

Basic information and care recommendations  
for *Phyllobates terribilis*,  
Golden Poison frog





# Contents

1. **Profile**
2. **Why is *Phyllobates terribilis* a Citizen Conservation Species?**
3. **Biology and Conservation**
  - 3.1 Biology
  - 3.2 Threat situation
  - 3.3 Conservation efforts
4. **Husbandry**
  - 4.1 Requirements and documentation obligation
  - 4.2 Transport
  - 4.3 The terrarium
  - 4.4 Water chemistry, technology and temperatures
  - 4.5 Feeding
  - 4.6 Socialisation
  - 4.7 Breeding
  - 4.8 Rearing
  - 4.9 Problems
5. **Further Reading**



# 1. Profile

**Scientific Name:** *Phyllobates terribilis* (MYERS, DALY & MALKIN, 1978)

**Common names:** Golden Poison Frog, rana dorada venenosa, rana dardo dorada (Spanish)

**Head-torso length:** 4,5–4,7 cm

**CC#Amphibians-Category:** III, also suitable for experienced beginners

**Endangered status according to the IUCN Red List:** endangered

**CITES protection status:** Appendix II

**Protection status EU species protection regulation:** Annex B

**Keeping facilities:** Rainforest terrarium of at least 50 x 50 x 50 cm for groups of approx. 5 animals; temperature gradient between 22 and 32 °C; lighting with e.g. fluorescent lamps or LED bars, possibly a heat island with spotlights; high humidity with several daily sprinklings; winter rest period with slightly cooler and drier housing

**Equipment required:** Dense planting; structural elements such as roots; egg deposition sites, e.g. spawning houses, film cans, halved coconut shells; atomiser or sprinkler system; aquarium, e.g. 60 x 30 x 40 cm, or plastic boxes for rearing tadpoles

**Feeding:** Well-fed food animals for the frogs (*Drosophila*, crickets, oven fish, cockroaches, bean beetles etc.) dusted with vitamin-mineral powder, fish flake food and pellets for the tadpoles.





## 2. why is *Phyllobates terribilis* a citizen conservation species?

*Phyllobates terribilis* is listed as „endangered“ on the Red List of the World Conservation Organisation. The species only inhabits a small distribution area, the population is in constant decline and the habitat is threatened by deforestation, conversion to agricultural land, mining activities and environmental pollution from pesticides (IUCN SSC AMPHIBIAN SPECIALIST GROUP 2017).

The international terrarium populations of this frequently kept and bred species are relatively large. However, there has been a lack of coordinated conservation breeding to date. In many cases, it is unclear whether the terrarium animals are pure *Phyllobates terribilis* at all. In the past, the frogs were regularly confused with *P. bicolor*, and hybridisation also occurred.

Citizen Conservation is working on building up an ex-situ population of confirmed pure-bred animals. Genetic studies to clarify the origin of the animals and their relationships are planned and have already been carried out in some cases.

Due to the threat situation in the wild, a reserve population outside the species' native habitat makes sense in any case. In order to ensure the long-term conservation and a good demographic and genetic structure of such an ex-situ population, the populations must be coordinated. This has hardly been done in terraristics to date. Citizen Conservation wants to contribute to this goal in the future.

*Phyllobates terribilis* is particularly well suited to telling exciting stories due to its exceptional toxicity (in the wild; captive-bred specimens are non-toxic) and its traditional use for poisoning arrows by the indigenous population, thus arousing interest in amphibians and the threats they face. The frogs also make excellent show animals and excellent ambassadors for this group of animals due to their attractive appearance and their display-friendly behaviour.



In the past, *Phyllobates terribilis* has often been confused with the closely related and similar-looking *P. bicolor* (pictured here).  
| Dirk Ercken, Shutterstock



## 3. Biology and conservation



Habitat of *Phyllobates terribilis* near Joaquincito, Colombia  
| Björn Encke

### 3.1 Biology

The Golden Poison frog is one of only five representatives of the genus *Phyllobates*, which is categorised in the subfamily *Dendrobatinae* within the poison dart frog family (*Dendrobatidae*). The *Phyllobates* species live in lowland rainforest areas in northern South America west of the Andes and in Central America. They are relatively large poison dart frogs. They are characterised by strong yellow lateral stripes (which in *P. terribilis* and *P. bicolor* largely displace all other colourations in adults and turn almost the entire animal yellow to orange) and by the fact that their skin venom contains batrachotoxin, one of the strongest known animal poisons.

The two Central American species *P. lugubris* and *P. vittatus* are more closely related to each other than to their South American congeners, and among these, *P. terribilis* is more closely related to *P. bicolor* than to *P. aurotaenia*. *Phyllobates terribilis* and *P. bicolor* look very similar. The *Phyllobates* species are genetically clearly separated from each other, but can still be crossed.

*Phyllobates terribilis* only occurs in less than five small areas in the catchment area of the Río Saija as well as the Río Naya and in Boca Yurumanguí in the Colombian Departamento de Cauca. The total extent of the area in which the known sites are located is only 1,475 square kilometres (IUCN SSC AMPHIBIAN SPECIALIST GROUP 2017).

*Phyllobates terribilis* inhabits hot and very humid, hilly lowland rainforest areas from 30-400 metres above sea level. The annual precipitation is around 4,000 mm - for comparison: in Manaus in the Brazilian Amazon it is only 2,300 mm per year, in Berlin 580 mm. The Golden Poison frog lives in the ground leaf layer of both primary and secondary forests near rivers on hills or on hilltops.



Golden Poison frog in habitat | Björn Encke

Large females reach 4.7 cm in length, the males remain somewhat smaller at 4.5 cm. The colouring of adult animals is almost uniformly golden yellow to yellow, orange or greenish yellow, sometimes also mint green or cream with a tinge of turquoise. Some animals have black feet, others are uniformly yellow in colour. Apparently, different colouration types occur side by side at the few localities, albeit with varying frequency. At the type locality Quebrada Guanguí - i.e. the place from which the animals originated that were first used to scientifically describe the species in 1978 - MYERS et al. found a majority of uniformly yellow or yellow-orange coloured frogs in 1978, but also some that were intensely orange or pale yellow-green. Interestingly, although these different colour variants came from one area, the frogs were all the same colour on one slope or ridge area. The second site, La Brea, only 15 kilometres away, presented a different picture. Most of the animals found there were mint green in colour; they also came from an area directly by the river. Two animals

caught a little further inland were again differently coloured: one animal was yellow-orange like most „Quebrada Guanguí“ animals, another was greyish.

In terraristics, the name „Quebrada Guanguí“ has therefore become established for the uniformly yellow or yellow-orange coloured animals and the name „La Brea“ for the mint green ones. However, this is not an indication of the actual geographical origin, as the different colour forms appear to be divided into extremely small areas. A black-footed, otherwise yellow / yellow-orange form is also common in the terrarium trade. Even if there are apparently no natural barriers between the occurrence of the individual colour variants, they should not be mixed because they seem to live separately from each other in the habitat.



Yellow-coloured *Phylllobates terribilis* are often referred to as „Quebrada Guanguí“ in the terrarium hobby, after the place where the first specimens of this species were found. | Björn Encke

The young are initially black with two broad yellow dorsolateral stripes (longitudinal stripes at the transition from the back to the sides). As they grow, these stripes become wider and wider until they finally almost completely replace the black colour. Only the toes and the underside often remain black, even in adult animals. Individual black spots can usually still be found in the armpit area, at the ear opening and on the joints of the legs.



Juvenile of *Phylllobates terribilis* undergoing colour change | Nicolas Chalwatzis

The bright yellow or orange warning colour indicates the extreme toxicity of the frogs. The batrachotoxin of *Phylllobates terribilis* is one of the strongest toxins in the animal kingdom (e.g. LÖTTERS et al. 2007). The venom of a single frog could kill up to ten people. The native Embará



Despite its name, the mint-coloured „La Brea“ variant is not a site-specific form, but occurs in the natural habitat in varying frequencies together with yellow-coloured *Phylllobates terribilis*. | Heiko Werning

people used it for centuries to poison blowpipe arrows.

The animals were collected and kept as pets in woven baskets for some time. The arrows were slipped over the frogs' backs. The poison released was sufficient to produce highly effective poison arrows for hunting. Prey struck by the arrows died almost instantly due to the strong neurotoxin. To avoid poisoning themselves through small scratches in the skin, the Embará never touched the frogs directly, but only used leaves as protection. They cut out the area around the point where the arrow entered the game before eating it. This traditional hunting method is now rarely practised.

However, the frogs cannot synthesise batrachotoxin on their own. They ingest the toxin or its precursors with their food, i.e. with the microorganisms that they eat in their native habitat. The exact processes have not yet been clarified. Because this food is not available in the terrarium, frogs taken from the wild gradually lose their toxicity over a period of months. Captive-bred frogs, such as those distributed by Citizen Conservation, are generally non-toxic to humans.



Due to their extreme toxicity, indigenous people in the Colombian Chocó used to use Golden Poison frogs to poison their blow-gun arrows. | Arco

Their great natural poisonousness in combination with their warning colouring ensures that the animals are not shy when out and about in broad daylight, even in their natural habitat. They are evenly distributed and, unlike many other poison dart frogs, do not form clusters. Where the animals still occur, they are also common.

The calls of this frog sound like a delicate trill, which sounds more like a small bird to human listeners who have not yet come into contact with it. The indicator call is about 6-10 seconds long and has 13 pulses/second; the dominant frequency is about 1,900 Hz. (LÖTTERS et al. 2007). Humans generally find these calls pleasant, discreet and not disturbing.

*Phyllobates terribilis* has a life expectancy of 8-15 years in the terrarium.



I know that you know that I am poisonous ... *Phyllobates* *terribilis* is completely unimpressed by human approach, even in its natural habitat. | Björn Encke



The tiniest amounts of skin poison from frogs taken from the wild can be fatal to humans if they get into the mouth or a wound, for example. The animals should therefore only be handled with gloves. Offspring in terrariums, on the other hand, are completely non-toxic. | Björn Encke

A fundamental problem is the great similarity between *P. terrible*s and *P. bicolor*. In the 1980s, the two species were probably consistently confused, so that the first terraristic publications on *P. terrible*s from this time probably all describe *P. bicolor* in reality. According to LÖTTERS et al. (2007), the first true *P. terrible*s probably only arrived in European terraria in 1996. Older terrarium literature in particular should therefore be viewed with caution, even if the observed behaviour patterns, e.g. for reproduction, do not appear to differ significantly between the two species.

*Phyllobates bicolor* remains smaller than *P. terrible*s with a maximum length of 3.9 cm in males and 4.3 cm in females. Its colouration is more orange on the back (instead of yellow/mustard or mint green in *P. terrible*s); while *P. terrible*s is generally unicoloured (with the exception of the black feet in the corresponding colour variant), the ventral side and extremities of *P. bicolor* are often coloured black; however, there are also *P. bicolor* in which the extremities and back are the same colour (LÖTTERS et al. 1997). The calls of the males of *P. bicolor* have a significantly higher dominant frequency than those of *P. terrible*s (2,500 vs. 1,900 Hz; LÖTTERS et al. 2007). *Phyllobates bicolor* also has a lower temperature requirement than *P. terrible*s.

With the frogs circulating in the terrarium trade, there is a certain risk that the two species have been confused or, worse still, crossed with each other. Hybrids between the two species are known.



### 3.2 Threat situation



*Phyllobates terribilis* in its natural habitat: critically endangered | Björn Encke

*Phyllobates terribilis* only has a small distribution area and is dependent on forests as a habitat. The main threat to the species is the ongoing destruction of the rainforest through deforestation for agriculture, the expansion of human settlements and mining. Environmental pollution from herbicides due to cereals grown in the habitat are also a threat factor.

*Phyllobates terribilis* is therefore listed as „endangered“ on the Red List of the International Union for Conservation of Nature (IUCN) - with populations continuing to decline.

Despite their frequent appearance in the pet trade, this no longer plays a relevant role in terms of endangerment (IUCN SSC AMPHIBIAN SPECIALIST GROUP 2017). The frogs are regularly bred in terrariums, meaning that captures from the wild are unnecessary and do not promise sufficient profit for smugglers. The fact that there are still isolated poaching and smuggling attempts from time to time does not change this fundamental finding.



### 3.3 Conservation efforts



Location of *Phyllobates terribilis* in Colombia: There are not enough protected areas for the Golden Poison frog. | Björn Encke

The most important measure to protect the Golden Poison frog is to preserve the habitat within its small distribution area. Unfortunately, there is currently only one official protected area, which is also very small, the „Reserva Rana Terribilis“. In Colombia, the removal of animals from the wild without official authorisation has been prohibited since 1985.

Due to its importance in the international pet trade, the species is protected in Appendix II of the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and accordingly in Appendix B of the EU Endangered Species Regulation. International trade is therefore only possible with the appropriate licences and documents, and the animals must be officially registered in the EU.

Thanks to the support of Zurich Zoo, there is a conservation breeding centre for amphibians at Cali Zoo in Colombia, which also looks after *P. terribilis*. In 2022, the European zoo association EAZA announced its intention to set up a European conservation breeding programme for *Phyllobates terribilis*. This could be a useful addition to CC's ex situ population, with private and institutional keepers working together. The common goal of the programmes must be to establish a long-term, coordinated, demographically and genetically healthy reserve population outside the country of origin.



## 4. Husbandry

*Phyllobates terribilis* is a species that is very easy to keep and can also be recommended to beginners in keeping poison dart frogs. The animals have been kept and bred regularly and in relatively large numbers in the European terrarium hobby since at least 1996.

*Phyllobates terribilis* is kept in lushly planted rainforest terrariums. The tanks can be designed very attractively, which is what makes keeping poison dart frogs so appealing to many terrarium keepers. What's more, these diurnal frogs are naturally unafraid of humans and can normally be seen in the terrarium all day long - with a short rest break in the middle of the day.

The husbandry recommendations given here are mainly based on the recommendations of the experienced breeder Jens Hoberg, the CC advisory board member Karl-Heinz Jungfer and the publications of LÖTTERS et al. (2007) and WIRTH & RIEDEL (2011).

Basic knowledge of terraristics (expertise) is a prerequisite for participation in CC and must be demonstrated to the CC office before taking on the animals. They are therefore not conveyed in these husbandry recommendations, at best only touched on briefly.

Especially in keeping poison dart frogs, there is a wealth of experience on numerous individual aspects, from terrarium construction, design and technology to planting and various options for rearing tadpoles. We therefore strongly recommend that, in addition to general terrarium expertise and these species-specific husbandry recommendations for *P. terribilis*, you also consult the general literature and relevant

A good, practice-orientated basic work on keeping poison dart frogs in general is „Faszinierende Pfeilgiftfrösche“ by SALTERBERG (2016). If you want to delve deeper into the subject and are also interested in scientific aspects, please refer to „Pfeilgiftfrösche - Biologie, Haltung, Arten“ by LÖTTERS et al. (2007). An excellent practice-orientated treatise specifically on keeping *Phyllobates terribilis* is the volume „Der Schreckliche Pfeilgiftfrosch - *Phyllobates terribilis*“ from the series „Art für Art“ (WIRTH & RIEDEL 2011).



Private breeders like Jens Hoberg successfully breed *Phyllobates terribilis* and thus contribute to the protection of this highly endangered species. | Jens Hoberg

In principle, the regulations in the general CC guidelines (<https://citizen-conservation.org/wp-content/uploads/2024/05/CC-Leitlinien.pdf>) and in the recruitment contract apply to all CC animals.



#### 4.1 Requirements and documentation obligation

*Phyllobates terribilis* is protected under Appendix II of the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora, under Appendix B of the EU Species Directive and „specially protected“ under the Federal Nature Conservation Act. This means that keepers must be able to prove the legal origin of the animals and register their population and any changes to the population with the responsible local authority. You can easily google the responsible authority by entering the name of your place of residence and the keyword „protected animals“ or similar; it is usually the lower nature conservation authority of the city or district.

At CC, keepers always receive the animals with a certificate of origin, which is recognised for deliveries within the EU in order to prove the legal origin. Accordingly, CC breeders must ensure that the „Certificate of origin and handover“ form provided by CC is completed in full and signed when handing over their animals. Not only the origin of the parent animals of the offspring should be stated, but also that of the parents of the parent animals. This ensures complete back documentation. All paperwork relating to transfers within or out of CC must be sent to the CC office ([amphibians@citizen-conservation.org](mailto:amphibians@citizen-conservation.org)) immediately as a scan or photo.

The obligation to register applies to the owners of the animals, i.e. those who actually keep them, irrespective of the fact that the animals are the property of CC. The official notification should be made immediately after the transfer, preferably by submitting a copy of the CC certificate of origin and transfer or adequate

proof of origin. Any changes to the stock must also be reported regularly to the authorities, i.e. both offspring and deaths or surrenders. Please clarify the desired procedure with your authority, especially in the case of offspring. Often only a six-monthly report or similar is required, often only for young frogs that have undergone metamorphosis, for example, and not for tadpoles, which is often hardly possible in practice. However, the requirements of the respective authorities differ here, so that the mode should be agreed with the first report.

Different rules apply to imports and exports from or to outside the EU (e.g. Switzerland, Great Britain). Here, the relevant export and import documents must be applied for in advance.

All CC animals are the property of the non-profit Citizen Conservation Foundation gGmbH. This also applies to all resulting offspring (see CC guidelines and contract). Keepers are therefore not allowed to give or sell the offspring themselves. Offspring are distributed within the project as long as this makes sense in terms of population management. If offspring cannot or should not be distributed within the project, they can be sold outside the project after prior consultation with the CC office or can be arranged by the CC office, e.g. to licensed dealers. Proceeds from this go to CC and contribute to the financing of our species conservation programme. The sale to retailers also supports CC's species conservation work.



Count them all! Twice a year, Citizen Conservation has to be notified.  
| Björn Encke



An essential part of CC is the coordination of our inventory, which is why we must always be informed about its development. CC participants are therefore contractually obliged to submit a stock report twice a year, on 1 March and 1 September. This stock report (number of animals, their sex if possible, animals that have died or bred in the last six months) can be submitted online. You will receive a reminder from the CC office in good time; you will also be informed of the current procedure for submitting the stock report.

In addition, we are happy to receive observations and experiences gained in keeping and breeding, as an important goal of CC is to generate knowledge on ex-situ husbandry and biology of the species managed in our conservation breeding network.

We are also always happy to receive photos of animals and their facilities. We can then use these for publications or social media, for example. Permission to use the images within the framework of the CC programme is deemed to have been granted upon sending them, unless expressly objected to; CC always names the image authorship in publications, unless expressly objected to.

Please also inform the CC office about deaths informally by e-mail to [amphibien@citizen-conservation.org](mailto:amphibien@citizen-conservation.org) between the stock reports, so that further steps can be discussed if necessary, such as examinations of the other animals, a necropsy or veterinary care.

In the case of clutches and young tadpoles, it is often only possible to make estimates, which are nevertheless helpful. The CC office should also be informed of any successful offspring

outside of the stock reports so that new keepers can be found for the offspring in good time.

If owners can no longer or no longer wish to keep the animals or offspring, the CC office must be informed as early as possible so that we can place the animals in the following homes.

Veterinary tests must be carried out every time the animals are moved within CC, i.e. from one person to the next. A skin swab for the chytrid fungus Bd and a faecal sample for parasites must be taken, and further tests can be arranged if necessary. Instructions and the necessary dry swab and faecal sample tubes can be provided by CC, the examination costs are borne by CC. A corresponding test order for a suitable test laboratory is available from the CC office.

Under no circumstances should the animals be mixed with other *Phyllobates*, not even with other variants of *P. terribilis*. It is crucial for the development of long-term conservation breeding that the genetic background of the animals can be traced, which is why uncontrolled mixing with animals from outside must be avoided. From a studbook management perspective, it is often desirable to avoid mixing between generations. So please do not keep parent and offspring animals together without prior consultation with the CC office! Siblings, on the other hand, can be kept together without hesitation and can also be bred together until the CC studbook management gives other instructions.



## 4.2 Transport

You normally receive the animals in the Citizen Conservation #Amphibians programme directly from the breeders or previous owners. The future owners are responsible for organising the transport themselves; any costs incurred (i.e. travel costs to the breeders, shipping costs if applicable) must be borne by you. The CC office may be able to help arrange shipping - however, in order to minimise the effort and administrative costs, we ask that you organise the transport yourself if possible. Only forwarding agents authorised to transport live animals may be used for shipping; the relevant guidelines for shipping and all legal regulations must be complied with!

The animals undergo a veterinary examination each time they are moved (see section 4.1). Parasites may still be present; not every parasite load is worthy of treatment. In addition, there is always a risk that pathogens will not be recognised despite examinations.

The usual quarantine rules in terraristics should usually also be observed by the new owner when taking over CC animals.

For transport, the *Phyllobates terribilis* are best packed individually in small plastic boxes (e.g. cricket boxes). It is important that the air holes do not have any inward edges so that the frogs do not injure themselves on the sometimes sharp-edged plastic with their delicate skin. Put some damp kitchen paper in the box beforehand. These transport boxes are then placed in a polystyrene box or insulated bag, secured against slipping, to protect the frogs from external weather influences such as overheating or hypothermia. In winter or summer, it may be necessary to add a cooling battery or heat pack to the box.

Caution - always separate such elements safely from the transport boxes (e.g. wrap in a towel) so that the frogs in their box cannot overcool or overheat due to direct contact with a neighbouring cooling or heating element. Heat packs must not be placed in the polystyrene boxes immediately after activation; they initially become too hot and consume too much oxygen. To be on the safe side, you can stick them in front of a small hole in the outer packaging of the box. Overheating must be avoided, especially in summer. CC participants can purchase appropriately insulated transport boxes directly from the supplier at favourable conditions.



For transport, the frogs are individually packed in small plastic boxes, which are then placed in a thermostable box to prevent them from slipping. | Nicolas Chalwatzis



Terrarium for *Phyllobates terribilis*, lushly planted, well structured and equipped with a sprinkler system  
| Jens Hoberg



Golden Poison frogs in the terrarium | Tobias Eisenberg

### 4.3 The Terrarium

*Phyllobates terribilis* can be kept in pairs or groups. Cube-shaped terrariums with an edge length of 50 cm are considered the minimum size for a terrarium. Cubes of 60 cm are better, even better larger terrariums, for example 60 x 50 x 80 cm or 80 x 50 x 80 cm (length x width x height). Groups of 5-10 animals can also be kept well together in such larger tanks.

Of course, such size specifications are always somewhat arbitrary. Poison dart frogs also behave differently and the terrarium design also makes a difference; the more richly the terrarium is structured and also includes the back and side walls, the more usable space is available for the animals. The „General keeping guidelines for anurans“ of the DGHT-AG Anurans recommend a terrarium of at least approx. 90 x 50 x 40 cm for a group of four ground-dwelling poison dart frogs (based on the size of adult *P. terribilis*).

All-glass terrariums have proven to be the best for poison dart frogs. In order to maintain the humidity in the terrarium at the required high values, the ventilation areas must not be too large. It is best to use the ventilation system commonly used in standard terrariums, where the vents are installed at the front under the sliding panes and at the top in a side pane or at the back at the top of the lid. The resulting chimney effect also prevents the panes from misting up. The ventilation areas must be sealed with *Drosophila*-proof gauze. It requires a little sensitivity to select the ventilation areas or reduce them by covering them so that the fresh air supply is good on the one hand, but the high humidity in the terrarium is maintained on the other.



In terrariums specially designed for keeping poison dart frogs, the ventilation areas are already optimised for this purpose and can usually be used in this way. Such tanks also have a sloping bottom with a drain and a small „moat“ in front of the front pane. If the tank needs to be kept moist, the water then automatically runs forwards through the drainage layers of the substrate, flushing through the floor and can be regularly drained through the drain, which makes maintenance work much easier.

Golden Poison frogs are not exclusively bottom dwellers, but also like to climb. The side and rear walls should therefore be designed to be usable for the frogs, i.e. equipped with small plateaus and platforms as well as recesses for inserting plants and be climbable. Planted Xaxim back walls have also proved successful. Furnishing examples and instructions for wall design can be found, for example, in WIRTH & RIEDEL (2011). It is important to provide several spawning burrows at different heights in the terrarium (see point 4.7). Several feeding places should also be set up (e.g. using simple flower stands or bowls).

The substrate can also be formed with self-made, modelled base plates, e.g. made of Styrodur. A small „pond“ should always be provided. In the above-mentioned poison dart frog terrariums with a sloping glued-in base plate, this is the area at the front pane; an outlet makes it easy to change the water. You should also provide mini-ponds with a low water level (approx. 2 cm), for example with flower stands, stone-look drinking bowls or halved Brazil nut shells. Moss and dry leaves (oak and beech leaves are well suited) are good materials to make the floor look more natural and create additional hiding places and structural elements.

Alternatively, or in addition, a drainage layer is first added to the tank as a substrate, e.g. a layer of expanded clay or gravel a few centimetres high. A well water-permeable fleece is placed on top, as is common in plant care and is available everywhere. The actual substrate with soil, moss, shredded coconut, leaves or similar is then placed on top.



Two examples of terrarium set-ups that are suitable for keeping *Phylllobates terribilis* | Heiko Werning



It is also important to ensure that there are drier areas in the terrarium, e.g. slate slabs that dry out quickly. If a spotlight is used, such a drying and basking area should be located in its light cone.

Specialised suppliers also offer poison dart frog terrariums with pre-designed back and side walls, or corresponding wall sections in standard sizes. Of course, you can also design such walls yourself; there is extensive literature and websites on this subject.

The terrarium should be lushly planted. All species that can cope with a warm, humid climate are suitable. In addition to plants standing on the floor, epiphyte branches can also be used very well, and the walls should also be enhanced with climbing plants. Bromeliads have proved particularly successful.

This not only creates visually appealing mini-habitats for the frogs, but also good conditions for an ideal microclimate and plenty of structural elements and hiding places. Roots, branches, stones etc. also help to organise the terrarium.

Adult frogs like to sleep in the leaf axils of bromeliads or between the leaves of climbing plants, for example. Young animals usually prefer hiding places in the leaf litter on the ground.



View inside a terrarium for Golden Poison frogs with feeding area and several spawning sites at different heights | Jens Hoberg



Bromeliads are ideal terrarium plants in the tank for *Phyllobates terribilis*. | Jens Hoberg



#### 4.4 Water chemistry, technology and temperatures



Sprinkler system in use | Heiko Werning

Golden Poison frogs make no special demands on lighting. To be on the safe side, a UV component in the light is usually recommended nowadays and special lamps are available from pet shops. However, the frogs can be kept without any problems and without any recognisable differences in their well-being, even without UV light. The lighting can therefore be orientated primarily to the needs of the plants. Fluorescent lamps or LED bars for basic illumination have proven to be effective, possibly also a small spotlight to create a „heat island“ and the desired temperatures in the terrarium. The lighting duration is around 12 hours per day and can vary slightly over the course of the year.

The temperature range of 22-32 °C should be covered in the terrarium during the day, i.e. 22-24 °C should prevail in cooler areas near the floor and 30-32 °C in more exposed, higher areas. In this way, the frogs can always seek out the temperature zones that suit them best. Golden Poison frogs are relatively temperature tolerant. Nevertheless, you should avoid temperatures exceeding 30 °C in the entire tank, although the frogs can withstand such periods of heat well for a short time.



The desired temperatures are normally achieved through a combination of normal room temperature and lighting. If necessary, the desired temperature range can be set by switching on a spotlight of suitable intensity, e.g. 35 W. Heating mats or cables are not usually used for keeping poison dart frogs.

At night, the values drop to room temperature when the lighting is switched off. In winter, temperatures can be a few degrees lower overall. Although there is no summer or winter in their natural tropical habitat as there is here, the alternating rainy and dry seasons mean that temperatures are not completely constant all year round. A slightly cooler environment in winter also seems to be conducive to a long life expectancy for the animals, as no reproductive activities take place during this time, which gives the frogs a „breather“.

High humidity in the terrarium is important, but waterlogging on the floor must be avoided. To achieve this, spray or sprinkle the terrarium regularly. This can be done manually with water atomisers from flower care or pressurised sprayers, but in view of the frogs' humidity requirements, sprinkler systems are recommended, with which the terrarium is sprayed several times a day (e.g. three times a day) for 20-60 seconds, depending on the strength of the nozzles or the droplet size. Care must be taken to ensure that the tank does not become wet. As a rule of thumb, the furnishings in the terrarium (e.g. plant leaves) should be dried again about an hour after spraying. In winter, you can spray less frequently and/or for shorter periods.

Nebulisers are also used successfully, often in combination with sprinkler systems. A humidity level of around 100 % is achieved through misting. The activity of the frogs then increases noticeably and audibly. In addition, misting is also a visually appealing effect. Suitable devices are available in various sizes and types from specialised retailers.

The water used in the terrarium can be decalcified using an osmosis system in order to avoid or limit ugly limescale stains on the panes and leaves of the plants.



Various food animal farms at a poison dart frog breeder  
| Heiko Werning



The trusting frogs also like to take freshly skinned cockroaches directly from the tweezers. | Jens Hoberg

#### 4.5 Feeding

Poison dart frogs usually eat extremely small food, even for their small size. However, *Phyllobates terribilis* is an exception: the frogs prefer somewhat larger food in comparison.

The number one staple food of the Golden Poison frog is the large fruit fly (*Drosophila melanogaster*). You can breed them yourself, in which case you will always have flies available in sufficient quantities; breeding instructions are widely available in the literature. However, they can also be obtained from pet shops.

In addition to fruit flies, Golden Poison frogs also like to eat medium-sized crickets, freshly skinned cockroaches (*Phoetalia pallida*), oven fish, aphids, bean weevils, white woodlice and occasionally a few wax maggots (caterpillars of the wax moth) and other similarly sized food animals. CC participants can purchase food from co-operating suppliers at a reduced price.

The adult animals are fed about twice a week. All food animals must be fed high-quality food themselves. Before they are fed, they are enriched by dusting them with commercially available vitamin and mineral supplements. This nutritional enhancement is of great importance for successful keeping and breeding. The standard preparations known in terraristics such as Korvimin ZVT, Herpetal +Amphib, Repashy etc. are suitable. Many keepers in the „poison dart frog scene“ swear by „Birkhahn A-Vital“ in particular.



The young animals are given smaller food and are fed several times a week or even daily. They eat micro crickets, small *Drosophila*, small oven fish etc.

If you leave a bowl with a banana or similar in the tank for *Drosophila*, the flies will gather there and can be better preyed upon by the frogs.

It is advisable not to feed the frogs too often so that they do not become fatty, but also so that they hungrily eat the food insects offered and thus also the vitamin-mineral powder. Otherwise the feeder insects will rub it off if they crawl around in the terrarium for longer.

Feeding is best done at fixed feeding stations. For hygienic reasons, feeding bowls, flower stands or similar have proven to be suitable.

Golden Poison frogs learn quickly where food is offered and often come hopping to the feeding site as soon as the terrarium windows are opened to take their prey. This enables relatively well-controlled feeding.

An enriched environment for the animals is also playing an increasingly important role in terraristics. It is therefore advisable to vary feeding times, types and locations from time to time.



One fruit fly on terrarium two, please! Jens Hoberg preparing the classic *Phylllobates* menu. First the *Drosophila* are tipped from the breeding jar into the food container, then a pinch of vitamin-mineral powder is added. Then shake once carefully - and into the terrarium it goes! | Jens Hoberg



#### 4.6 Socialisation

Opinions differ on the best way to keep *Phyllobates terribilis*. Some breeders recommend keeping them in pairs because the males are territorial and incompatible and even the females can fight with each other. Others recommend keeping them in groups of at least five animals, in which they have not observed any relevant fights.

Ultimately, all keepers must find their own recipe. However, it definitely makes sense to observe the animals regularly in order to be able to make changes to the social structure if necessary. Ultimately, the facts are the deciding factor: If the animals are healthy, obviously feeling well and reproducing, you have done everything right.

Aggressive behaviour can be recognised by one animal jumping on the back of the other or clutching it by the head with its front legs. They may also push each other away from the food bowl. Such fights often only occur directly after re-homing and the animals will get used to each other. However, it may also be necessary to separate them.

Socialisation with their own offspring is usually not recommended in captive breeding for population genetic reasons. *Phyllobates terribilis* has been bred in terrariums for decades and many keepers regularly place their young in the parent groups. Nevertheless, this should normally be avoided with CC animals; the young animals should be kept separately from the parents in order to avoid intergenerational mixing. Other forms of husbandry may be possible by arrangement.

Socialisation with many other poison dart frog species is unproblematic. Due to the risk of hybridisation, they should not be kept together with other *Phyllobates* species (or other colour

forms of *P. terribilis*). However, other poison dart frogs can usually be kept together with *P. terribilis* in sufficiently large and appropriately structured terraria without any problems. Associations with anoles, day geckos (*Phelsuma*), juvenile geckos and other species have also been tried and tested in terrariums. The frogs have even been successfully socialised with bushmasters (*Lachesis muta*) in large terrariums.

When socialising with other amphibians, CC participants should have them tested for Bd and parasites beforehand (at their own expense). In any case, it is recommended to always examine your own stock accordingly and to thoroughly test and quarantine new arrivals. Bd can have a devastating effect on poison dart frogs. Nobody should risk introducing this fungus into their flock (see point 4.9).



Golden Poison frogs can easily be socialised with other Golden Poison frog species, such as the Dyeing poison dart frog (*Dendrobates tinctorius „azureus*”). | Axel Kwet



#### 4.7 Breeding

The first reproductive activities of *Phylllobates terribilis* begin at the age of 1.5-2 years after going ashore. The first clutches of females usually do not yet develop. They also have fewer eggs than the clutches of older animals. The frogs can reach an age of 8-15 years. In the last 2-3 years or so, they become visibly older and reproduce noticeably less frequently. Golden Poison frogs can breed all year round. However, it is better to give them a break from laying in winter by keeping them in cooler temperatures and slightly drier conditions. It is important to provide several suitable egg-laying burrows in the terrarium so that the animals can reproduce and the eggs can be removed easily. Artificial burrows, such as halved coconut shells into which a small entrance has been cut and which are placed on a flower mat or similar, have proved effective for this purpose. A dry oak or beech leaf can be placed on top. Classic film canisters are particularly popular. Of course, other cave-like objects also work. Specialist shops now sell spawning houses specially made for this purpose. Smooth surfaces are favoured for laying eggs. There should be several possible egg-laying sites distributed throughout the terrarium, which should be located in different places and at different heights.

For reproduction, the males try to attract females with their trilling. The calls can be heard throughout the day, especially after sprinkling or fogging. The males stimulate each other with their trilling. If a female ready to spawn comes to a calling male, it strokes its back with a front foot, whereupon the male hops to a suitable egg-laying cave. The female follows him. This process can go on for hours and be repeated until a suitable egg-laying cavity is found. The calling-touching-hopping ritual is repeated. Finally, the partners move into a moist cave, where the male first deposits his sperm. The

female then lays her eggs inside. *Phylllobates* do not perform an amplexus. The male leaves the egg-laying site immediately after depositing the sperm, while the female often needs several hours to lay the eggs completely.

If, as described above, a rhythm is maintained in the terrarium between the rainy and dry seasons, a peak in reproduction can be observed at the beginning of the rainy season, which in our terrarium is usually in spring. During this time, the females produce a clutch of eggs approximately every 2-3 weeks. Later in the year, the frequency is reduced. If kept in cooler and drier conditions in winter (dry season), the females will stop laying eggs for a few weeks, which is highly recommended to conserve their energy. A clutch usually consists of 10-30 eggs, depending on the constitution and age of the female. Young and very old females lay fewer eggs. The eggs have a diameter of about 2.5 mm (without jelly shell).



Calling male of *Phylllobates terribilis* | Axel Kwet



Spoilt for choice: Which of the numerous egg-laying sites in the terrarium will the male attract his mate to?

| Jens Hoberg

*Phyllobates terribilis* practise brood care. After laying the eggs, the male returns to the cave and waters the eggs. The eggs may well develop in the terrarium. The male guards the clutch. When the tadpoles have hatched, he sits between them so that they can climb onto his back with wriggling movements. With all the tadpoles on his back, the male then begins to search for suitable small bodies of water where he releases the larvae into the water. It can take several days of travelling with the tadpoles before this happens.

In order to breed as selectively as possible and achieve good quantitative results, we recommend removing the clutches from the terrarium and incubating them outside. The easiest way to do this is to take the Petri dish or film can of the egg-laying site together with the eggs out of the terrarium and place them in a small, closed plastic container at controlled temperatures of approx. 22-24 °C and constantly high humidity (no ventilation of the incubation container). A little osmosis or rain-water is then added to the substrate so that the eggs are wetted but not completely submerged. During incubation, check regularly that the eggs are developing well. If not, dead or mouldy eggs should be carefully removed with a spoon to prevent fungi from spreading to the developing eggs. Depending on the temperature, the tadpoles will hatch after 10-25 days, at the recommended 22-24 °C after about three weeks. Not all tadpoles necessarily hatch at the same time; the process can take several days. When they hatch, the tadpoles measure around 11 mm.



*Phyllobates terribilis* in the spawning house | Jens Hoberg



The male carries his tadpoles together on his back to a waterhole - in this case, however, only one. | Jens Hoberg



The clutches are removed from the terrarium and carefully transferred to a petri dish or similar for incubation and only slightly moistened with water. There the larvae grow in the egg and hatch after 2-3 weeks. | Jens Hoberg



#### 4.8 Rearing

For separate rearing outside the terrarium, the water level of the newly hatched tadpoles is initially raised to approx. 1 cm. During the first few days, the tadpoles lie largely motionless on the bottom of the container. Only after about two weeks do they begin to swim around freely. In the meantime, the water level is gradually increased.

After around three weeks in the petri dish, the tadpoles are either reared individually in small plastic containers or together in a well-established aquarium. Here too, keepers have different philosophies; some have better success with individual rearing, others with group rearing.

For individual rearing in plastic boxes, choose containers that hold between 200 ml and one litre. Small plastic containers such as those used in grocery stores for pastes, salads etc. are suitable, as are small Tupperware containers, yoghurt pots etc. A lid is not required. As a general rule, the smaller the container, the more frequently the water needs to be changed, about every three days for small containers and about once a week for larger ones. To do this, carefully tip out the water until only a low water level remains so that the tadpole can be easily removed with a teaspoon and transferred to a container with fresh water. Some oak leaves or sea almond leaves, for example, can be added to the container to provide cover and structure and to have a positive effect on the water quality; the leaves also have a positive effect on the water chemistry, they have a bactericidal effect and lower the pH value. Herbaceous aquatic plants can also be introduced.

Alternatively, up to 30 tadpoles can be reared together in a 60 x 30 x 30 cm aquarium. The water in the aquarium should have been settled for some time beforehand; the above parameters apply. The aquarium should be well weeded. Gravel forms the substrate and beech leaves and sea almond leaves should also be added here.

The aquarium is filtered with a Hamburg mat filter, for example, and heated with a heating rod set to around 23 °C. The mat filter can also serve as a land section so that metamorphosing juvenile frogs can go ashore on it. The mat filter can also serve as a land section so that the metamorphosing juvenile frogs can go ashore on it. Otherwise, other transitional areas must be created so that the young frogs can go ashore without any problems during metamorphosis, or they are caught out of the aquarium beforehand, when all four legs have formed and resorption of the tail has begun, and placed in a separate terrestrial tank (see below).

Only osmosis or rainwater should be used as water for burbot rearing. The water should be soft and slightly acidic (conductivity e.g. 20 microsiemens, 2-3 °dH, pH approx. 6).

The tadpoles start feeding a few days after hatching. They are fed with micro fish food („dust food“), shrimp food or various self-composed food mixtures. Instructions for a well-proven „tadpole nutrient solution“ can be found in Wirth & Riedel (2011), for example. In a well-established aquarium with gravel as a substrate, shiny worms will ideally also settle, which can also be preyed upon by the tadpoles as desired.



The larvae take 1-2 months to develop, depending on the temperature and diet. As with all frogs, the hind legs develop first, followed by the front legs. When all four legs are developed, metamorphosis is imminent, even if the animals still have a long tail at this stage. They are now transferred to „shorebird containers“. These are plastic containers with lids but air holes (e.g. cricket tins). They are placed at an angle, e.g. by placing something under the can on one side so that it is at an angle of 45°. Water is then poured in, which collects on the lower side and should reach a height of about 2-3 cm. In this way, the land-goers can easily crawl from the water to land when the time comes. The young frogs that have come ashore are finally caught and placed in a rearing terrarium.

The young frogs are reared in terrariums that are similar to those of the adults in terms of climate and equipment. They are kept slightly cooler, at approx. 23 °C; in winter, temperatures should not fall below 20 °C.



Tadpole rearing system for individual rearing at a breeder  
| Heiko Werning



Young animal in the terrarium | Jens Hoberg



A young frog looks curiously into the world. | Nicolas Chalwatzis

Sufficient hiding places are important. The young frogs are much shyer than their parents and show themselves less often. They prefer to hide on the ground, e.g. in a layer of leaves, which should be available accordingly. You should not choose terrariums that are too large so that a high density of food animals can easily be achieved.

In the first few days, the young still feed on the reserves from the tadpole tail. They start eating after about ten days. In the first two weeks or so, springtails are the ideal rearing food and should be available in large numbers in the terrarium. This is followed by small fruit flies, micro-frogs and other suitable sized food animals. All food animals should be dusted with vitamin-mineral powder before feeding, especially in the case of young frogs. Young frogs are initially fed once or twice a day, then the frequency of feeding is gradually reduced as they grow.

They can easily be reared in larger groups. Wirth & Riedel (2011) recommend a stock of up to 15 young frogs for a rearing terrarium measuring 30 x 30 x 25 cm. However, these grow at different rates and are sorted by size after a few weeks and distributed across several terrariums. At the age of around three months, the young animals can be considered „stable“ and sold.

After metamorphosis, the young frogs are still black with only a U-shaped, yellow lateral stripe that runs from the tip of the snout over the edge of the upper skull and runs along the edge of the back on both sides to the base of the hind leg. As they grow, this yellow stripe becomes wider and wider and the extremities also gradually change colour to yellow. At around 3-4 months of age, the change in colour is largely complete.

Males reach sexual maturity at a size of 3.7 cm, females at 4.0-4.1 cm. They are 16-20 months old at this time. You can tell that they have reached sexual maturity when the males begin to call cautiously.



## 4.9 Problems

One of the greatest dangers in keeping poison dart frogs is the chytrid fungus *Bd*, which has already eliminated entire terrarium populations. Keepers should therefore pay particular attention to preventing the introduction of the fungus. The tricky thing is that some species/individuals live with the fungus without becoming ill, while others are highly sensitive to it, immediately fall ill and eventually die. Although *Bd* can be treated, the treatment is relatively costly. With bad luck, the fungus can be introduced via all possible routes, but can be significantly reduced if a few simple precautions are taken.

- Every new addition to your own stock (i.e. also in other terrariums) should undergo quarantine and be tested for *Bd*. CC animals must be tested once at CC's expense when they are handed over. However, many keepers have a private animal population that does not belong to CC. It is their responsibility and in their own interest to also test for *Bd* in new additions to their private stock.
- You should not bring in any furnishings, either from nature or from the trade, without first disinfecting them safely.

With the support of CC, the DGHT has produced a brochure on this topic („Recommendations for dealing with epidemic amphibian diseases“), which is sent to CC participants in the welcome pack and can be downloaded at any time from the CC website (<https://citizen-conservation.org/wp-content/uploads/2024/05/Handlungsempfehlungen-zum-Umgang-mit-seuchenartig-verlaufenden-Amphibienkrankheiten.pdf>)

A common problem when keeping frogs and especially poison dart frogs are the so-called matchstick legs: Young animals develop insufficiently developed or, in rare cases, no front legs at all during metamorphosis and then die sooner or later. The exact causes are still unclear. They are probably related to the diet of the tadpoles or even the parents, and the constitution of the parents may also be a reason. Perhaps the water parameters for rearing tadpoles are not ideal, or the tadpoles suffer too much stress (e.g. too dense stocking). If the problem occurs frequently, all husbandry conditions should be checked and improved.



## 5. Further Reading

IUCN SSC AMPHIBIAN SPECIALIST GROUP (2017): *Phyllobates terribilis*. – The IUCN Red List of Threatened Species 2017: e.T55264A85887889. [https:// dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T55264A85887889.en](https://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T55264A85887889.en). (letzter Zugriff am 1.7.2024).

LÖTTERS, S., F. CASTRO HERRERA, J. KÖHLER & R. RICHTER (1997): Notes on the distribution and color variation of poison frogs of the genus *Phyllobates* from western Colombia (Anura: Dendrobatidae). – Revue fr. Aquariol. 24(1–2): 55–58.

LÖTTERS, S., K.-H. JUNGFER, F.W. HENKEL & W. SCHMIDT (2007): Pfeilgiftfrösche. Biologie, Haltung, Arten. – Edition Chimaria, Frankfurt/M., 668 S.

MYERS, C.W., J.W. DALY & B. MALKIN (1978): A dangerously toxic new frog (*Phyllobates*) used by Embera Indians of western Colombia with discussion of blowgun fabrication and dart poisoning. – Bulletin of the American Museum of Natural History 161(2): 307–366.

SALTERBERG, S. (2016): Faszinierende Pfeilgiftfrösche. Lebensweise, Haltung, Nachzucht. – Natur und Tier - Verlag, Münster, 104 S.

WIRTH, M. & F. RIEDEL (2011): Der Schreckliche Pfeilgiftfrosch *Phyllobates terribilis*. – Art für Art, Natur und Tier - Verlag, Münster, 64 S.