

The Yellow Anaconda is easily distinguished from the Green Anaconda *Eunectes murinus* by the colouration and body pattern, but it is very similar in appearance to the De Schauensee's Anaconda *E. deschauenseei* and the Beni Anaconda *E. beniensis*.²² In the wild these latter two species are separated from *E. notaeus* by distribution, and neither appears to be kept in zoos or the private trade (from internet searches of reptile forums, and none are listed as being kept by any international zoos on the Zoological Information Management System (ZIMS)²³). Superficially the Yellow Anaconda could be confused with other large boas and pythons but only due to the large size.

The Yellow Anaconda has a distribution covering a large part of south-eastern South America centred on the Paraguay Basin. Waller *et al* (2007) describe the distribution as encompassing "the Paraguay River drainage, from the Pantanal region in Bolivia, Paraguay, and Brazil to northeastern Argentina, where it reaches its southernmost distributional limit."²⁴ Within this range they are permanent (non-migratory) inhabitants of shallow seasonal wetlands and floodplains along major rivers.^{25,26} Waller *et al* (2007) write "Although this species [the Yellow Anaconda] colonizes artificial ponds and channels, it is strongly dependent on the persistence of wetlands."²⁷

The Yellow Anaconda is the southernmost species of anaconda. Most wild studies have taken place in northeastern Argentina and concern impacts of commercial harvesting, with the majority of the studies being published in Spanish. The climate in these study areas is largely subtropical to tropical with an average yearly temperature of 23 degrees Celsius (with an average summer temperature of

27 degrees Celsius and average winter temperature of 17 degrees Celsius), but in the most extreme areas can range between a high of 45 degrees Celsius and a low of minus 7 degrees Celsius.²⁸ Rainfall is seasonal, causing flooding over large areas of grassland and it is in these wetlands that the Yellow Anacondas live. During cold months - when water temperatures drop below 15 degrees Celsius - the snakes spend longer basking in the sun (thermoregulating) on exposed logs above the water, but they remain active and do not hibernate.²⁹ During the dry seasons they retreat to small pockets of reedbeds which retain moisture, but they do not aestivate.³⁰ They are predominantly aquatic and are naturally restricted to wetland habitats, with extensive areas of dry land being a barrier to dispersal for this species.³¹

Yellow Anacondas are generalist predators.^{32,33} Stomach contents and noted prey items include a range of fish, amphibians, reptiles, birds' eggs, adult birds up the size of herons and spoonbills, and mammals up to the size of Capybaras (*Hydrochoerus hydrochaeris*).³⁴ They have also been recorded as being cannibalistic, consuming smaller members of their own species.³⁵ Most prey items are birds and mammals, and almost all prey items are of aquatic or semi-aquatic species.³⁶ There is a correlation between the size of the individual snake and the size of the prey (larger snakes take larger prey items).³⁷

Yellow Anacondas are not social animals, but neither are they territorial or aggressive to one another. In the rainy seasons the individuals are widely spread through the floodplains but during the dry seasons they congregate together in numbers in the remaining wet retreats.³⁸ During the mating season the males form "mating balls" where several males compete with one another in non-lethal "wrestling matches" for females.³⁹ In captivity they have a reputation for being irritable and unpredictable towards their owners, and their teeth can inflict nasty wounds although like all boas they are non-venomous.⁴⁰

¹¹ Rivas, J.A. and S.J. Corey (2008) "Eunectes murinus (Green Anaconda). Longevity" *Herpetological Review*, vol. 39 (4): p 469

¹² Rivas and Corey (2008), *op. cit.*

¹³ Biegler, R. (1966) "A survey of recent longevity records for reptiles and amphibians in zoos" *The International Zoo Yearbook*, vol. 6: pp 487-493

¹⁴ <http://www.pondturtle.com/lsnakea.html#Eunectes>

¹⁵ O'Shea (2007), *op. cit.*

¹⁶ Waller *et al* (2007), *op. cit.*

¹⁷ Waller *et al* (2007), *op. cit.*

¹⁸ Waller *et al* (2007), *op. cit.*

¹⁹ Waller *et al* (2007), *op. cit.*

²⁰ Waller *et al* (2007), *op. cit.*

²¹ Waller *et al* (2007), *op. cit.*

²² O'Shea (2007), *op. cit.*

²³ <http://www2.isis.org/products/Pages/ZIMS-benefits.aspx> (log-in required for access to ZIMS listings)

²⁴ Waller *et al* (2007), *op. cit.*

²⁵ O'Shea (2007), *op. cit.*

²⁶ Waller *et al* (2007), *op. cit.*

²⁷ Waller *et al* (2007), *op. cit.*

²⁸ Waller *et al* (2007), *op. cit.*

²⁹ Waller *et al* (2007), *op. cit.*

³⁰ Waller *et al* (2007), *op. cit.*

³¹ McCartney-Melstad *et al* (2012), *op. cit.*

³² O'Shea (2007), *op. cit.*

³³ Waller *et al* (2007), *op. cit.*

³⁴ Waller *et al* (2007), *op. cit.*

³⁵ Barros, M.M., J.F. Draque, P.A. Micucci and T. Waller (2011) "*Eunectes notaeus* (Yellow Anaconda). Diet / Cannibalism" *Herpetological Review*, vol. 42 (2): pp 290-291

³⁶ Waller *et al* (2007), *op. cit.*

³⁷ Waller *et al* (2007), *op. cit.*

³⁸ Waller *et al* (2007), *op. cit.*

³⁹ Waller *et al* (2007), *op. cit.*

⁴⁰ Wagner, D. (1996) "*Boas: everything about selection, care, nutrition, diseases, breeding, and behaviour*" Barron's Educational Series: USA

- **Provide information on the reproductive biology of the species**

Like all boas, Yellow Anacondas are live-bearing snakes (not egg-layers). They produce litters of 10 to 30 young, although there can occasionally be as many as 37.⁴¹ In wild studies in northern Argentina the average litter size was found to be 24 young.⁴²

Males reach sexual maturity at a snout-to-vent length (SVL) of 128-143cm, and females at SVL of 145-185cm, but the size is determined not by age but by ecological conditions governing growth rate (abundance of food, temperature, etc).⁴³ Waller *et al* (2007) mention a 2.9 metre female which was not yet reproductively active, despite being morphologically mature.⁴⁴ Estimates of age at sexual maturity in the wild, based circumstantially on capture rates, suggest males mature as early as 17 months old and females as early as 29 months old.⁴⁵ Captive-bred individuals are also recorded as reaching the average sizes of sexual maturity within two years.⁴⁶

Yellow Anacondas are highly-synchronised breeders in the wild due to the nature of their habitat (seasonally flooded wetlands). Mating takes place at the end of winter (from September) when the dry season is approaching, and the young are born the following spring (around April) when the wetlands are flooding again.⁴⁷ Gestation is around six months long.⁴⁸ Wild females breed only once every second year.⁴⁹

No reptile is known to be capable of spontaneous or age-related sex changes (an ability found in many fish and some amphibians). However, parthenogenesis (breeding without sexual contact) is known in many reptile species.⁵⁰ Boa species which are known to be capable of facultative parthenogenesis are the Brazilian Rainbow Boa *Epicrates cenchria*,⁵¹ Colombian Rainbow Boa *Epicrates maura*,⁵² and Common Boa *Boa constrictor*.⁵³ There are some media reports of parthenogenesis in captive Green Anacondas *Eunectes murinus* but nothing appears to be published scientifically as verification. Given that several boa species are known to be able to reproduce in this fashion it would not be impossible for it to also occur in Yellow Anacondas.

Captive-bred hybrids between the Yellow Anaconda and the closely-related Green Anaconda *Eunectes murinus* are well-known in the pet trade in Europe and the USA. More surprisingly there are also captive-bred intergeneric hybrids between Yellow Anaconda and Common Boa *Boa constrictor*.⁵⁴ However there are no native boa species in Australia and it is extremely unlikely that Yellow Anacondas could hybridise with pythons or any other Australian snake species.

⁴¹ O'Shea (2007), *op. cit.*

⁴² Waller *et al* (2007), *op. cit.*

⁴³ Waller *et al* (2007), *op. cit.*

⁴⁴ Waller *et al* (2007), *op. cit.*

⁴⁵ Waller *et al* (2007), *op. cit.*

⁴⁶ Waller *et al* (2007), *op. cit.*

⁴⁷ Waller *et al* (2007), *op. cit.*

⁴⁸ Waller *et al* (2007), *op. cit.*

⁴⁹ Waller *et al* (2007), *op. cit.*

⁵⁰ Bagemihl, B. (1999) "*Biological Exuberance: animal homosexuality and natural diversity*" Saint Martin's Press: New York (USA)

⁵¹ Kinney, M.E., R.F. Wack, R.A. Grahn and L. Lyons (2013) "Parthenogenesis in a Brazilian Rainbow Boa (*Epicrates cenchria cenchria*)" *Zoo Biology*, vol. 32 (2): pp 172-176

⁵² Booth, W., L. Million, R.G. Reynolds, G.M. Burghardt, E.L. Vargo, C. Schal, A.C. Tzika and G.W. Schuett (2011) "Consecutive Virgin Births in the New World Boid Snake, the Colombian Rainbow Boa, *Epicrates maurus*" *Journal of Heredity*, vol. 102 (6): pp 759-763

⁵³ Booth, W., D.H. Johnson, S. Moore, C. Schal and E.L. Vargo (2011) "Evidence for Viable, Non-clonal but Fatherless Boa Constrictors" *Biology Letters*, vol. 7 (3): pp 253-256

⁵⁴ Ernst, N., A. Schmitz, N. Chai, J. Rigoulet, A. Bourgeois, M. Kohl, C. Hano and I. Ineich (2014) "An Unexpected Occurrence - a case study on an intergeneric hybrid in giant snakes" *Swiss Journal of Zoology*, vol. 121 (3): pp 293-317

- **Provide information on whether the species has established feral populations**

The Yellow Anaconda has never established wild breeding populations outside of its natural range.⁵⁵ Within its natural range it is not considered a pest in any economic way (the habitat is flooded grasslands which for human activities are used primarily for cattle ranching).⁵⁶

Powell *et al* (2011) note the species as being recorded in the wild on the Caribbean island of Puerto Rico but under the category of "Stray (no indication of a breeding population becoming established)".⁵⁷ The species is not recognised as an established member of that island's fauna.^{58,59}

There are records of individual Yellow Anacondas being caught in the Everglades of Florida, USA, but Krysko *et al* (2011) noted only two such verified specimens (one collected in 2007 and one photographed in 2008). Equally they note only two verified specimens of Green Anacondas *Eunectes murinus* from the Everglades (in 2004 and 2010). In both cases they also note there are anecdotal records of the species' presence.⁶⁰

⁵⁵ Lever, C. (2003) "*Naturalized Reptiles and Amphibians of the World*" Oxford University Press: Oxford (UK)

⁵⁶ Waller *et al* (2007), *op. cit.*

⁵⁷ Powell, R., R.W. Henderson, M.C. Farmer, M. Breuil, A.C. Echternacht, G. van Buurt, C.M. Romagosa, and G. Perry (2011) "Introduced Amphibians and Reptiles in the Greater Caribbean: patterns and conservation implications" pp 63-144, in Hailey, A., B.S. Wilson, and J.A. Horrocks (eds) "*Conservation of Caribbean Island Herpetofaunas, vol. 1: conservation biology and the wider Caribbean*" Koninklijke Brill NV: Leiden (Netherlands)

⁵⁸ Powell *et al* (2011) *op. cit.*

⁵⁹ Rivero, J.A. (1998) "*The Amphibians and Reptiles of Puerto Rico*" University of Puerto Rico Press: San Juan (Puerto Rico)

⁶⁰ Krysko, K.L., J.P. Burgess, M.R. Rochford, C.R. Gillette, D. Cueva, K.M. Enge, L.A. Somma, J.L. Stabile, D.C. Smith, J.A. Wasilewski, G.N. Kieckhefer III, M.C. Granatosky, and S.V. Nielsen (2011) "Verified Non-indigenous Amphibians and Reptiles in Florida from 1863 through 2010: outlining the invasion process and identifying invasion pathways and stages" *Zootaxa* 3028: pp 1-64

- **Environmental risk assessments of the species**

The Yellow Anaconda is included in the Vertebrate Pests Committee's 2007 "List Of Exotic Vertebrate Animals In Australia" where they assign it a threat rating of "2/Serious". The number "2" in the threat rating is used to denote "limited to statutory zoos or endorsed special collections". The rating of "serious" is qualified as "These animals may be introduced and/or should be kept only in collections approved by the relevant State/Territory authority as being primarily kept for (1) public display and education purposes, and/or for (2) genuine scientific research approved by the relevant State/Territory authority, and as meeting Best Practice for the purposes of keeping the species concerned".⁶¹

Quarantine requirements for live reptiles have been established by Biosecurity Australia, and would cover Yellow Anacondas if these were to be imported.⁶²

The related Green Anaconda *Eunectes murinus* is already included on the list of exotic zoo animals allowed to be imported into Australia, along with seven other species of Boidae.⁶³

In 2012 the USA government banned the importation and interstate trade of four species of large constricting snakes (of the families Pythonidae and Boidae), followed by four further species in 2015. Collectively these species include all four species of anacondas (*Eunectes*). The law does not prohibit the keeping of such species privately. The listing of these species on the Lacey Act as "Injurious Wildlife" follow studies into the establishment of Burmese Pythons *Python bivittatus* in the Florida Everglades.⁶⁴

The four anaconda species appear to have been included in the Lacey Act simply due to their large size. As noted by Krysko *et al* (2011) only two specimens each of Yellow Anaconda and Green Anaconda have been verified from the Everglades,⁶⁵ and the United States Fish and Wildlife Service (FWS) notes that the other two species (De Schauensee's Anaconda *Eunectes deschauenseei* and Beni Anaconda *Eunectes beniensis*) are not present in captivity at all in the USA.⁶⁶

⁶¹ <http://www.pestsmart.org.au/wp-content/uploads/2010/03/VPCListJuly2007.pdf>

⁶² <http://www.agriculture.gov.au/biosecurity/risk-analysis/reviews/final-animal/live-reptiles>

⁶³ <http://www.comlaw.gov.au/Details/F2014C00744>

⁶⁴ <http://www.fws.gov/verobeach/InvasiveSpecies.html>

⁶⁵ Krysko *et al* (2011), *op. cit.*

⁶⁶

<http://www.fws.gov/verobeach/PythonPDF/20150306%20Final%20Economic%20Analysis%20large%20constrictor%20snakes.pdf>

- **Assess the likelihood that the species could establish a breeding population in Australia**

The likelihood of Yellow Anacondas establishing a breeding population in Australia outside effective human control is low. There are no known wild populations of Yellow Anacondas established outside their natural range,⁶⁷ and individual captures outside this range are deemed to be individual escapes from captivity.^{68,69}

Yellow Anacondas have been held in Australian zoos for many decades with no instances of escaped animals forming wild populations. In Australia they are now currently held only at the Darling Downs Zoo (Queensland). They were formerly also held at Bredl's Reptile Park (South Australia), the Australian Reptile Park (NSW) and Australia Zoo (Queensland).

Yellow Anacondas are subtropical to tropical in distribution, but can survive in a wide temperature range - in study areas in Argentina these range between a high of 45 degrees Celsius and a low of

minus 7 degrees Celsius.⁷⁰ However the species is specifically adapted for an aquatic life in extensive shallow floodplains⁷¹ so little of Australia's landscapes, whether natural or man-made, would meet their physical requirements. They spend most of their time in water and even during dry periods will only move distances of a few hundred metres overland between water bodies.⁷² Hence they would not be able to move to or from isolated water bodies. They inhabit seasonal habitats but which retain remnant wetlands during dry periods; they cannot tolerate drought conditions.⁷³ They feed entirely on vertebrates of small to medium body size, primarily birds and mammals, captured either in or next to water.⁷⁴

Yellow Anacondas are relatively slow-breeding compared to many snakes. Sexual maturity is probably reached within two years but is determined by growth rate as well as age.⁷⁵ In the natural state females breed only every second year,⁷⁶ giving birth to between ten and thirty babies.⁷⁷ The lifespan in the wild is probably around ten to twenty years.⁷⁸ As an average each wild female would therefore produce only about 100 to 200 babies in her lifetime (at an average of 20 babies every two years).

Where suitable habitat in Australia exists (notably the Top End) Yellow Anacondas could compete with native semi-aquatic snakes such as the Water Python *Liasis fuscus* which has a similar diet. Small individuals could be preyed upon by larger snakes, crocodiles and predatory birds, but large individuals would likely have no predators. Detection and capture of free-living Yellow Anacondas in suitable habitats would probably be difficult due to their aquatic nature, although during cold weather they become sluggish and bask in the sun (thermoregulating) on exposed logs⁷⁹ and in dry periods they would be concentrated in remnant water sources.

⁶⁷ Lever (2003), *op. cit.*

⁶⁸ Powell *et al* (2011) *op. cit.*

⁶⁹ Krysko *et al* (2011) *op. cit.*

⁷⁰ Waller *et al* (2007), *op. cit.*

⁷¹ Waller *et al* (2007), *op. cit.*

⁷² McCartney-Melstad *et al* (2012), *op. cit.*

⁷³ Waller *et al* (2007), *op. cit.*

⁷⁴ Waller *et al* (2007), *op. cit.*

⁷⁵ Waller *et al* (2007), *op. cit.*

⁷⁶ Waller *et al* (2007), *op. cit.*

⁷⁷ O'Shea (2007), *op. cit.*

⁷⁸ Rivas and Corey (2008), *op. cit.*

⁷⁹ Waller *et al* (2007), *op. cit.*

- **Provide a comprehensive assessment of the potential impact of the species should it become established in Australia**

Yellow Anacondas are large-bodied constricting snakes which feed on small to medium-sized vertebrates, primarily mammals and birds.⁸⁰ They are semi-aquatic, and in their wild range live solely in seasonal wetlands.⁸¹ There are a large number of native and endemic pythons in Australia,⁸² some of which are of similar size to Yellow Anacondas and all of which prey on equivalent food items (small to medium-sized vertebrates). However very few of these species live in wetland habitats, instead being adapted for forested or arid habitats. The only major exceptions are the Olive Python *Liasis olivaceus* and the Water Python *Liasis fuscus* (syn. *Liasis mackloti*).^{83,84} These two species are found across northern Australia where there are seasonal wetlands (floodplains) associated with the monsoons.⁸⁵ This region is probably the only area in Australia where Yellow Anacondas could

potentially establish a wild population. Both these python species have broadly similar lifestyles to the Yellow Anaconda, although neither is as restricted to wetland habitats. It should be noted that both these python species live sympatrically without competition with one another.⁸⁶

Yellow Anacondas prey entirely on vertebrates, primarily birds and mammals, but fish, amphibians, reptiles and bird eggs have also been recorded in their stomach contents in lesser quantities.⁸⁷ The largest recorded food item is the Capybara *Hydrochoerus hydrochaeris*,⁸⁸ a species of large semi-aquatic rodent which can reach an extreme weight of 75kg.⁸⁹ With the major exception of the larger macropods (kangaroos), most native Australian birds and mammals species would fall within their prey size range. Domestic species which could be eaten include young or small hooved animals (i.e. of pigs, goats and sheep), dogs, cats and poultry. However prey is generally taken by ambush from water, and not on land.⁹⁰

If a wild population should become established there would be no impact on the physical environment. Yellow Anacondas do not dig burrows, destroy vegetation, pollute waterways, or spread seeds.^{91,92}

An established wild population of Yellow Anacondas would have no impact on primary industries such as farming or agriculture. In their native ranges they inhabit seasonal wetlands which are used for cattle ranching, but they are no threat to cattle.^{93,94} The monsoonal Top End of Australia is equivalent in agricultural use (cattle ranching). If established elsewhere, Yellow Anacondas would be restricted to wetlands and not farmland or settlements.

Yellow Anacondas would pose no threat to property, and would not be a cause of social nuisance. Like all pythons and boas, the species is non-venomous but can give a nasty bite if antagonised. Anacondas are considered potentially dangerous by virtue of their size, although there are no accepted records of fatal attacks on humans, even by the largest anaconda species, the Green Anaconda *Eunectes murinus*.⁹⁵ Even the FAQ for the "Giant Constrictor Risk Assessment", created by U.S. Geological Survey (USGS) for the U.S. Fish and Wildlife Service (FWS), states that they do not "pose more than minimal risk to human safety" and that "the risk of attack is miniscule".⁹⁶

Yellow Anacondas (and reptiles in general) can be carriers of external parasites such as ticks and internal parasites such as nematodes, all of which can be easily and effectively treated/removed before undergoing quarantine. Protozoal, fungal and especially bacterial infections are frequent in reptiles⁹⁷ but can be treated effectively before importation. Reptiles can also be symptomatic and asymptomatic carriers of infectious viruses which can be passed on to other animal species including humans and domestic species. Marschang (2011) gives an overview of all the forms of viruses which are recorded in reptiles.⁹⁸

Biosecurity Australia has an existing comprehensive set of quarantine requirements for the importation of live reptiles, which covers disease control.

If a wild population were to become established, detection and capture in suitable habitats would probably be difficult due to their aquatic nature, although during cold weather they become sluggish and bask in the sun (thermoregulating) on exposed logs⁹⁹ and in dry periods they would be concentrated in remnant water sources.

⁸⁰ Waller *et al* (2007), *op. cit.*

⁸¹ Waller *et al* (2007), *op. cit.*

⁸² Wilson, S. and G. Swan (2013) "*A Complete Guide to Reptiles of Australia*" New Holland: Australia

⁸³ Wilson and Swan (2013), *op. cit.*

- ⁸⁴ Cermak, M. (2008) *"Spectacular Snakes of Australia"* CSIRO Publishing: Collingwood, Victoria (Australia)
- ⁸⁵ Cermak (2008), *op. cit.*
- ⁸⁶ Cermak (2008), *op. cit.*
- ⁸⁷ Waller *et al* (2007), *op. cit.*
- ⁸⁸ Waller *et al* (2007), *op. cit.*
- ⁸⁹ Patton, J.L., U.F.J. Pardinias and G. D'Elia (eds) (2015) *"Mammals of South America, volume 2: Rodents"* University of Chicago Press: Chicago (USA)
- ⁹⁰ Waller *et al* (2007), *op. cit.*
- ⁹¹ Waller *et al* (2007), *op. cit.*
- ⁹² McCartney-Melstad *et al* (2012), *op. cit.*
- ⁹³ Waller *et al* (2007), *op. cit.*
- ⁹⁴ McCartney-Melstad *et al* (2012), *op. cit.*
- ⁹⁵ Rivas, J.A. (1999) "Predatory attacks of green anacondas (*Eunectes murinus*) on adult human beings" *Herpetological Natural History*, vol. 6 (2): pp 158-160
- ⁹⁶ <https://www.fort.usgs.gov/FLConstrictors/FAQ>
- ⁹⁷ Ebani, V.V. and F. Fratini (2005) "Bacterial Zoonoses Among Domestic Reptiles" *Annali della Facolta di Medicina veterinaria*, vol. 58: pp 85-91
- ⁹⁸ Marschang, R.E. (2011) "Viruses Infecting Reptiles" *Viruses*, vol. 3: pp 2087-2126
- ⁹⁹ Waller *et al* (2007), *op. cit.*

- **What conditions or restrictions could be applied to reduce any potential for negative impacts of the species?**

Importation and transfer of Yellow Anacondas would be limited to recognised zoological facilities as licensed by the respective states and territories. As a containment species, Yellow Anacondas are specifically excluded from import by or transfer to private individuals to keep as private pets.

With the low probability of the species establishing a breeding population in the Australian environment, measures to prevent breeding such as limiting importation to a single sex or to de-sexed individuals are unnecessary and would prevent imported specimens being used to conserve the species in Australian zoos in the future.

- **Summary of proposed activity**

Yellow Anacondas will be used in a variety of ways:

- for captive breeding programmes, in cooperation with other licensed zoos, to further the conservation of the species in captivity;
- for public display as an ambassador for their species;
- to facilitate education of zoo visitors in a range of different areas of learning.

Yellow Anacondas are already held in Australian zoos (currently now only at Darling Downs Zoo but formerly also at the Australian Reptile Park, Australia Zoo, and Bredl's Reptile Park) but numbers and genetic diversity are extremely low. Importation of new stock is important to maintain this species in the Australasian region as a representative of South American wildlife. There are currently only two individual Yellow Anacondas left in Australia (one male and one female). Without new genetic stock the current zoo population of Yellow Anacondas will die out.

The proposed import would initially be of 6.6.0 individuals for three zoos. The intention of the importing facility is to hold 3.3 while the remaining individuals will be held at the other two facilities.

The intention of importing six pairs of Yellow Anacondas is to help achieve and maintain genetic diversity for the species in the Australasian region. The intention is for all imported animals to be from separate bloodlines. Further imports may be undertaken to provide additional genetic stock.

The imported animals will all have been captive-bred in the USA at licenced zoos.

Individual animals will be separated to avoid unwanted breeding. Breeding will be undertaken to order to avoid surplus stock.

- **Guidelines on how species should be kept**

Yellow Anacondas are widely kept privately and in zoos in Europe and North America, and captive care information is readily available. In Australia, the Zoo and Aquarium Association (ZAA) has general guidelines governing the well-being of zoo animals.

Large snakes tend to be sluggish in captivity so the primary consideration in their care is appropriate temperature, humidity level, and UV source. In the case of anacondas a pool of sufficient depth, size and temperature is also required, coupled with proper filtration or regular cleaning.

As predators upon small to medium-sized birds and mammals, commercially-bred animals are an appropriate and safe food source in captivity (e.g. rats, rabbits, chickens).

Transport of imported Yellow Anacondas would follow IATA Live Animal Regulations.

With respect to the importing facility, juvenile Yellow Anacondas would be imported and kept individually in secure, climate-controlled enclosures measuring 2 metres wide by 1.5 metres deep by 1.2 metres high. Each enclosure has solid walls, a locked rear door, is insulated, and has a toughened-glass viewing window at the front. The individual enclosures are contained within a lockable building, and there is no public access to the rear of the displays. The only access into the enclosures is through the door at the rear. In the event of escape from an enclosure, the snake would be confined within the building - the access door to each enclosure opens into an enclosed passageway which is accessed through a locked door. The access doors to each enclosure, and the door to the keeper passageway, are securely locked at all times except when a keeper is physically present. Reptiles are only serviced and handled by fully-trained personnel, there is no public interaction with exotic reptiles within this facility, and the zoo has never had an escape or accidental release at any time.

The zoo premises have 24-hour live-in human security presence, and at night guard dogs patrol the grounds. The entire zoo property is enclosed within a security fence with lockable access gates.

Upon reaching maturity, breeding of Yellow Anacondas by the holding zoos will be either "on request" from other licenced zoos or to ensure continuity of display animals at the holding zoos. To prevent the production of surplus "unwanted" stock, the Yellow Anacondas will be kept separately (individually) when breeding is not required.

- **State/Territory controls**

In Queensland the Yellow Anaconda is listed in Schedule 3 as a Declared Pest under the *Land Protection (Pest and Stock Route Management) Regulation 2003*. This regulation allows the species

to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/L/LandPRPSRMR03.pdf>

In New South Wales the Yellow Anaconda is listed in Category 3a (animals restricted to licenced facilities) under the *Non-Indigenous Animals Regulation 2012*. This regulation allows the species to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

http://www5.austlii.edu.au/au/legis/nsw/consol_reg//nar2012321/sch1.html

In Victoria the Yellow Anaconda is listed in Schedule 2 as a Controlled Pest Animal under the *Catchment and Land Protection Act 1994*. This regulation allows the species to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<http://www.gazette.vic.gov.au/gazette/Gazettes2010/GG2010S399.pdf>

In South Australia the Yellow Anaconda is listed in Category 1 under Schedule 1 of the *Natural Resources Management Act 2004*. The species is allowed to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

http://www.pir.sa.gov.au/data/assets/pdf_file/0003/137460/Declaration_of_Animals_and_Plants_Jan_2015.pdf

In Western Australia the Yellow Anaconda is listed in the Biosecurity and Agricultural Management (Prohibited Organisms) Declaration 2013 under the category C1 as a Prohibited Organism.

<https://www.agric.wa.gov.au/sites/gateway/files/BAM%20Decl%20s22%20%28Prohibited%20Organisms%29.pdf>

There appears to be no specific reference to Yellow Anacondas in the legislation for Tasmania, the Northern Territory, or the Australian Capital Territory.

Biosecurity Australia has an existing comprehensive set of quarantine requirements for the importation of live reptiles, which would cover Yellow Anacondas should they be imported.

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