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SALAMANDERS AND NEWTS

Vietnam Crocodile Newt

Tylototriton vietnamensis

Tylototriton vietnamensis is a small, dark crocodile newt of 12-17 cm from a few forest remnants in northern Vietnam. The animal is black to brownish grey, with clearly yellow to orange-red fingers, toes and tail base, and lives mostly on land. The species was only described in 2005 and is vulnerable in the wild.

Family: Salamandridae

Mild skin toxins

KEY FACTS

THE ANIMAL

Adult size	**12-17 cm** total length incl. tail
Weight	**7-18 g**
Lifespan	**10-20 years**
Active	**At dusk and at night**
Lifestyle	**Terrestrial**
Habitat	**Rainforest**
Skin toxins	**Mild** Wash your hands after contact and keep your fingers away from your eyes and mouth
Difficulty	**Intermediate**

CARE

Min. enclosure	**60 × 40 × 40 cm** L × W × H for 3 adults
Temperature, day	**23-25 °C**
Temperature, night	**23-25 °C**
Humidity	**70-100%**
Water	**Water section** depth 1-5 cm
UVB	**Not required**
Diet	**Insects and worms/snails**
Kept	**In pairs or in groups**

BREEDING

Reproduction	**Egg-laying**
Development	**Larvae in water**
Egg-laying site	**On the ground**
Sexually mature	**18 months**
Eggs per season	**5-178**
Clutches per year	**1-2**
Hatching	**28 days** at 22-24 °C
Larval period	**60-180 days** from hatching to metamorphosis
Larval diet	**Small aquatic invertebrates (daphnia, mosquito larvae)**
Parental care	**None**

PROTECTION AND PAPERWORK

CITES	**Appendix II**
EU annex	**Annex B**
IUCN	**Vulnerable (VU)**

About the species

Tylototriton vietnamensis is a small, compact crocodile newt. Adults measure 12-17 cm including the tail. Females are clearly larger and sturdier than males: from snout to vent females reach about 8 cm, and males are slightly smaller. The tail is slightly longer than the head and body, laterally compressed and has a fin above and below. The head is wider than the body and slightly flattened, and large parotoid glands sit at the back of the head. Three warty dorsal ridges run along the back, giving the genus its crocodile-like look, while the warts on the back and sides are relatively small.

The ground colour is uniformly black, brown or grey, and the animals are clearly darker on land than in water. The fingers and toes and the underside of the tail are clearly yellow to orange-red, and in some animals this also applies to the rib bumps and the top edge of the tail. Young animals are black or dark brown with the same orange markings. At sexual maturity, at about 1.5 years old, the animals are about 10 cm long; males then weigh 7-9 g and females 14-18 g.

T. vietnamensis was described in 2005 and was previously counted as *Tylototriton asperrimus*. Older records of *T. asperrimus* from Vietnam may therefore cover this species or other crocodile newts described later. Genetically it is most closely related to *Tylototriton hainanensis*. Longevity has not been documented for the species; other crocodile newts live 10-20 years.

As in other crocodile newts, there are toxin glands in the parotoid glands and in the warts. The secretion is for defence, and it irritates mucous membranes. Wash your hands before and after any contact, and never touch your eyes and mouth with your fingers.

Distribution and habitat

Tylototriton vietnamensis is known only from a few sites in northern Vietnam: Tay Yen Tu in Bac Giang Province (the species' type locality), Mau Son mountain in Lang Son and the Yen Tu and Dong Son-Ky Thuong reserves in Quang Ninh. Known finds lie at 180-980 m above sea level. Occurrences in the neighbouring countries are not documented, but are not ruled out.

The population is small and scattered, because the forest at its sites has been cleared for agriculture, and because coal mines and their infrastructure lie close to the protected areas. Models of the species' habitat do not point to large, undiscovered populations. The species is assessed as vulnerable.

> **Native range:** Vietnam.

HABITAT

The habitat is small remnants of lowland rainforest on granite ground with broadleaved trees, bamboo and undergrowth. Humidity varies between 68 and 100 %, and the temperature is around 24-34 °C. The climate is shaped by the summer monsoon. The species depends on forest, tolerates some disturbance and is not bound to primary forest, but open, cleared areas are not used.

The animals live on land for most of the year, hidden among leaves and roots. The breeding season is the rainy season from April to July: when small, shallow pools, puddles and temporary ponds appear in the forest, the males head straight for them and stay in the water for weeks. The pools are small, muddy and at least half shaded by trees. The females enter the water only briefly to mate. The eggs are not laid in the water, but on the forest floor up to 2 m from the edge, under leaf litter. In the wild 5-85 eggs are laid, and the larvae metamorphose around October at a length of 4-5 cm and a weight of about 0.6 g.

Read more: Humidity, misting and ventilation

Care

THE ENCLOSURE

Tylototriton vietnamensis is kept in a rainforest enclosure with a water section. Space requirements are calculated from the length of the animals: for two animals of 15 cm the floor area must be about 0.15 m² (50 × 30 cm), and for each extra animal 25 % is added. Three animals need at least 60 × 40 × 40 cm, and a group of four or five animals at least 80 × 50 × 40 cm.

The water section takes up a quarter of the floor area and is at most 5 cm deep. It is made with a glass strip of up to 10 cm, or the floor slopes so that the substrate rises towards one side. It is important that the animals can easily climb out of the water: use stones or a flat bank of clay or gravel. The water must be soft and slightly acidic (pH 6.4-6.8), and it is changed regularly. The water section is used mostly by males in the breeding season.

The substrate is 8-15 cm deep and layered: drainage of clay pebbles or gravel at the bottom, landscape fabric above it and forest soil on top, which has first been heated in an oven at 70 °C for 20 minutes. Give the enclosure an uneven surface so that there are both dry and damp zones. Moss, cork bark, clay dishes, halved bamboo tubes and a layer of oak, beech or bamboo leaves provide hiding places, and living plants such as *Pilea cadierei* and ferns do well. Springtails, earthworms and isopods (*Porcellio laevis*) can be added as a clean-up crew and as permanent food; isopods can drown in the water section, so it must be cleaned regularly. The lid must have good ventilation.

The animals are kept in small groups, and aggression is seldom a problem. Keep them apart from other amphibians. The parents may eat eggs and larvae, so the eggs are removed and incubated separately.

Read more: Feeder animals: keeping and breeding

TEMPERATURE

From March to October the enclosure is kept at 23-25 °C around the clock; a separate night temperature is not documented. Short peaks above 30 °C are tolerated, but there must always be cooler places in the enclosure.

In winter, from about November to February, the temperature falls to 18-20 °C, and short periods at lower temperatures do no harm. This is a cool dry season and not a true winter dormancy: the animals still eat, though irregularly and much less. The cold, the dryness and the reduced feeding together are what bring the animals into breeding condition in spring.

Read more: Brumation and the seasons

HUMIDITY AND MISTING

Humidity is 70-100 % in the warm part of the year. The enclosure is misted daily with a plant sprayer or a rain system; the amount depends on the size and ventilation of the enclosure. In winter it is kept drier: from October the water level in the water section is lowered until only a remnant is left, and only a few spots (moss pads) are lightly misted. From the beginning of March misting is greatly increased, and the water level rises gradually.

WATER AND WATER QUALITY

The water section is 1-5 cm deep and takes up a quarter of the floor area. The water is soft and slightly acidic (pH 6.4-6.8) as in the wild. Always provide an easy exit with stones, gravel or a flat bank. The water is changed regularly, and uneaten food is removed.

Amphibians have very permeable skin, so avoid soap, cleaning agents and hand cream close to the enclosure, and rinse your hands in clean water before touching the animals. If gravel is used as substrate, it is rinsed regularly; soil and mixtures of soil and clay seldom need replacing.

LIGHTING AND UVB

Light is of no particular importance to the animals, and they do not like strong light. Lighting can be set to suit the plants, with LED strips or fluorescent tubes, or just the light that falls into the room. UVB is not necessary. The light is switched on for about 12 hours a day in summer and 10-11 hours in winter.

Read more: Lighting and UVB

FEEDING

Adults are fed earthworms, crickets and waxworms, and the feeder animals are themselves fed a varied diet and dusted with vitamin and mineral supplements. Adults are fed about twice a week; in winter they eat irregularly and much less. Males also eat in the water in the breeding season, and both sexes have a much greater appetite in spring.

Young animals after metamorphosis are given micro-crustaceans, small earthworms, fruit flies and tubifex every day on a small plate or in a dish, and the food is dusted with supplements. Feeding is scaled down as the animals grow.

Read more: Calcium, vitamins and supplements Read more: Rearing tadpoles

BEHAVIOUR AND HANDLING

The animals seek cover and do not like bright light. Males go into the water in the breeding season, become paler and develop noticeably different skin, and wait for the females. For the rest of the year both sexes live on land. The animals are sensitive to air pressure, and falling air pressure probably helps to send them into the water. Pick the animals up only when necessary, with wet, clean hands.

Breeding

SEXUAL MATURITY AND SEXING

The animals are sexually mature after about 1.5 years, after the second winter, at a length of about 10 cm. Females are larger and sturdier, and they become clearly thicker towards the end of summer. The sexes can be told apart fairly reliably after one year, when some males already go into the water and take on their aquatic colouring. By gently opening the vent, you can see that the opening is point-shaped in the female and slit-shaped in the male.

MATING

Breeding condition is triggered by the winter drop in temperature, the dryness and the reduced feeding, followed by an artificial rainy season. The rainy season starts in March, preferably when the air pressure falls: the enclosure is misted many times a day, the water level in the water section is raised sharply, and the temperature rises. The males enter the water within 1-2 days and wait for the females, who enter the water for one or more days to mate. Mating takes place at 18-22 °C in the water and often in low-pressure or thundery weather.

The pair dance in a circle. The male repeatedly butts the female with his head, waves his tail at her and deposits several spermatophores, which he guides the female over with his vent. This can last several hours. Sometimes the male briefly holds the female's front leg with his own. Egg-laying occurs only when the female has entered the water to the male herself; a female forced into the water will mate, but does not lay eggs.

EGGS AND LARVAE

The female usually lays the eggs within 24 hours of mating and at the latest after a week. She chooses a moss-covered spot on the ground close to the water and hides the eggs under leaves or bark. Egg-laying is usually finished the first night, and the female stays with the eggs until the following evening. Eggs are laid from January to August, most in March and April, and some females lay twice a year.

In the enclosure the eggs are 6-10 mm when laid, and swell over the first hours to 8-13 mm. A clutch is 95-178 eggs in the enclosure and 5-85 eggs in the wild. The parents may eat eggs and larvae, so the eggs are removed and incubated separately.

METAMORPHOSIS

The eggs are best incubated outside the enclosure. They are laid singly or in small clumps on damp kitchen paper, which is placed on a grid in a closed plastic box with a little water in the bottom. The eggs lie above the water, but in very high humidity. The box is opened once or twice a day for inspection and ventilation, dead eggs are removed, and the paper is changed once or twice during incubation. Damaged eggs with live larvae are placed in the water in the box; they usually hatch, but earlier and at a less developed stage.

The time from laying to hatching depends on temperature: from 9 days to almost four months, and above 26 °C it becomes noticeably slower. At 22-24 °C by day and 20-22 °C by night the eggs hatch after about 28 days. The larvae are then 18-22 mm and jump into the water themselves, up to 12 cm. When the first larvae hatch, the water level in the box is raised, which makes the rest hatch. Superficial mould does not harm the larvae.

The larvae are best reared in small groups of no more than five animals, sorted by size, in trays with 10 litres of still, soft, slightly acidic water (rainwater with leaf extract works well). The bottom is sand from an established aquarium, with boiled oak leaves, PVC pipes as hiding places and aquatic plants such as Java fern and Java moss. The larvae must swim in the food, and a day without food harms development: they are given newly hatched *Artemia*, very small daphnia and copepods 2-3 times a day, later up to 6-8 times. From 25 mm pieces of tubifex are added, from 35 mm pieces of earthworm, whole tubifex and white worms, and the largest larvae also take bloodworms. At most 15 % of the water is changed at a time, 2-3 times a day after feeding. At metamorphosis, about eight weeks after hatching and three months after egg-laying, the larvae lose their gills, and the animals must have easy access to land. The whole larval period lasts 2-6 months: the smaller the group, the larger the larvae and the longer they stay in the water.

In large groups of up to 150 larvae in a 75-litre aquarium fewer survive, but the survivors grow larger and can be over 7 cm when they go onto land.

Read more: Incubating eggs

REARING THE YOUNG

Newly metamorphosed young are 5-8 cm and weigh 1-3 g. They still have remnants of the gills, which disappear within a few days, and they shed their skin around the move onto land. Only after the first shed are they moved from the transition tray to the rearing enclosure. These are trays of 40 × 30 cm for 5-12 young, with a sloping gravel bottom and a small puddle in the lowest corner, moss, stones, oak leaves and cork bark, at the same temperature and light as the adults.

The young are very hungry and are fed daily with micro-crustaceans, small earthworms, fruit flies and tubifex, dusted with vitamin and mineral supplements. The trays are checked every day, and a full clean is done weekly, later every other week. After three months the young are 7-10 cm, and after half a year 8-11 cm. Young of captive-bred animals are usually easy to rear, while young from wild-caught animals are difficult.

Read more: Buying animals: captive-bred, wild-caught and transport

Health and common mistakes

Typical problems and mistakes:

- Gas build-up in the belly of larvae if too much fresh water is changed at once. Never change more than 15 %.
- Breakdown of the gills if the water is too hard. Move the larvae to soft water as soon as possible.
- Hydra (freshwater polyps) in the rearing trays, which harm the larvae with their stinging cells. Large pond snails (*Lymnaea stagnalis*) help against them.
- Empty snail shells that accumulate in the larval trays when the larvae eat snails, and pollute the water.
- Fungal infections in larvae.
- Bsal (*Batrachochytrium salamandrivorans*) is a skin fungus that kills many European salamanders. Many East Asian salamanders can carry the infection without symptoms. New animals are therefore quarantined for several weeks, kept apart from other salamanders and amphibians, with their own equipment and good hand hygiene.

See a vet with amphibian expertise if the animal stops eating, develops sores, swellings or discoloured skin.

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.