GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Anolis carolinensis***

Anolis carolinensis **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia		Polychrotidae

Common name green anole (English), Carolina anole (English), rotkehlanolis (German), anole vert (French), anolis verde (Spanish), northern green anole (English)

Synonym
Anolis carolinensis , (Voigt 1832)
Lacerta principalis , Linnaeus 1758 (fide Dumeril & Bibron 1837: 121)
Anolis bullaris , Daudin 1802: 69 (part.)
Dactyloa (Ctenocercus) carolinensis , Fitzinger 1843: 68
Anolis principalis , Gray 1845: 202
Anolis carolinensis , Dumeril & Bibron 1837: 120
Anolis carolinensis , Boulenger 1885: 43
Anolis principalis , Loennberg 1894
Anolis carolinensis , Liner 1994
Anolis carolinensis , Mckeown 1996
Anolis carolinensis , Nicholson *et al*. 2005
Anolis carolinensis seminolus , Vance 1991
Anolis carolinensis seminolus , Collins & Taggart 2009

Similar species

Summary The green anole, Anolis carolinensis is a moderate sized arboreal lizard native to the southeastern United States. Most likely spread through unintentional transport, alien populations have managed to establish on numerous islands in the Caribbean Sea and Pacific Ocean, including the Ogasawara Islands, Japan. Here *A. carolinensis* is thought to have played a significant role in the extinctions and population declines of many species of endemic insects through predation. Projects are underway to manage this species through use of adhesive traps and exclusion fencing, with preventing the spread of *A. carolinensis* to uninvaded nearby islands having priority.

view this species on IUCN Red List

Species Description
Anolis carolinensis is a moderately sized anole with introduced populations on Hawaiian islands ranging from 51 - 76 mm SVL (snout to vent length) (Muensch *et al.*, 2006). On the Ogasawara Islands, males reached a maximum length of 74 mm SVL while females grew up to 60 mm SVL with a tail length about double the individual SVL length (Toda *et al.*, 2010).

Notes
Two subspecies are recognised *Anolis carolinensis carolinensis* (Voigt, 1832) and *Anolis carolinensis seminolus* Vance, 1991 (Reptiles Database 2010).
A. carolinensis is preyed upon by numerous taxa in its home range (Schaefer *et al.*, 2009) including feral pigs (*Sus scrofa*) (Jolley *et al.*, 2010). The invasive brown anole (*Norops sagrei*) also competes with *A. carolinensis*.

Habitat Description
Anolis carolinensis is arboreal and generally uses any type of forested habitat; it can be found in vegetation around urban and suburban areas (Wiles & Guerrero, 1996; Mount, 1975; in Gates & Gates, 2006). It has also been observed using vegetation around water or in wetland situations with Gates & Gates (2006) making an observation of *A. carolinensis* travelling across floating alligator weed, perhaps to feed on invertebrates on the plants or the water surface. A higher shrub density in its native range has been associated with higher *A. carolinensis* abundance (Schaefer *et al.*, 2009).

Reproduction
Ten female *Anolis carolinensis* individuals from Chichijima, in the Ogasawara Islands laid 138 eggs from May to October with the average number of eggs laid per season per female being 13.8 (Noriyuki Komatsu, pers. Comm.; in Toda *et al.*, 2010). Incubation lasts about 40 days (Hasegawa, 2004; in Toda *et al.*, 2010), with the first hatchings strating to appear in June and seen most frequently in September (Toda *et al.*, 2010). The breeding season on the Ogasawaras is thus estimated to extend from April to October, with a maturation period of about 1 year (Toda *et al.*, 2010). The potential longevity of this species is estimated to exceed 7-8 years (Toda *et al.*, 2010).

Nutrition
Anolis carolinensis like other anoles is primarily insectivorous (Muensch *et al.*, 2006). On Chichijima and Hahajima, Ogasawara Islands, a stomach content analysis undertaken by the Japan Forest Technology Association 2005; in Toda *et al.*, 2010) revealed that *A. carolinensis* preyed most frequently on Hemiptera and Coleoptera, as well as Lepidoptera (mainly larvae) and Hymenoptera (mainly ants).

General Impacts
Anolis carolinensis has had the largest impact on the Ogasawara Islands, where increased predation pressure on endemic insect species has played a significant role in the extinctions of species such as the tricolored tiger longhorn (*Xylotrechus takakuwai*), the Ogasawara tumbling flower beetle (*Glipa ogasawarensis*) and the Ogasawara carabid beetle (*Colpodes boninensis*) as well as contributued to the decline of insect pollinators (Abe *et al.*, 2008), endemic odonates (Yoshimure & Okochi, 2005) and diurnal longicorn beetles (Makihara *et al.*, 2004).

Management Info
Please follow this link for a more detailed information on the management of *Anolis carolinensis*. A summary can be found below.
Preventative measures: *A. carolinensis* is likely to be difficult to control in areas where it is widespread and abundant such as the islands of Chichijima and Hahajima in the Ogasawara Islands of Japan (Toda *et al.*, 2010). As such, priority should be given to preventing its spread to nearby islands which still have healthy endemic insect populations (Yoshimura & Okochi, 2005). The chances of *A. carolinensis* finding its way onto ships travelling to these islands has been attempted by intensive trapping at piers and surrounding residential areas (Toda *et al.*, 2010). While a reduction of density was achieved in the area, rapid increases occurred through immigration and highlighted the need for exclusion fencing in key areas (Toda *et al.*, 2010).

Use of Teflon coverings on steel mesh fences have shown to be effective in blocking the movement of *A. carolinensis* in both indoor and field trials, with a number of sites on Hahajima showing positive results from their use (Toda *et al.*, 2010).

Monitoring: The use of 1 x 1m pieces of burlap fabric tied to tree trunks has been shown to be an effective and non-destructive sampling method for *A. carolinensis* and other reptile species in its home range (Horn & Hanula, 2006).

Physical: The primary method used on invaded Ogasawara Islands is the use of adhesive traps placed on tree trunks (Toda *et al.*, 2010). While not as efficient a method such as angling, they are able to provide longer-term continuous pressure on *A. carolinensis* populations; they also do not require the use of food or attractant baits as trunks of trees are frequently used to travel between the tree crown and the ground (Toda *et al.*, 2010).

Chemical: While consumer reptile sprays for use against habu vipers were trialled against *A. carolinensis*, these were not implemented as the risks of negative environmental impacts were too high (Toda *et al.*, 2010).

Integrated management: The exclusion of *A. carolinensis* from specific areas by intensive trapping using Teflon covered fences is necessary to fragment their dispersal range and allow the restoration of endemic species in key locations (Toda *et al.*, 2010).

Principal source:

Compiler: IUCN SSC Invasive Species Specialist Group (ISSG) with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

Review:

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ALIEN RANGE

[1] ANGUILLA
[1] BELIZE
[2] JAPAN
[1] UNITED STATES
[1] BAHAMAS
[2] CAYMAN ISLANDS
[1] NORTHERN MARIANA ISLANDS

BIBLIOGRAPHY
27 references found for **Anolis carolinensis**
Managment information

Horn, Scott; Hanula, James L. 2006. Burlap bands as a sampling technique for green anoles (*Anolis carolinensis*) and other reptiles commonly found on tree boles. Herpetological Review. 37(4). DEC 2006. 427-428
Summary: Available from: http://www.srs.fs.usda.gov/pubs/ja/ja_horn011.pdf [Accessed 2 July 2010]
IUCN/SSC Invasive Species Specialist Group (ISSG)., 2010. A Compilation of Information Sources for Conservation Managers.
Summary: This compilation of information sources can be sorted on keywords for example: Baits & Lures, Non Target Species, Eradication, Monitoring, Risk Assessment, Weeds, Herbicides etc. This compilation is at present in Excel format, this will be web-enabled as a searchable database shortly. This version of the database has been developed by the IUCN SSC ISSG as part of an Overseas Territories Environmental Programme funded project XOT603 in partnership with the Cayman Islands Government - Department of Environment. The compilation is a work under progress, the ISSG will manage, maintain and enhance the database with current and newly published information, reports, journal articles etc.

General information

Abe, Tetsuto; Makino, Shun ichi; Okochi, Isamu, 2008. Why have endemic pollinators declined on the Ogasawara Islands? Biodivers Conserv (2008) 17:1465-1473
Daniells, Esther A.; Jeffrey W. Ackley; Ruth E. Carter; Peter J. Muelleman; Seth M. Rudman; Patrick A. Turk; Nelson J. V�lez Espinet; Lauren A. White and Natalie N. Wyszynski, 2008. An Annotated Checklist of the Amphibians and Reptiles of Dominica, West Indies. Iguana Volume 15 Number 3 September 2008 131
Summary: Available from: http://www.ircf.org/downloads/wwdigitalmembers/Iguana_15-3web.pdf#page=5 [Accessed 2 July 2010]
Eaton, J.M., K.G. Howard, and R. Powell. 2001. *Anolis carolinensis*. Geographic distribution. Herpetol. Rev. 32:118.
Eaton, M. James; Samantha C. Larimer; Katharine G. Howard; Robert Powell and John S. Paramerlee, Jr., 2002. Population Densities and Ecological Release of the Solitary Lizard *Anolis gingivinus* in Anguilla, West Indies. Caribbean Journal of Science, Vol. 38, No. 1-2, 27-36, 2002
Summary: Available from: http://academic.uprm.edu/publications/cjs/Vol38a/38_27-36.pdf [Accessed 2 July 2010]
Gates, William R.; Gates, Anna R., 2006. *Anolis carolinensis carolinensis* (Northern green anole). Behavior. Herpetological Review. 37(3). SEP 2006. 344
Hayashi, Fumio; Shima, Akina; Suzuki, Tadashi, 2009. Origin and Genetic Diversity of the Lizard Populations, *Anolis carolinensis*, Introduced to the Ogasawara Islands, Japan. Biogeography. 11 AUG 20 2009. 119-124.
Integrated Taxonomic Information System (ITIS), 2010. *Anolis carolinensis* Voigt, 1832
Summary: Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=173885 [Accessed 2 July 2010]
Jolley, D. Buck; Ditchkoff, Stephen S.; Sparklin, Bill D.; Hanson, Laura B.; Mitchell, Michael S.; Grand, James B., 2010. Estimate of herpetofauna depredation by a population of wild pigs. Journal of Mammalogy. 91(2). APR 16 2010. 519-524.
Karube, Haruki, 2010. Chapter 20 Endemic Insects in the Ogasawara Islands: Negative Impacts of Alien Species and a Potential Mitigation Strategy. K. Kawakami and I. Okochi (eds.), Restoring the Oceanic Island Ecosystem, 2010; 133 Translated from the Japanese original, Karube H (2009) Global Environmental Research 14:33–38, with permission of the Association of International Research Initiatives for Environmental Studies.
Losos, Jonathan B.; Jane C. Marks; Thomas W. Schoener, 1993. Habitat use and ecological interactions of an introduced and a native species of *Anolis* lizard on Grand Cayman, with a review of the outcomes of anole introductions. Oecologia (1993) 95:525-532
Makihara, Hiroshi; Kitajima, Hiroshi; Goto, Hideaki; Kato, Toru; Makino, Shun ichi, 2004. An evaluation of predation impact of the introduced lizard *Anolis carolinensis* on the endemic insect fauna of the Ogasawara Islands based on insect collection records and feeding experiments, with special reference to longicorn beetles (Insecta: Coleoptera: Cerambycidae) Bulletin of the Forestry & Forest Products Research Institute. 3(2). June 2004. 165-183.
McCoid, Michael James, 1994. Eggs, hatchling sizes, and oviposition sites of lizards on Guam, Mariana Islands. Herpetological Review. 25(3). 1994. 98-100.
Michael, John H. Jr., 2005. *Anolis carolinensis* (green anole). Behavior. Herpetological Review. 36(2). JUN 2005. 170-171.
Muensch, J. Alexander; Penny D. Leininger; Dusty E. Werth; Angela, M. Fawks and Sydney, M. Thomas, 2006. The Anoles of Coconut Island, Kaneohe Bay, Oahu, Hawaii. Iguana Volume 13 Number 3 September 2006. 199
Summary: Available from: http://www.ircf.org/downloads/wwdigitalmembers/Iguana_13-3web.pdf#page=25 [Accessed 2 July 2010]
Okochi, Isamu; Yoshimura, Mayumi; Abe, Tetsuto; Suzuki, Hajime, 2006. High population densities of an exotic lizard, *Anolis carolinensis* and its possible role as a pollinator in the Ogasawara Islands. Bulletin of the Forestry & Forest Products Research Institute. 5(4). DEC 2006. 265-269.
Summary: Available from: http://www.ffpri.affrc.go.jp/labs/kanko/401-2.pdf [Accessed 2 July 2010]
Platt, G. Steven; Jan C. Meerman; Thomas, R. Rainwater, 1999. Diversity, Observations and Conservation of the Herpetofauna of Turneffe, Lighthouse and Glover Atolls, Belize. British Herpetological Society Bulletin. No.66. 1999
Summary: Available from: http://biological-diversity.info/Downloads/Atoll_herpetol.pdf [Accessed 2 July 2010]
Powell, Robert, 2002. *Anolis carolinensis* (Green anole). Herpetological Review. 33(4). December 2002. 321.
Reptiles Database, 2010. *Anolis carolinensis* Voigt, 1832
Summary: Available from: http://reptile-database.reptarium.cz/species.php?genus=Anolis&species=carolinensis [Accessed September 8 2010]
Robison, Henry W.; Rader, Janet, 2005. *Anolis carolinensis carolinensis* (Northern Green Anole). Herpetological Review. 36(4). DEC 2005. 466.
Schaefer, Richard R., Robert R. Fleet, D. Craig Rudolph, and Nancy E. Koerth, 2009. Habitat Selection by *Anolis carolinensis* (Green Anole) in Open Pine Forests in Eastern Texas
Shafer, Valerie, 2000. *Anolis carolinensis* (green anole) Herpetological Review. 31(2). June, 2000. 112.
Toda, Mitsuhiko; Hiroo Takahashi; Naomi Nakagawa and Naozumi Sukigara, 2010. Ecology and Control of the Green Anole (*Anolis carolinensis*), an Invasive Alien Species on the Ogasawara Islands. In Restoring the Oceanic Island Ecosystem
Toda, Mitsuhiko; Yoshida, Tsuyoshi, 2005. Issues and perspectives regarding invasive alien species of amphibians and reptiles in Japan. Bulletin of the Herpetological Society of Japan.(2). 2005. 139-149.

Wiles, Gary J.; Guerrero, Jesse P., 1996. Relative abundance of lizards and marine toads on Saipan, Mariana Islands. Pacific Science. 50(3). 1996. 274-284.
Summary: Available from: http://scholarspace.manoa.hawaii.edu/bitstream/10125/2900/1/v50n3-274-284.pdf [Accessed 2 July 2010]
Yoshimura, Mayumi; Okochi, Isamu, 2005. A decrease in endemic odonates in toe Ogasawara Islands, Japan. Bulletin of the Forestry & Forest Products Research Institute. 4(1). MAR 05. 45-51.
Summary: Available from: http://www.ffpri.affrc.go.jp/labs/kanko/394-3.pdf [Accessed 2 July 2010]