

Green and Black Poison Dart Frog (*Dendrobates auratus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, September 2011

Revised, July 2018

Web Version, 8/29/2018



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1 Native Range and Status in the United States

Native Range

From Somma (2018):

“The green and black dart-poison frog is indigenous to the Central American countries of Costa Rica, Panama, southern Nicaragua, and northern Colombia (Silverstone, 1975; Frost, 1985; Savage and Villa R., 1986; Walls, 1994; Pröhl, 1997; Renjifo, [1997]; Norman, 1998; Campbell, 1999; Duellman, 1999).”

Status in the United States

From Somma (2018):

“These dart-poison [*sic*] frogs are established in Oahu (Oliver and Shaw, 1953; McKeown, 1978, 1996; Smith and Kohler, 1978; Frost, 1985; Walls, 1994, 1998), but are not listed in Frost (2000) or Crother et al. (2001). Until recently there have been no known dendrobatids on Maui, Hawaii (McKeown, 1996), but this latest discovery seems to indicate they are established (Duerr and Hirayama, 2002).”

“*Dendrobates auratus* is a popular species; kept and bred by hobbyists worldwide (Zimmerman[n], 1979; Mattison, 1987a, b; Zimmermann, 1986; Walls, 1994; Davies and Davies, 1997). The Hawaiian populations on Oahu may be the principle source of stock for the commercial pet trade (Walls, 1994, 1998).”

From State of Hawaii Plant Industry Division (2018):

“Animals on the List of Restricted Animals Part B – may be imported for filming or exhibition or for research by zoological parks or for aquaculture production with approval from the Hawaii Board of Agriculture.”

“PART B: FOR PRIVATE AND COMMERCIAL USE

[...]

ORDER Salientia

FAMILY Dendrobatidae

Dendrobates (all species in genus) frog, poison arrow
(poison dart)”

Means of Introductions in the United States

From Somma (2018):

“The green and black dart-poison frog was intentionally introduced to the upper Manoa Valley on Oahu, in 1932, for mosquito control (McKeown, 1978, 1996; Vivarium Staff, 1998). The means of introduction on Maui is not known.”

Remarks

From ITIS (2018):

“Common Name(s): Dart Poison Frog [English]

Green and Black Poison Dart Frog [English]

Green and Black Dart-poison Frog [English]

Green-and-black Poison Dart Frog [English]”

From Solís et al. (2008):

“There is great geographic variation in the appearance of this species; over 15 distinct colour morphs of wild *D. auratus* have been recorded. (Heselhaus, 1992). The blue morph of *D. auratus* present on the Pacific side of Panama is believed to be threatened with extinction (Heselhaus, 1992).”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Taxonomic Status:
Current Standing: valid”

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Tetrapoda
Class Amphibia
Order Anura
Family Dendrobatinae
Subfamily Dendrobatinae
Genus *Dendrobates*
Species *Dendrobates auratus* (Girard 1844)”

Size, Weight, and Age Range

From Somma (2018):

“Size: snout-vent length of 25-42 mm”

From Solís et al. (2008):

“Longevity of at least six years reported in captivity (Zimmermann and Zimmermann, 1994).”

Environment

From Solís et al. (2008):

“It is an arboreal and terrestrial diurnal species of humid lowland and submontane forest. It is also found in dense secondary growth and cocoa plantations (Kitasako, 1967).”

“Terrestrial; Freshwater”

From Twomey and Brown (2017):

“These frogs are mostly terrestrial, though some individuals were observed 50 m up in trees while transporting tadpoles to tree holes.”

Climate/Range

From Twomey and Brown (2017):

“Though mostly distributed in humid lowlands and premontane rainforests from 0-800 m elevation, some montane morphs can be found up to 1200 m elevation.”

Distribution Outside the United States

Native

From Somma (2018):

“The green and black dart-poison frog is indigenous to the Central American countries of Costa Rica, Panama, southern Nicaragua, and northern Colombia (Silverstone, 1975; Frost, 1985; Savage and Villa R., 1986; Walls, 1994; Pröhl, 1997; Renjifo, [1997]; Norman, 1998; Campbell, 1999; Duellman, 1999).”

Introduced

No known introductions outside of the United States.

Means of Introduction Outside the United States

No known introductions.

Short Description

From Somma (2018):

“*Dendrobates auratus* is a small, dark dendrobatid (poison frog), lacking webbing on its feet, with a SVL (snout-vent length) of 25-42 mm (1-1.7 in) (Silverstone, 1975; Zimmermann, 1986; Norman, 1998). Color varies considerably and is usually a black or dark brown, with blotches, spots or bands of color, variable in size and exhibiting varying shades of green, tan, gold, yellow, blue, or blue-white (Silverstone, 1975; Savage and Villa R., 1986; Mattison, 1987a; Walls, 1994; Pröhl, 1997). Most Hawaiian specimens tend to be patterned green or green-gold, but some are blue-white (Walls, 1994; McKeown, 1996). The male's call is a slurred, high, musical "cheez-cheez-cheez" (Silverstone, 1975; Norman, 1998).”

From Schafer (1999):

“*Dendrobates auratus* has many color variants. Most of them are black and either green or light blue, with the black in bands or spots. The Hawaiian frogs are metallic green or brownish-black. The adults are approximately 4 cm long. As is true of most frogs, adults have a fused head and

trunk with no tail. Tadpoles use gills to breathe, unlike the adults, which breathe through lungs. Tadpoles also lack legs and have tails, which is appropriate for their watery habitat. Another important physical characteristic of *D. auratus* is the poison glands located throughout the surface of their body. Their bright colors are believed to encourage predators with color vision to avoid the frogs. The boldly contrasting patterns may be aposematic to predators that lack color vision, although this has not been proven. Approximately 90 alkaloids have been identified from all species of dendrobatids <<Dendrobatidae>>.. [sic] (Myers & Daly, 1976)”

Biology

From Twomey and Brown (2017):

“Adult frogs are diurnal and active during the whole day. In the drier habitats of the Pacific versant, many morphs are inactive during the dry season and dwell the leaf litter only after rain showers. Both sexes tend to be territorial. Females try to monopolize strong males and are very aggressive towards female counterparts. Depositing of eggs and the larval development occurs in the leaf litter. Brood care is done in general by the male. Hatching tadpoles are transported separately by the male to small seasonal pools in tree holes, big leaves, or in small depressions of river rocks. Tadpoles feed mainly on arthropod larvae and tend towards cannibalism if other food is lacking.”

From Solís et al. (2008):

“The species is polygynous; females actively compete for males and attempt to guard their mate from others. The species shows a high degree of paternal care. After oviposition upon leaf-litter the male guards and cares for the clutch of three to 13 eggs (Silverstone, 1975; Schafer, 1981; Heselhaus, 1992). On hatching (13-16 days in captivity) the tadpoles are carried by the male to a stagnant water body in a tree-hole, the leaf axil of a bromeliad (up to 30m from the forest floor), or a small ground pool (Eaton, 1941; van Wijngaarden, 1990). Wild tadpoles feed on protozoans and rotifers, and metamorphose after 39-89 days; in captivity, sexual maturity is attained at between six and 15 months (Eaton, 1941; Silverstone, 1975; Summers, 1990; Zimmermann and Zimmermann, 1994). A reduction in the number of egg clutches and tadpoles maintained by the male results in a more rapid development of the eggs and higher growth rate of tadpoles (Wells, 1978; Summers, 1990).”

Human Uses

From Somma (2018):

“The Hawaiian populations on Oahu may be the principle source of stock for the commercial pet trade (Walls, 1994, 1998).”

Diseases

From OIE (2018):

“[...], Bd [*Batrachochytrium dendrobatidis*] has been identified on six continents, from two amphibian orders, 14 families and in over 350 species. Collectively, it can be stated that most, if

not all, anurans and urodeles are susceptible to Bd infection; morbidity and mortality varies between species. Mortality in tadpoles has not, in the main, been reported (there is one report stating otherwise [Blaustein et al. 2005]) and, to date, viable Bd has not been detected on eggs.”

From OIE (2007):

“Amphibians (all members of the class Amphibia are considered to be susceptible [to *Batrachochytrium dendrobatidis*]).”

Infection with *Batrachochytrium dendrobatidis* is an OIE-reportable disease.

Threat to Humans

From Schafer (1999):

“There are no negative impacts of these frogs on humans, although the skin of these frogs is highly toxic and unprotected contact can be dangerous. Negative Impacts: injures humans (poisonous)”

3 Impacts of Introductions

From Somma (2018):

“Unknown; however, their primarily insectivorous diet could impact native endemic species, if this has not happened already. Hawaii has no indigenous frogs (McKeown 1996).”

4 Global Distribution



Figure 1. Known global distribution of *Dendrobates auratus* in Panama, Costa Rica, Nicaragua, Colombia and the United States. Map from GBIF Secretariat (2017).

5 Distribution Within the United States

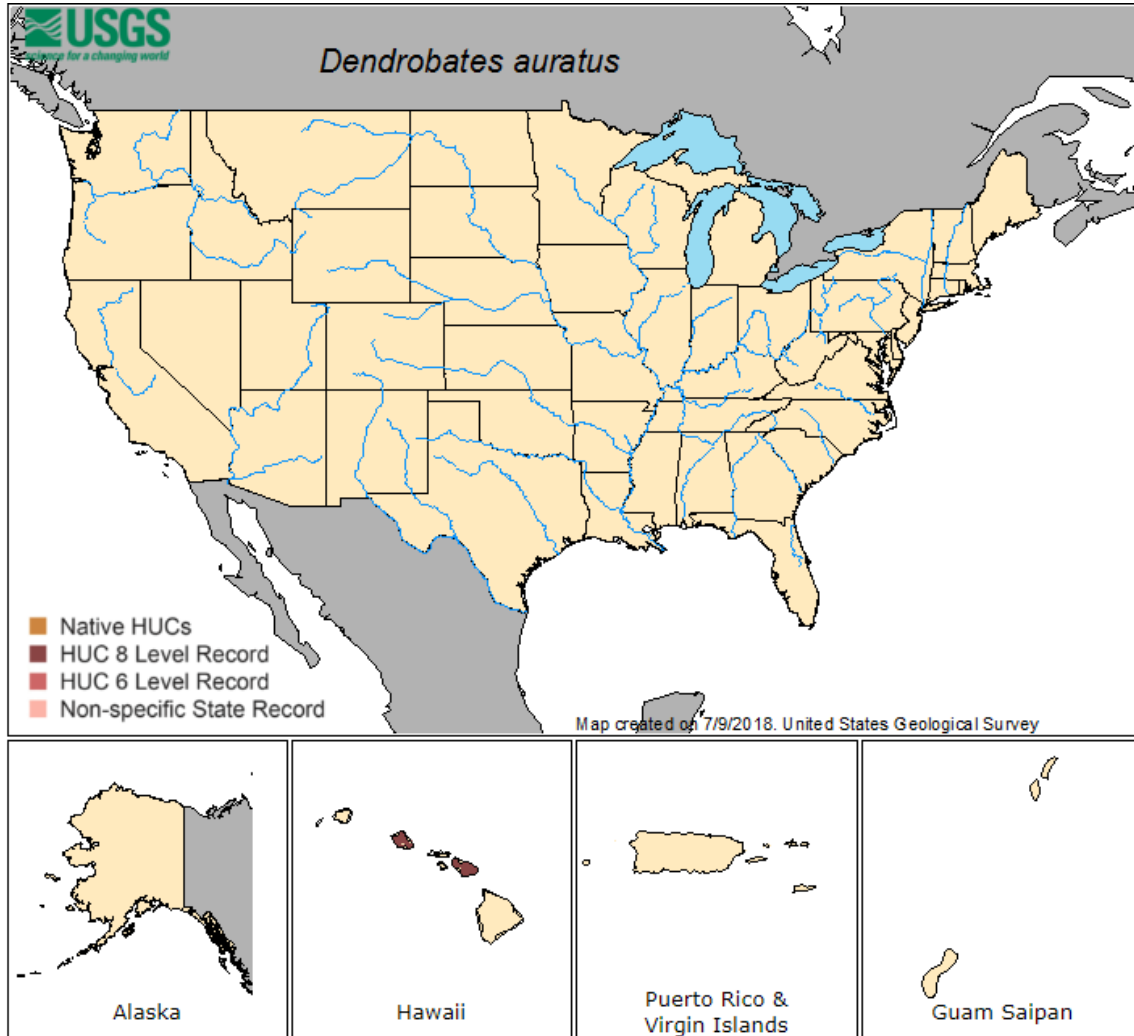


Figure 2. Known distribution of *Dendrobates auratus* in the United States (Hawaii). Map from Somma (2018).

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.000, which is a low score. The range for a low climate match is 0.0 to 0.005 inclusive. No State recorded a medium or high match. The highest match was 5 out of 10 in which there was two matches. The highest matches were located in Southern California, Southern Texas, Southern Louisiana, and Southern Florida. Majority of the United States recorded 0 out of 10.

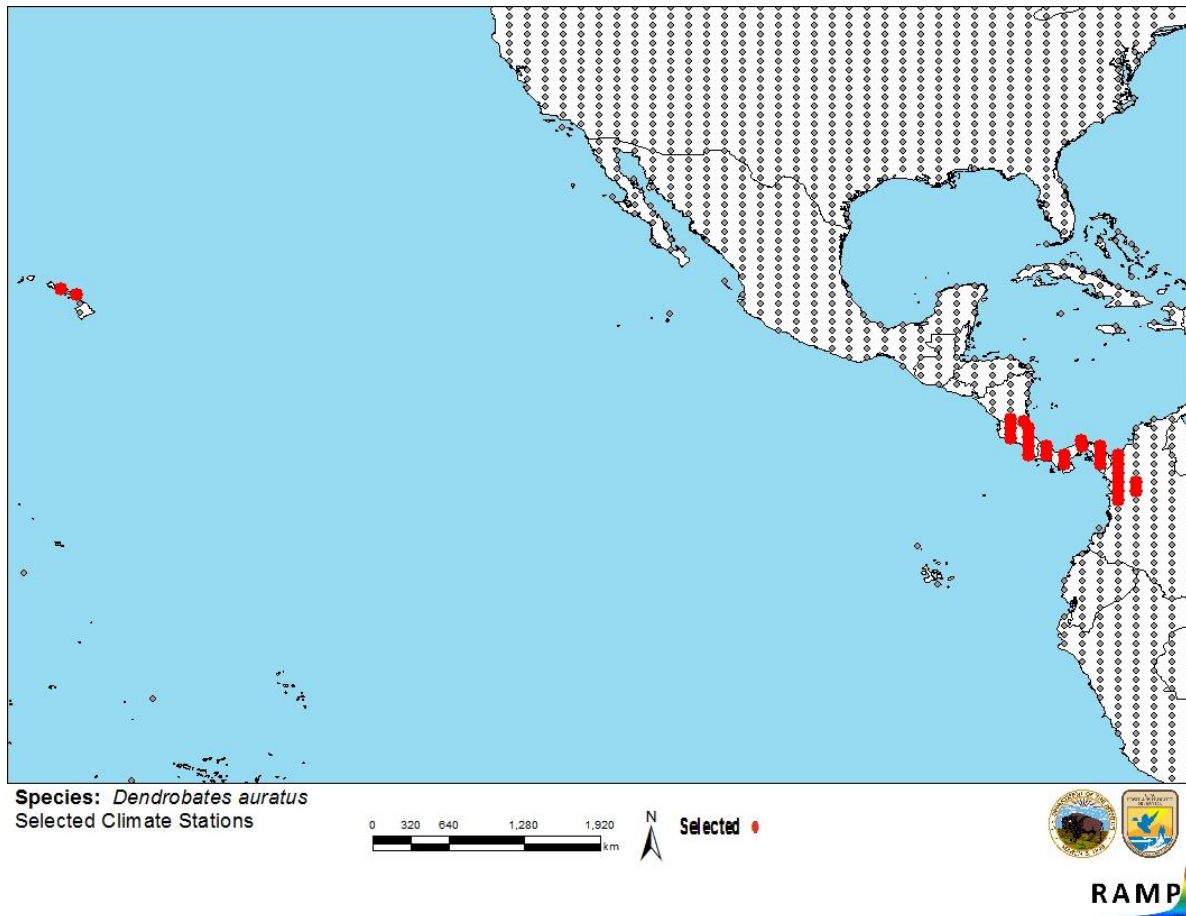


Figure 3. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Hawaii, Nicaragua, Costa Rica, Panama and Colombia) and non-source locations (gray) for *Dendrobates auratus* climate matching. Source locations from GBIF Secretariat (2017).

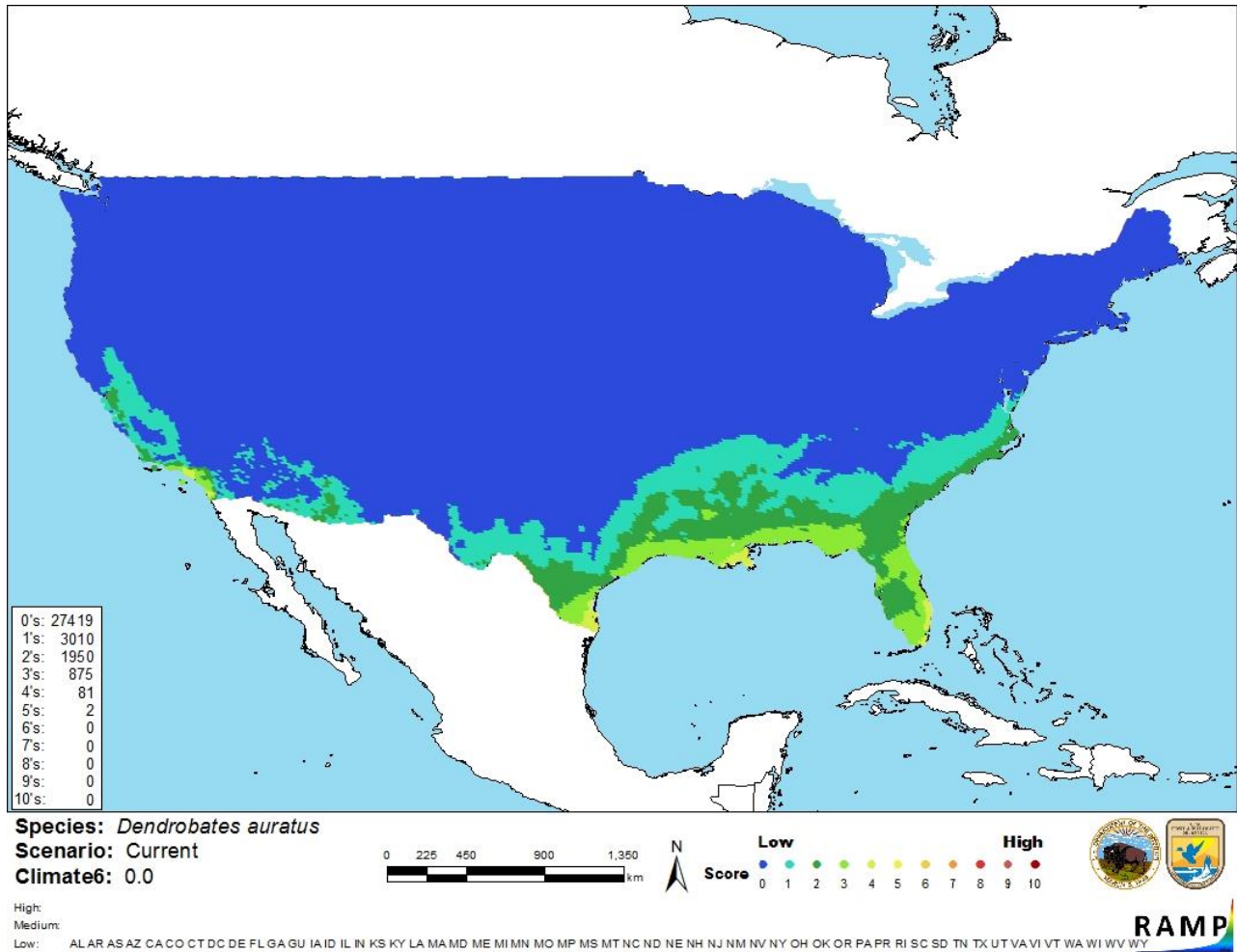


Figure 4. Map of RAMP (Sanders et al. 2018) climate matches for *Dendrobates auratus* in the contiguous United States based on source locations reported by GBIF Secretariat (2017). 0= Lowest match, 10= Highest match.

The “High”, “Medium”, and “Low” climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

A lot is known on the biology and ecology of *Dendrobates auratus*. This species is native to Central America and was intentionally introduced to Hawaii where it is now established. Potential impacts have been stated but no significant impact has been reported. Due to lack of information, the certainty of assessment is low. More information is needed to elevate the assessment to medium or high certainty.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Dendrobates auratus is native to Nicaragua, Costa Rica, Panama and Colombia. It was intentionally introduced into Hawaii for mosquito control. Potential impacts have been mentioned but none reported as of yet. Climate match with the contiguous United States is low with the highest match a 5 out of 10. The highest matches were in the Southern parts of California, Texas, Louisiana, and Florida. Due to lack of information and introduction, the risk for this species is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Low**
- **Certainty of Assessment (Sec. 7): Low**
- **Overall Risk Assessment Category: Uncertain**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

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10 References Quoted But Not Accessed

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

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