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POISON DART FROGS

Granular Poison Frog

Oophaga granulifera

Oophaga granulifera is a small, diurnal poison dart frog of 19-22 mm from the Pacific side of Costa Rica and the far west of Panama. The skin is distinctly granular, the back red, orange or olive-green, and the legs and belly blue-green to turquoise. The species lives along shaded forest streams, and the female feeds her tadpoles with unfertilised eggs.

Family: Dendrobatidae Former name: *Dendrobates granuliferus*

KEY FACTS

THE ANIMAL

Adult size	**19-22 mm** snout-vent length
Lifespan	**6 years**
Active	**By day**
Lifestyle	**Terrestrial**
Habitat	**Rainforest**
Skin toxins in the wild	**Mild**
Skin toxins in captivity	**None** Captive-bred animals. Wild-caught animals can keep their toxins for a long time
Difficulty	**Experienced**

CARE

Min. enclosure	**80 × 40 × 40 cm** L × W × H for 2 adults
Temperature, day	**21-25 °C**
Temperature, night	**17-21 °C**
Humidity	**80-100%**
Water	**Water dish** depth 1-2 cm
UVB	**Optional** Ferguson zone 1
Diet	**Small invertebrates (springtails, fruit flies)**
Kept	**In pairs**

BREEDING

Reproduction	**Egg-laying**
Development	**Tadpoles carried to water**
Egg-laying site	**On the ground**
Sexually mature	**12-18 months**
Eggs per clutch	**2-5**
Hatching	**19-20 days**
Larval period	**87-212 days** from hatching to metamorphosis
Larval diet	**Unfertilised eggs from the female**
Parental care	**Guards the eggs, carries the tadpoles and feeds the tadpoles with eggs**

PROTECTION AND PAPERWORK

CITES	**Appendix II**
IUCN	**Vulnerable (VU)**

About the species

Oophaga granulifera is a small to medium-sized frog in the genus *Oophaga* and grows to 19-22 mm from snout to vent. The name comes from the Latin word for grain and points to the skin, which is strongly granular. The back and forelimbs are red to orange-red or yellow to olive-green. The lower back, belly, hind legs and forefeet are turquoise, mint green, blue-green, blue-grey, pale green or white, in some forms also uniformly red. Around Quepos there is a form in which the orange is replaced by olive-green. The local forms are named after the localities, for example 'Quepos', 'Golfito', 'Dominical', 'Baru' and 'Corcovado'.

The species was described in 1958 by Edward Taylor as *Dendrobates granuliferus* and was moved to *Oophaga* in 1994. Genetically it stands relatively isolated and is regarded as the most basal in the genus: it is less closely related to the other *Oophaga* species than they are to each other. Behaviour and parental care most resemble *Oophaga pumilio*, but *O. granulifera* is far shyer and lives more secretively. The male spends most of his time and energy defending his calling site, above all with sound; if another male comes too close, it can end in a fight.

In the wild the skin is toxic. As in other poison dart frogs, the toxin comes from the diet, and the bright colours warn predators. Frogs that grow up on ordinary feeder insects do not produce toxin. How strong the toxin is in wild animals of the species is not known, so wash hands after working in the enclosure.

Distribution and habitat

Oophaga granulifera lives on the Pacific side of Costa Rica and Panama: from Parrita in the province of Puntarenas south to the Osa Peninsula and Golfito and on into westernmost Panama (the province of Chiriquí). The type locality lies north of the Río Diquís, near Palmar Norte. By far the most known records come from Puntarenas, and the species is found, among other places, in Corcovado National Park, Piedras Blancas National Park and the Golfito reserve. The known population on the Caribbean side of Costa Rica has probably been introduced and descends from the Osa form.

The range is smaller than 20,000 km². The species is listed as Vulnerable because the forest is cleared for oil palm, banana and pineapple plantations, because pesticides follow, and because collection for the pet trade can pull local populations down. The species fares worse in cultivated landscape than *Oophaga pumilio*. It can be found in extensively managed plantations and secondary forest, but does not survive in the intensively managed palm plantations.

> **Native range:** Costa Rica and Panama.

HABITAT

Oophaga granulifera is a purely lowland animal, living from sea level up to 100 m and in some areas up to 600 m. It lives in the leaf litter of primary forest or old secondary forest. It is tied to small and medium-sized, shaded streams that have cut down into volcanic rock, so that the brook lies in a gorge of blocks and slabs. In the horizontal crevices between the stones, 0.5-2 m from the water, the frogs find shelter. Arum plants such as *Dieffenbachia* always grow nearby; the leaf axils are used as breeding plants. The character of the stream determines occurrence more than the forest itself: at streams without the large, fissured rocks the species has not been found.

The climate is tropical and very humid, with a distinct rainy and dry season. The dry season falls in the winter half-year, and the rains begin around May. In the dry season the frogs retreat to the streams, hide in moist crevices and under roots, and are active only early in the morning, about 6-9 am. When the rain comes, they are active all day, the males call, and the species is abundant. In the middle of the heavy rainy season, when the streams swell, they withdraw again, and a new period with many calling males follows from the end of August. Humidity close to the streams seldom falls below 80 % even in the dry season. Because the species lives along cool, shaded streams, it tolerates heat poorly.

Read more: Humidity, misting and ventilation

Care

THE ENCLOSURE

Little is known about the husbandry of *Oophaga granulifera*, and the species is rare in the hobby. Husbandry is based on the habitat, cool and shaded lowland streams where the frogs live among stones and leaf litter, and on *Oophaga pumilio*, which has the same behaviour and parental care. *Oophaga sylvatica* and *Oophaga lehmanni* follow the genus's pattern and are better known in captivity. In the same area as *O. granulifera* live *Phyllobates vittatus* and *Dendrobates auratus*, which are far better known in the hobby.

A rainforest enclosure of at least 80 × 40 × 40 cm (length, width, height) suits one pair. In the wild the animals live in pairs, and a pair is also the best way of keeping them in the enclosure. The young can stay with the parents for about a year. Use a drainage layer of expanded clay pebbles under a mesh and above it unfertilised soil or coconut fibre. Lay a thick layer of dry oak or beech leaves on top. Preferably build a rock section of slate and flat stones with horizontal crevices of 1-2 cm, imitating the stream's rock blocks. Cork bark, plants and especially medium-sized bromeliads and arum plants with water in the leaf axils provide places where the female can deposit tadpoles. Slanted film canisters with a little water are an alternative and can be moved without disturbing the animals.

The enclosure must have ventilation at the front and top so that the air does not stand still, but humidity must stay high. The mesh must be fine enough that the feeder insects do not escape.

Read more: Terrarium construction and bioactive substrate Read more: Rearing tadpoles

TEMPERATURE

The daytime temperature should be 21-25 °C, and the frogs are most active at 20-22 °C. At night the temperature should fall by 4-5 °C, to about 17-21 °C. Seasonal variation is minimal, about 1-2 °C. The species lives along cool, shaded streams and is very sensitive to heat: the daytime temperature must not exceed 25 °C. Place the enclosure in a cool room without direct sun, and use LED lighting that does not give off heat. If the room is warm, a fan over the enclosure's ventilation opening and regular misting help. Warning signs are a frog sitting still in the open and loose, dark skin. Heating is rarely necessary; a thermostat-controlled heating cable can be used if the room is colder than 20 °C.

Read more: Heat and temperature

HUMIDITY AND MISTING

Humidity should be 80-90 %, and 100 % early in the morning and late in the day when the enclosure is misted. Even in the dry season humidity along the streams rarely falls below 80 %, and that is also the lower limit for the enclosure. Mist twice a day with soft water (rainwater, reverse-osmosis water or dechlorinated water), and preferably use a rain or mist system. The leaf litter must be damp all the time without standing in water, and the substrate layer must never dry out. If the enclosure is too dry, the animals retreat into hiding and stop eating. If the air is too stagnant and too wet, mould and bacterial growth can arise. The species has a natural dry season and rainy season; a period of slightly less misting followed by heavy rain corresponds to the rhythm of the year, but is not documented as a breeding trigger in captivity.

WATER AND WATER QUALITY

A shallow water dish of 1-2 cm depth, for example a low bowl sunk into the substrate or a water section between the stones, provides drinking water and humidity. The frogs are poor swimmers, so the water must be shallow enough for them to stand on the bottom. Use rainwater, reverse-osmosis water or dechlorinated tap water, and change it every day or every other day. Amphibians absorb water and substances through the skin, so there must be no residues of soap, chemicals or pesticides on the dish, the plants or the decor. If breeding is intended, there must be water in the leaf axils of bromeliads or in small containers: the tadpoles live in very small amounts of water, in the wild about 2-3 ml per axil, and the water in them must be kept clean and refreshed regularly.

LIGHTING AND UVB

The species lives on the shady forest floor, so the light must first and foremost cover the plants' needs. Use LED or fluorescent tubes with high efficiency, preferably about 6,500 K, 10-12 hours a day; this fits the day length in Costa Rica near 9° north. No need for UVB is documented, and UVB is therefore optional; a weak UVB light in Ferguson zone 1 can be used if the enclosure has sufficient cover. The light source must not heat up the enclosure, as the species is sensitive to heat.

Read more: Lighting and UVB

FEEDING

Adults are fed small, flightless fruit flies, springtails, newly hatched micro crickets, the smallest waxworm larvae and field plankton. In the wild the genus feeds on ants and mites, and that is where the toxin comes from; in captivity the animals do not get that diet and therefore do not become toxic. Feed adults every other day, and young daily. Dust the feeder insects with calcium and a vitamin powder intended for amphibians, weekly for adults and at every other feeding for young animals. The feeder insects must be small: the young are very small and need springtails or newly hatched crickets. Keep your own cultures of fruit flies and springtails so that there is always enough food. Remove dead feeder insects from the enclosure.

Read more: Feeder animals: keeping and breeding Read more: Calcium, vitamins and supplements

BEHAVIOUR AND HANDLING

Oophaga granulifera is shy and lives very secretively, especially in the dry season, when it almost completely shuts down. The males defend a calling site and call mostly in the rainy season; fights are rare and follow sound signals. If two males are kept together, stress and fighting must be expected. A pair is the safest way of keeping them, because the animals also live in pairs in the wild. The frogs must not be handled: the skin is sensitive, and handling stresses them. If an animal has to be moved, use a clean, moistened plastic container. Always wash hands before and after working in the enclosure. The species is diurnal, but shows itself less if there are not many hides.

Breeding

SEXUAL MATURITY AND SEXING

Sex differences are small, and males are most reliably recognised by the call, which they use mostly in the rainy season. The animals become sexually mature after 1-1.5 years. A reliable pair is obtained by letting the animals grow up together.

MATING

Breeding is tied to the beginning of the rainy season around May, and a new period of calling males follows from the end of August. Mating resembles *Oophaga pumilio*: the male calls from his calling site on the forest floor, the female approaches, and the pair seeks a hide where the eggs are laid. In the dry season there is no water in the leaf axils of the plants, and there is almost no breeding. A drier period followed by heavy misting corresponds to the rhythm of nature, but is not known as a breeding trigger in captivity.

EGGS AND TADPOLES

The female lays 2-5 eggs, most often 3-4. The eggs are laid in rolled-up dead leaves, under stones, in branch forks or in leaf axils just above the ground. The male guards the eggs and keeps them moist with his urine. When the eggs hatch, the female carries the tadpoles one at a time up to small pools of water: hollows in trees and the leaf axils of arum plants such as *Dieffenbachia* and bromeliads, one to two metres above the ground. The amount of water in them averages only 2-3 ml. The female returns regularly and lays unfertilised eggs in the water, on which the tadpole lives. Provide small leaf axils or film canisters at different heights and let the parents look after them.

METAMORPHOSIS

The eggs hatch after 19-20 days. The development of the tadpoles takes a long time, 87-212 days, and can stretch into the dry season. Rearing by the parents is the safest. Artificial rearing is possible, but difficult; the procedure is the same as for *Oophaga pumilio*, where each tadpole lives alone in a small container and is fed regularly. When the forelimbs emerge, the tadpole must be able to get out of the water: lower the water level and provide a sloping surface with damp moss, so that the little frog can leave the water without drowning.

REARING THE YOUNG

The newly metamorphosed froglets are very small and need the smallest feeder insects: springtails and newly hatched crickets, later small fruit flies. Feed daily and dust the food with calcium and vitamins. The young can stay with the parents for about a year if there is enough space and no sign of fighting. Move them if the parents begin to chase them. Give them a humid vivarium with many hiding places. Growth is not described for the species and is probably similar to *Oophaga pumilio*. Lifespan is about 6 years.

Health and common mistakes

There are no known diseases specific to the species. The list applies to poison dart frogs in general and the particular conditions for a species from cool streams:

- Heat stress: daytime temperatures above 25 °C and poor ventilation stress the species and weaken the immune system. Cool the enclosure at once.
- Desiccation: humidity that is too low and a dry substrate layer cause lethargic, sunken animals that stop eating. Mist and moisten the substrate.
- Calcium deficiency and malnutrition: too few or too uniform feeder insects and a lack of calcium cause deformed limbs and paralysis. Add calcium and vitamins and vary the food.
- Fungal and bacterial infections (including chytrid fungus): reddening, injured or flaking skin, lethargy and weight loss. Quarantine new animals for at least 6 weeks, and use clean equipment.
- Parasites (for example roundworms): weight loss despite a good appetite.

Contact a vet with knowledge of amphibians if a frog does not eat for several days, is lethargic or has obvious sores. Treatment is difficult, so prevention is most important.

Read more: Quarantine and hygiene

Always ask someone who knows

This guide is a good place to start, but it cannot replace experience. Animals differ, and much of what matters most is learned from people who have kept the species for years. Talk to a breeder, an experienced keeper or a vet who knows reptiles and amphibians before you get the animal - and again if anything looks wrong.