Blue Poison Dart Frog Okopipi Facts

(Dendrobates tinctorius or Dendrobates Azureus)

Picture by: John White

Characteristics

The blue poison dart frog or blue poison arrow frog (Dendrobates azureus) is a poison dart frog found in the "forest islands" surrounded by the Sipaliwini Savanna in southern Suriname. Its indigenous Tirio name is okopipi. The name "azureus" comes from its azur blue color. While first described as a valid species and usually recognized as such in the past, recent authorities generally treat it as a morph of D. tinctorius, although a few treat it as a subspecies of D. tinctorius or continue to treat it as its own species. To what extent it differs from the blue D. tinctorius in southern Guyana, adjacent Pará (Brazil) and possibly far southwestern Suriname, also is a matter of dispute, and many herpetologists, as well as many people keeping poison dart frogs in captivity, often have not distinguished these, with all commonly being identified as "azureus". Country distribution from AmphibiaWeb's database shows: Brazil, French Guiana, Guyana, Suriname. This colorful frog was only discovered by scientists in 1968.

These little frogs are easily recognized by their blue color, which is generally darker on the limbs and belly and overlaid with black spots or patches, especially on the head and back.

As their name implies, poison dart frogs can release toxins from the skin that are distasteful and potentially lethal to would-be predators.

Blue poison dart frogs are active during the day and can be found hiding among boulders and debris near streams and among leaf litter on the forest floor; however, they lack toe webbing and are poor swimmers, so they are not found in the water.

Description

The blue poison dart frog is a medium-sized poison dart frog that as an adult frog weighs about 8 g (0.28 oz) and grows to 3.0–4.5 cm (1.2–1.8 in) in snout–vent length. Females are larger and on average about half a centimeter longer than males, but males have larger toes.

Its bright blue skin, usually darker around its limbs and stomach, serves as a warning to predators. The glands of poisonous alkaloids located in the skin serve as a defense mechanism to potential predators. The black spots are unique to each frog, enabling individuals to be identified. In addition to differing in color, blue poison dart frogs also tend to have a distinctive hunch-backed posture and a relatively smaller, more oval (less round) tympanum than in other variants of dyeing poison dart frog. Each foot has four toes, which each have a flattened tip with a suction cup pad used for gripping. The tips of the toes in females are round, while males have heart-shaped tips.

Mating calls, Reproduction and lifespan

The blue poison dart frog breeds seasonally, usually during February or March when the weather is rainy. To find mates, the males sit on a rock and produce quiet calls, which the females follow to track down the males. The females then physically fight over a male. The male takes the female to a quiet place by the water, which becomes the site of the egg-laying. Fertilization occurs externally; once the eggs are laid, the male covers them in his sperm.

Between five and ten offspring are produced at each mating. Eggs are laid in the male's territory, which he defends. The male takes care of the eggs, sometimes joined by the female. The eggs hatch after 14 to 18 days, and after 10 to 12 weeks the tadpoles are fully mature. After the eggs hatch, the parents transfer tadpoles to individual pools of water, where they finish development.

Another source gives this description:

Mating behavior starts with the male calling from his position in tree leaves or on the ground. The female is attracted by his calls and strokes the male's snout and back in a typical poison frog courtship sequence. The male then leads the female to his chosen spot, where a clutch of 2-6 eggs are laid, and attended to, in most cases, by the male, but also sometimes by the female. The eggs hatch within 14 to 18 days, and the tadpoles are carried to water pools within bromeliad or other plant leaf axils or crevices by both the female and the male.

The tadpoles have a long tail, about 6 mm, with a total length of around 10 mm. They lack legs and have gills instead of lungs. Both sexes reach sexual maturity at two years of age.

The expected lifespan of D. tinctorius "azureus" is between 4 and 6 years in the wild and about 10 years in captivity. At the National Aquarium in Baltimore MD, one frog in captivity even lived to be 23!

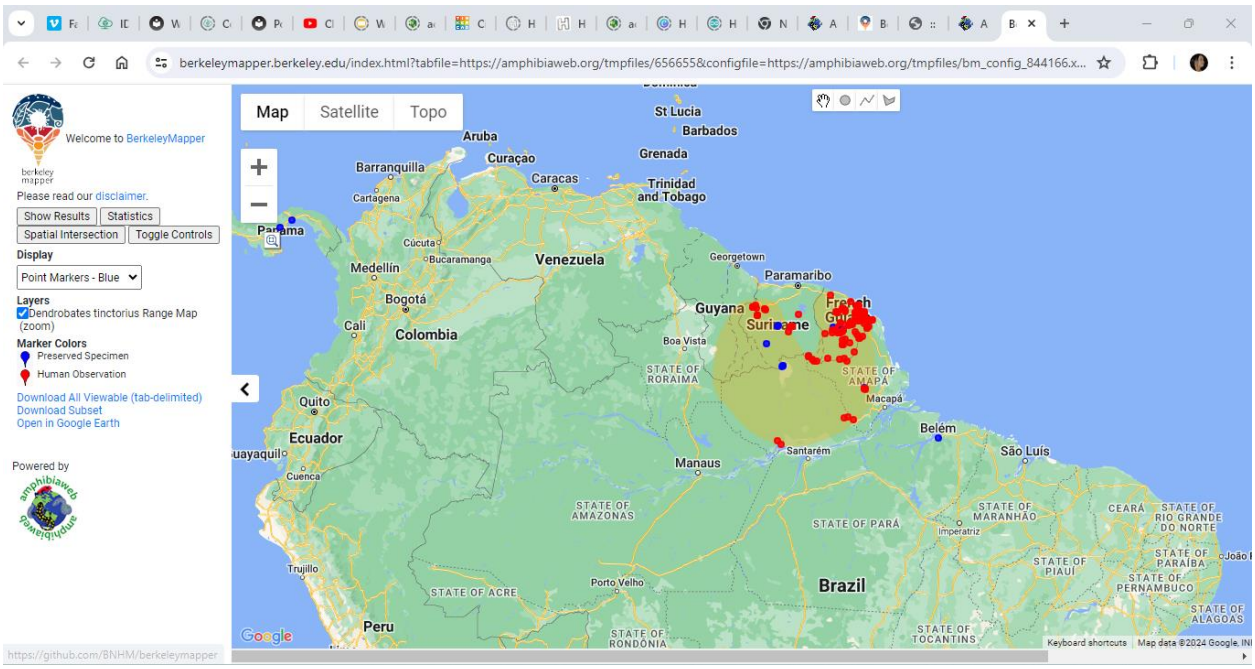
Distribution and Habitat

These frogs are found in a few isolated “rainforest islands” in the Sipaliwini savanna of southern Suriname…. The blue poison dart frog lives in a few isolated patches of relic rainforest habitat.

The habitat is remote and difficult to reach, so accurate population monitoring is a challenge. Regardless of numbers, this species is highly vulnerable to both human activities and natural factors, such as drought, due to its extremely small range and isolated populations

It is found in humid, wet forests, requires rocky streams of running water, which are relatively cool, with temperatures dropping up to 22-27 degrees C at night. Dendrobates tinctorius is found under cover, such as rocks and moss, near streams. It usually stays on the ground, but is also found at heights up to 5 m in trees.

View distribution map in BerkeleyMapper.



Predators: Warned by the bright color patterns

Adult dart frogs have few predators, but the tadpoles, which contain no toxins, often fall prey to other amphibians, reptiles, and predatory invertebrates.

The startlingly bright colors and intricate patterns of Neotropical poison frogs are icons of warning coloration. Barnet et al. (2018) show in a recent paper that at least in Dendrobates tinctorius, the bright color patterns may simultaneously scream "Here I am!" to nearby would-be predators, yet be relatively undetectable to predators farther away. They measured the frog's complex patterns of yellow and blue on a black background as perceived by different types of potential predators (reptiles, birds, mammals). Using a machine learning algorithm, they assessed the ability of different visual systems to discriminate D. tinctorius from a leaf litter background at different distances. Close up, discrimination by each visual system was highly accurate, but far away, discrimination declined dramatically. In the field, they used model frogs with different color patterns to show that cryptic (brown and black) models had fewer predation attempts against a natural leaf-litter background, whereas background did not affect the attack rates on purely aposematic (bright yellow) models. The tinctorius color pattern also had lower attack rates against the natural background, indicating an element of protective camouflage. Experiments with human "predators" trying to find frogs on a computer screen showed the tinctorius color pattern was just as aposematic as the bright yellow morph close-up, but from a distance was just as hard to see as cryptic coloration. They conclude a kind of perceptual averaging occurs, in which the different colors of the intricate pattern blend together at a distance, making the frogs virtually invisible in their natural background (Written by Kyle Summers).

Behavior

This species is diurnal. The animal behavior is characterized by activity during the daytime, with a period of sleeping or other inactivity at night.

The blue poison dart frog is a terrestrial animal, but, as an amphibian, stays close to water sources. These frogs spend most of their active hours hopping around in short leaps, looking for insects. A constant forager, this frog is always searching for mites, termites, tiny beetles, and any other small insect it may find among leaf litter. They are very territorial and aggressive, both towards their own species and others, much like other poison dart frogs. To ward-off intruders, they use a series of calls, chases, and wrestling.

Diet related to skin toxicity

Although poison dart frogs are known for their skin toxins used on the tips of hunting-arrows of natives, in reality, only the species of the genus Phyllobates are used in this manner. In nature, poison dart frogs consume specific insects, such as small beetles or ants, which contain formic acid (among other alkaloids), something the frogs are able to metabolize and retain as a defense mechanism. Thus, all captive and captive-bred dart frog specimens, including wild-collected individuals, lose their toxicity as a result of a change in diet.

The blue poison dart frog feeds on fire ants and insects which may have poisonous chemical which makes the blue poison dart frog poisonous. Other than that it also feeds on beetles, flies, mites, spiders, termites, maggots, and caterpillars.

Relation to Humans: trade and technology in research

Traditional indigenous

In the indigenous culture, the poison dart frog can be seen in rock carvings, wood carvings, and items of cultural expression. In addition the expression poison dart frog comes from the custom of indigenous to hunt with arrows that have been rubbed against the skin on the back of these frogs. The toxicity of the dart sedates the prey when caught but is not enough to poison the food source.

Trade and captive breeding

The brightly colored Dendrobates tinctorius is popular in the pet trade, many of which are captive bred.

Applications of research and technology

Technology is also giving more insight in the existence of the poison dart frogs. Here 2 examples of application of tiny radio transmitters to capture the distribution of tadpoles and research in chemical biology through the MasSpec Pen to capture skin extracts.

The larvae-toting parental care of many species of the Family Dendrobatidae is known to be an effective way to ensure tadpoles have food and protection while they develop. A study by Pašukonis, Loretto and Rojas (2019) asked further about the role of this parental shuttling in dispersal. With tiny radio transmitters, they tracked two poison frog species (Ameerega trivittata and Dendrobates tinctorius) and found that they

moved their offspring farther and to many more water sources than expected, with little regard to suitable, nearby pools. Examining the spatial patterns of the far-ranging fathers, the authors speculate on the adaptive benefits of ensuring the dispersal of their offspring to reduce competition and possible inbreeding against the increased costs and risks associated with long-distance travel. Their study highlights the parental role in offspring dispersal and the spatial acuity of these poison frogs (Written by Michelle Koo, 28 October 2019.)

Early studies to identify chemicals in poisonous frogs from South America were hampered by the limited resolution of mass spectrometry tools in the 1970s. Skin extracts from several hundred frogs were needed for scientists to obtain enough of a single compound to reveal its chemical structure. Over the following 20 years, advances in the sensitivity of these tools revolutionized the ability to describe the chemical structure of compounds new to Western science using only tiny quantities. A new tool allows even more innovative research into the chemical biology of amphibians. Krieger et al (2022) report an adaptation of the MasSpec Pen that allows real-time quantification of alkaloids and metabolites on frog skin that does not require biopsies or euthanasia. The MasSpec Pen is a hand-held device that, when pressed onto amphibian skin for 10-15 seconds, dissolves skin secretions into a droplet of solution containing water and a small amount of ethanol. The pen then ports the sample through a tube into a mass spectrometry machine where compounds are ionized and researchers can determine their identities. Such a tool can be valuable in repeated sampling of the same individuals, and future adaptations of the tool could even allow real-time sampling in the field. (Written by Rebecca Tarvin)

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