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SALAMANDERS AND NEWTS

Axolotl

Ambystoma mexicanum

Ambystoma mexicanum is a large, fully aquatic salamander that never leaves the larval stage: it keeps its external gills, the fin along its tail and a broad, smiling head throughout its life, yet still becomes sexually mature. In the wild the species is critically endangered, but in the aquarium it is hardy and calm as long as the water is kept cold and clean.

Family: Ambystomatidae

KEY FACTS

THE ANIMAL

Adult size	**20-30 cm** total length incl. tail
Lifespan	**10-15 years**
Active	**At dusk and at night**
Lifestyle	**Aquatic**
Habitat	**Wetland**
Skin toxins	**None known**
Difficulty	**Beginner**

CARE

Min. enclosure	**60 × 30 × 35 cm** L × W × H for 2 adults
Temperature, day	**16-20 °C**
Temperature, night	**14-18 °C**
Humidity	**100%**
Water	**Aquaterrarium** depth 20-35 cm
Water temperature	**16-20 °C**
UVB	**Not required**
Diet	**Complete diet and worms/snails**
Kept	**Singly or in groups**

BREEDING

Reproduction	**Egg-laying**
Development	**Stays in larval form for life (neoteny)**
Egg-laying site	**In water**
Sexually mature	**6-18 months**
Eggs per season	**100-1,000**
Hatching	**14 days** at 24 °C
Larval diet	**Other larvae and small aquatic invertebrates (daphnia, mosquito larvae)**
Parental care	**None**

PROTECTION AND PAPERWORK

CITES	**Appendix II**
EU annex	**Annex B**
IUCN	**Critically Endangered (CR)**

About the species

Ambystoma mexicanum is one of the largest species in the family Ambystomatidae. Most adults are 20-30 cm long including the tail. Over 30 cm is uncommon, but a few animals exceed 40 cm. The species typically lives 10-15 years, and a few animals have passed 20 years. The body is soft and largely cartilage, and the skin is thin and permeable.

The species is neotenic: it becomes sexually mature without metamorphosing. The animal keeps three pairs of external gill stalks with fine filaments, a fin running from behind the head to the cloaca, a broad head with lidless eyes and small legs with long, slender toes. This is because the body lacks the hormone that makes the thyroid gland start metamorphosis. The animal

also has small, rudimentary lungs and can gulp air at the surface, but the gills handle most of the oxygen uptake. The species can regenerate lost limbs, gills and parts of the tail.

The wild type is brown, grey or almost black with dark spots. In captivity there are many colour forms: albino (golden with pink eyes), leucistic (white with black eyes), melanoid (without shiny pigment and with very little yellow), axanthic (without yellow and shiny pigment) and combinations of these.

The male is recognised by a swollen cloaca with papillae, the female by a broader body when full of eggs. The species was described in 1798 by George Shaw and Frederick Nodder. Several closely related, fully aquatic species in the same genus, including *A. andersoni*, *A. taylori* and *A. dumerilii*, are often confused with *A. mexicanum*. Animals that metamorphose spontaneously are usually crosses with species from the *A. tigrinum* complex.

The species has no known skin toxin, but the skin is so delicate that the animal should preferably not be handled.

Read more: Rearing tadpoles

Distribution and habitat

Ambystoma mexicanum is native to the highlands around Mexico City, where the species lived in a series of connected lakes and wetlands. It is known from Xochimilco and Chalco and is presumed also to have lived in the larger lakes Texcoco and Zumpango.

Chalco has disappeared, and Xochimilco survives today only as a network of canals and lagoons. The draining began in Aztec times and accelerated in the 1900s. The species is critically endangered (IUCN: CR), and the wild populations are small. Today it lives mostly in aquaria and laboratories around the world.

> **Native range:** Mexico.

HABITAT

In the wild *A. mexicanum* lives in fresh water with a muddy bottom and rich animal and plant life. The animal stays in the water all its life and never leaves it. The water temperature in Xochimilco rarely rises above 20 °C, and in winter it can fall to 6-7 °C and perhaps lower.

The cold, stable water temperature is the main reason the species does poorly in warm rooms. The species eats worms, crustaceans, insect larvae and other small aquatic animals, which it sucks in with a sudden, wide gape.

Care

THE ENCLOSURE

A. mexicanum is kept in an aquarium without a land area, because the animal never leaves the water. One adult needs an aquarium of at least 50 × 25 × 25 cm, and two adults at least 60 × 30 × 35 cm. The species is very messy, so bigger is better: the more water, the more stable the water quality. The water must be at least 15 cm deep, and 20-35 cm is a good depth.

The aquarium must have a lid, because the species can jump out of the water. Use fine sand, stones much larger than the animal's head, or no substrate at all. Gravel must not be used: the animal sucks in everything nearby when it eats, and gravel and small stones can cause impaction and death. A bare bottom is safest and easiest to clean.

Give each salamander a hide, for example a cave, a pipe or a root piece, and put up plants or backgrounds as visual screens. Choose robust or plastic plants, because the animal pulls up delicate ones.

TEMPERATURE

The water temperature should be 16-20 °C, ideally 16-18 °C, and at night it may fall to 14 °C. Up to 22 °C is tolerated, but above 24 °C the animal is under severe stress: it stops eating and easily develops fungal and bacterial infections, and more than a couple of days at that temperature quickly leads to illness and death. The first sign is often pale, slimy patches on the skin.

If you cannot keep the water below 24 °C all year, the species is not a good choice. Place the tank in a cool spot, avoid sun and hot lamps, and if necessary use an aquarium chiller or a fan over the water surface in summer. The species has no winter rest, and there is no point in chilling it below 10 °C; at low temperatures it simply becomes sluggish and eats less.

HUMIDITY AND MISTING

Air humidity is irrelevant, because the animal never leaves the water, and misting is not relevant. Under the aquarium lid the air above the water is saturated with moisture, which is why the box says 100 %.

What counts is water quality: filtration, oxygenation and regular water changes. See the section on water.

Read more: Humidity, misting and ventilation

WATER AND WATER QUALITY

The aquarium filter must be cycled for several weeks before the animal goes in. Use ordinary tap water treated with a water conditioner against chlorine, chloramine and heavy metals; chlorine is harmful to the species. Test regularly for ammonia, nitrite and nitrate. Change about 20 % of the water every 14 days, more often with many animals, a small aquarium or heavy feeding.

The filter must give very little flow. The species does not tolerate noticeable water current: after a few months in a current it stops eating, and the gills curl forwards. An external filter with a spray bar, or an outlet that hits a stone or the glass, spreads the flow so that no strong current runs through the whole aquarium.

LIGHTING AND UVB

A. mexicanum does not need light, and UVB is not necessary. New animals are shy under strong light but get used to it if they have hiding places. The light is first and foremost for your benefit and for any plants.

Use a light source designed for aquarium plants, and choose LED, because other light sources give off heat that can push up the water temperature.

Read more: Lighting and UVB

FEEDING

The species is greedy and eats worms, crustaceans, pieces of fish, soft insects and lean meat. Good staples are large earthworms, frozen bloodworms, tubifex and sinking pellets for trout and salmon. Prawns, cooked and shelled, and pieces of lean meat are good as treats. Fatty food, such as pinkie mice, is given only rarely or not at all.

Prefer food that sinks. Give feeder fish only if you know their source; they can carry parasites and diseases. Vitamin and mineral supplements are not necessary, and they are hard to give in water.

Give as much as the animal eats in 15 minutes. At 22 °C every 2-3 days is enough, and at lower temperatures even longer can pass. Remove uneaten food so that it does not pollute the water.

Read more: Calcium, vitamins and supplements

BEHAVIOUR AND HANDLING

The species stays mostly on the bottom and is calm and curious. It is not social, and an animal does not benefit from company; keeping several together is for the keeper's convenience and for breeding. Young animals bite legs and gills off each other, so keep them together only if they are of equal size and fed generously. From 13-15 cm they become calmer, and adults rarely have conflicts, but they eat animals that are much smaller than themselves. Keep generations apart. The aquarium should hold only *A. mexicanum*: fish and other salamanders nip at the gills, and anything smaller is eaten.

The animal should not be handled, because the body is soft and the skin permeable. If it has to be moved, use a soft net with very fine mesh so that fingers and gills are not damaged. Forward-curled gills and lack of appetite are signs of stress, most often from too much current or water that is too warm.

Breeding

SEXUAL MATURITY AND SEXING

The male has a swollen cloaca with papillae, and the female is broader when full of eggs. The animals become sexually mature at around 20 cm, that is, after 6 months to just over a year. Females should be at least 18 months old before they are used for breeding, so that they reach full size and condition.

Sex can be determined reliably from the cloaca only in sexually mature animals.

MATING

The breeding season runs from December to June, and most breedings succeed in December and January. If temperature and light vary through the year, egg-laying typically begins in late winter; if the temperature is kept the same all year, it can happen at any time. A sudden drop in water temperature usually stimulates only the male. If the temperature follows the seasons without the water becoming too warm in summer, the animals typically mate once or twice in winter.

The male dances around the female and deposits a spermatophore, a clear stalk with a white cap, which the female picks up. Place flat, rough stones on the bottom where he can deposit them. Remove the male once the female has picked up the spermatophore.

EGGS AND LARVAE

Egg-laying takes place from a few hours to two days after mating. The female lays the eggs singly on plants, so use plastic plants, which do not rot. She lays from around 100 to over 1000 eggs, depending on size. Remove her when she has finished, and let her rest for at least two months before she breeds again.

The eggs hatch after about 14 days at 24 °C. There is no parental care. After a few hours the larvae begin to eat everything they can fit in their mouths: newly hatched brine shrimp (without shells), daphnia and microworms. From 3 cm they can have frozen bloodworms, chopped earthworms and tubifex. The larvae are highly cannibalistic, so do not keep many in the same aquarium.

METAMORPHOSIS

The species does not metamorphose. A larval period in the classic sense does not exist, because the animals remain in larval form all their lives and become sexually mature with their gills retained. The hatching time is about 14 days at 24 °C; in cooler water it takes longer.

Metamorphosis occurs only when the animal is given thyroid hormone, and it is used only in research. A metamorphosed animal loses its gills and fin, gains eyelids and lives on land, and it then resembles *A. velasci* and the species in the *A. tigrinum* complex. Animals that metamorphose on their own are usually crosses with these species, or they live in water with unusually high iodine.

REARING THE YOUNG

Feed the young twice a day at 24 °C, as much as they eat in 20-30 minutes, until they are 10 cm. Less feeding leads to many lost limbs and gills and to deaths. At lower temperatures feeding can be less frequent. Sort the young by size, provide hides and plenty of space, and change the water often.

At 15 cm they become calmer. Well-developed young kept at 24 °C can reach 25 cm and sexual maturity in under six months. Adult animals must then be kept cool as described under temperature.

Health and common mistakes

The species is hardy when the water is cold and clean. The most common problems are:

- Water that is too warm: above 24 °C come loss of appetite, pale slimy patches on the skin, and fungal and bacterial infections.
- Swallowed gravel or stones: impaction and death. Use sand or a bare bottom.
- Too much current: forward-curled gills, lack of appetite and stress-related illness.
- High ammonia or nitrite: requires water changes and a well-established filter.
- Biting between young: lost legs and gills. Feed generously and sort by size.
- Feeder fish and live food: can bring parasites and diseases.

Salamanders can carry the fungal disease Bsal (*Batrachochytrium salamandrivorans*), which is fatal to many species. Quarantine new animals, and wash equipment and hands between aquaria.

See a vet with amphibian expertise if the animal will not eat for more than a couple of weeks, swells up or develops white coatings.

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.