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MONITOR LIZARDS

Common Water Monitor

Varanus salvator

Varanus salvator is one of the largest lizards in the world, with males typically 150-240 cm and females 120-180 cm long, a semi-aquatic monitor from swamps, rivers and mangroves in South and South-East Asia. This guide is a reference work on the species' biology and requirements.

Family: Varanidae Former name: *Stellio salvator*

KEY FACTS

THE ANIMAL

Adult size	**120-240 cm** total length incl. tail
Weight	**3,000-20,000 g**
Lifespan	**15-25 years**
Active	**By day**
Lifestyle	**Arboreal, terrestrial and semi-aquatic**
Habitat	**Rainforest and wetland**
Difficulty	**Expert**

CARE

Min. enclosure	**245 × 185 × 245 cm** L × W × H for 1 adult
Temperature, day	**27-32 °C**
Basking spot	**50-60 °C**
Temperature, night	**21-24 °C**
Humidity	**60-70%**
Water	**Water section** depth 35-50 cm
UVB	**Recommended** Ferguson zone 3
Diet	**Insects, vertebrates and worms/snails**
Kept	**Singly or in pairs**

BREEDING

Reproduction	**Egg-laying**
Sexually mature	**24-60 months**
Clutch size	**6-40 eggs**
Clutches per year	**1-2**
Incubation	**180-270 days** at 25-30 °C

PROTECTION AND PAPERWORK

CITES	**Appendix II**
EU annex	**Annex B**
IUCN	**Least Concern (LC)**

About the species

The species is a heavy, long-necked monitor with an elongated snout, strong jaws with serrated teeth and large, sharp claws. The body is dark brown to almost black with yellow spots that fade with age, and dark, yellow-edged bands run backwards from the eyes. The scales are keeled, and the tail is long, muscular and laterally compressed, so that it can be used as a rudder in water. The tongue is deeply forked. Young have a clearer pattern than old animals, but in the black form from south-western Thailand and the neighbouring part of Malaysia the young are completely black from hatching.

V. salvator is regarded as one of the longest lizards in the world. The males are distinctly larger than the females: adult males typically reach 150-240 cm in length including the tail and females 120-180 cm, and the largest recorded has been measured at 321 cm. The weight varies greatly: wild animals of 142-150 cm weigh about 3.5 kg, while large, well-nourished animals can weigh 20 kg or more and animals in captivity over 50 kg. An adult monitor is thus not an animal that can be kept in an ordinary terrarium.

The taxonomy is disputed. The species was described in 1768 as *Stellio salvator*, and the name is tied to animals from Sri Lanka. The group comprises many geographical forms, including those from South-East Asia and Java, the Andamans and Sulawesi. Several former subspecies (e.g. *V. cumingi*, *V. marmoratus* and *V. nuchalis*) have been regarded as separate species since 2007. This means that names in the trade and in older literature can cover different animals, and that husbandry information cannot always be transferred from one form to another.

All forms are large, powerful and intelligent predators. The species is long-lived: it lives at least 15 and probably over 20 years in captivity and can grow from a young animal of 25-30 cm to an animal of over 1 m in two years. It requires a room or a large outdoor enclosure, a pool that it can dive right into, heat at the basking spot and whole prey in large quantities. The space, the food costs and the time are the real limitation, not interest in the animal.

Read more: Heat and temperature

Distribution and habitat

Varanus salvator is found from Sri Lanka and eastern India across Bangladesh, Myanmar, Thailand, Cambodia, Laos and Vietnam to southern China, including Hainan, and on through Malaysia and Singapore to Indonesia, including Sumatra, Borneo, Java, Bali, Lombok, Sumbawa, Flores and Sulawesi. The species is one of the most widespread monitors of all. On the Andaman Islands and the southern Nicobar Islands a separate form lives.

It is found mainly in the lowlands and has been recorded up to about 1,800 m, but the core area lies below 1,000 m. The monitors that live in the Philippines are now regarded as other species. Animals in the south-eastern USA come from released or escaped animals and are not shown on the map. Records of animals outside the natural range are due to release or escape.

> **Native range:** Sri Lanka, India, Bangladesh, Myanmar (Burma), Thailand, Cambodia, Laos, Vietnam, China, Malaysia, Singapore and Indonesia.

HABITAT

Varanus salvator is tied to water. It lives along lakes, rivers, ponds, swamps and canals and in mangrove, and it is found both in untouched forest and close to people, e.g. in parks and canal systems in cities, where it is not persecuted. Mangrove, swamps and low-lying wetlands are the most important habitats. The species does poorly where the vegetation and water disappear.

It is an excellent swimmer that steers with its tail, and water is also its escape route and hiding place. Young animals live mostly in the trees, while adults are mostly ground-dwelling; under pressure they climb up into trees or jump into the water. The climate is humid and tropical with even temperatures all year round, and the animals are most active early in the morning on sunny days.

Care

THE ENCLOSURE

What must be planned for is an adult animal of 120-240 cm. An ordinary terrarium is not sufficient. For one adult the minimum is about 245 × 185 × 245 cm (length × width × height), and a breeding pair needs at least 245 × 245 × 245 cm. For large males this is a minimum, and more is always better. In a tropical climate an outdoor facility of about 45 m² suits a breeding pair, of which just under 8 m² is water, surrounded by a 2 m high, smooth wall with a 1 m deep foundation against digging out.

Newly hatched young of 25-30 cm can initially live in a terrarium of about 90 × 45 × 40 cm, but they grow quickly: a one-year-old animal needs about 120 × 120 × 120 cm, and an adult facility must be ready within a couple of years. Glass terrariums often retain heat and humidity poorly. Always plan for the adult size from the start.

Furnish with a water pool in which the animal can swim and dive right under; a depth of at least 35-50 cm is reasonable. The species often passes urine and faeces in the water, so the water must be changed daily unless there is a powerful filter, and the filter intake must not be able to hold the animal under water. Provide deep, firm substrate for digging, e.g. a mixture of soil and sand without too high a clay content, and many hides: hollow tree trunks, boxes and tubes. The species readily climbs, even as an adult, so use the height with sturdy branches, shelves and trunks that can carry the animal's weight. Fragile

furnishings such as live plants are quickly destroyed. All doors must have secure locks, because the species is strong, and it can dig, climb and find weaknesses in a lock. Lamps and heat sources must be shielded against claws and tail, so that the animal does not burn itself.

Read more: Humidity, misting and ventilation

TEMPERATURE

Varanus salvator needs a lot of heat and must have a distinct temperature gradient. The background temperature by day is 27-32 °C. The air at the basking spot must be at least 35 °C, and the surface the animal lies on must reach 50-60 °C measured with an infrared thermometer. Several spotlights side by side over a large area heat the whole animal evenly and reduce the risk of burns. At night the temperature must be 21-24 °C.

An animal with suitable heat basks for a while, walks around the enclosure and returns to the basking spot several times a day. If it lies on the basking spot all the time, it is too cold, and if it never basks, it is too hot. A cooler zone in shade is essential, because after meals and basking the species likes to seek shade and water. Brumation is not necessary for a tropical species like this.

Read more: Brumation and the seasons

HUMIDITY AND WATER

The relative humidity should be around 60-70 %. The species comes from humid, tropical wetlands, but stagnant, humid air causes skin infections, so good ventilation is just as important as humidity. A large water section raises the humidity, and the substrate in the digging zone should be kept slightly damp but not wet. Ventilation also prevents mould, ammonia and bacterial growth.

The species drinks from its water section, and the water must therefore be kept clean. Change it regularly and remove faeces daily. A large water pool is heavy and requires a solid floor, a drain and a waterproof surface.

LIGHTING AND UVB

The species is diurnal and basks a great deal. Use a powerful heat lamp over the basking spot and UVB for animals with a high sun requirement (Ferguson zone 3). The UVB should cover a large part of the basking spot, and the animal must at the same time be able to withdraw into shade. The UVB requirement for this species specifically is not documented; the recommendation is borrowed from related, diurnal monitors.

Keep the light on for about 12 hours a day all year round, because the species lives close to the equator. At night it should be dark. Lamps are placed out of the animal's reach or in a strong guard.

Read more: Lighting and UVB

FEEDING

Varanus salvator is a carnivore and takes almost anything it can overpower: fish, frogs, crustaceans, molluscs, insects, eggs, birds, rodents and carrion. Young live mostly on insects and are fed daily to every other day in the first year, e.g. with crickets and cockroaches dusted with calcium and vitamin D3, supplemented with fish, frogs and occasionally newborn mice; newly hatched young begin to eat sardines and newborn mice within the first week. Gradually they switch to whole prey such as rodents, fish and poultry. One-year-old animals are fed three to four times a week and adults over two years two to three times a week. The food must be whole animals, because bones and offal provide calcium and vitamins that meat alone does not.

An adult gets 1-2 medium-sized rats about every third day, supplemented with fish, sardines and a meat-based jelly. The species seldom says no to a meal and easily becomes too fat, and rodents alone lead to obesity and fatty liver. Therefore alternate between fish, bird, eggs and rodents, and weigh the animal regularly. After a meal the animal must be able to bask in order to digest. Canned dog and cat food is unsuitable, and chicks give loose, strongly smelling faeces that require immediate cleaning. Feeding costs more the larger the animal becomes, and is a significant part of the lifelong expense.

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

BEHAVIOUR AND HANDLING

An adult *Varanus salvator* is a strong and dangerous animal. It defends itself with its tail, claws and jaws. A tail whip can cause serious injuries, the claws can lacerate deeply, and a bite from a large monitor can cause serious wounds that easily become infected. Monitors probably have venom glands, but what the venom means in a bite on humans is still debated, so a

bite should be treated as more than an ordinary wound. Bites on humans from wild animals that required many stitches have been recorded.

Juveniles are often nervous and bite, but captive-bred, hand-tame animals can become very calm and take food from the hand. This requires many months of patient work with short, calm and positive contacts. Approach from below and not from above, because movements above the animal are perceived as threatening, and preferably while the animal is lying in shallow water, where it feels more secure. Even a tame male can be unpredictable. Handling large animals requires experience, calm, two people and protective equipment such as heavy gloves. Small children or other animals must never be nearby, and the species is not a pet.

Monitors can carry salmonella. Wash your hands thoroughly after any contact with animals, water, faeces and food. Keep the animals singly; pairs can be kept together if there is plenty of space and many hides, but they must be watched closely. Females can be shyer than males and quickly retreat to a hide or water.

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

Breeding

SEXUAL MATURITY AND SEXING

Adult males are larger than the females, have a broader and heavier snout and distinct bulges from the hemipenes, while the females are slimmer with a more pointed snout. Sexing is difficult in young animals and requires a vet or an experienced person. In captivity both males and females become sexually mature as early as the end of their second year, when they are a little over 1 m long with a snout-vent length of about 50 cm; first-time females weigh 1.3-2.5 kg. Sexual maturity probably depends more on growth than on age, and in the wild three to five years is assumed. Females should not be put into breeding until they are in good condition.

MATING

In the wild the species breeds between April and October, and in captivity egg-laying follows much the same season. The species has been bred many times in zoos since the 1960s and is now bred regularly by a few private breeders, also in colour variants. Well-fed females can come into breeding condition several times a year. The male is put in with the female when her follicles are mature; this can be followed with ultrasound, where follicles of 15-25 mm show the right time. It can also be an advantage to keep the pair apart for periods of 4 weeks to 3 months to bring on breeding condition; this is borrowed from related species. The male is removed when mating is over, so that the female can eat and bask in peace.

EGG-LAYING AND CLUTCHES

The female lays the eggs 30-45 days after mating, in the wild in rotting tree stumps and in holes in the ground. In captivity the female lays 6-18 eggs per clutch, in the wild up to 40. The same female can lay two clutches in a year. The female digs trial holes for several days before laying the eggs in a hole about 30 cm deep and covering them with grass and soil. Give her deep, loose and slightly moist substrate at about 30 °C or a large, dark nest box with access from above, with good access to heat and water. The eggs are 67-89 mm long and weigh 33-82 g, and the whole clutch can weigh 22-40 % of the female's weight.

If she searches in vain for a suitable place, she may become stressed or retain the eggs. In a facility with a lot of clay, the eggs are at risk of suffocating, because the clay holds the moisture and shuts out the air.

INCUBATION

The eggs must be removed from the enclosure immediately after laying, because the animals eat eggs and dig in them. Remove most of the clay, if there is any, lay the eggs in moist perlite or vermiculite, and do not turn them; mark the upper side with a pencil. The eggs are incubated at 25-30 °C and hatch after 180-270 days, at 30 °C typically after six to seven months.

Some of the eggs often perish during the first months, in some clutches more than half. Hatching can take several days, because the young stay in the egg for up to 48 hours after they have broken through the shell. Help only if strictly necessary, and consult a vet if the navel bleeds.

REARING THE YOUNG

The young are about 25-30 cm long at hatching (snout-vent length 12-14 cm). They are kept singly to avoid bites and cannibalism. Within a week they begin to eat sardines and newborn mice, and after that they live mostly on insects supplemented with fish and small rodents, daily to every other day. Young are climbers, so provide branches and plants, and keep the heat high and the humidity suitable.

They grow quickly: by two years of age both males and females are 108-134 cm long and weigh 1.3-3.4 kg, and they must be moved up to larger units at regular intervals. Plan what the young animals will need as adults before the eggs are incubated: a clutch of 12 young gives 12 animals of over 150 cm, and it is difficult to find places for them.

Health and common mistakes

A large monitor has few but serious health problems. The typical ones are:

- Obesity and fatty liver, when rodents become the staple food or the animal is overfed. Weigh the animal and vary the food.
- Gout, which is a frequent cause of death in monitors in captivity.
- Bone disease from too little UVB, calcium and vitamins, especially in young, fast-growing animals.
- Skin infections in the scales in stagnant, humid air.
- Bacterial infection in bite wounds and mouth rot. Clean all wounds, and contact a vet.
- Burns from unshielded heat lamps and hot rocks.
- Parasites, in wild-caught animals often in large numbers, and stress diseases after transport and acclimatisation.
- Egg-laying difficulties in females without a suitable nesting place.
- Salmonella, which can be transmitted to humans.
- Problems at hatching, for example bleeding from the navel.

Animals in the trade have to a large extent been wild-caught, but the species is now bred regularly. Captive-bred, hand-tame animals are easier to handle and have fewer parasites, while wild-caught animals often come with parasites and stress and take time to settle in. A healthy animal is powerful and active, has clear, open eyes and no discharge from the nose or mouth; a lethargic animal may seem tame but be ill. See a vet with experience of reptiles if the animal loses weight, refuses food or seems lethargic.

Read more: Common diseases and signs of illness

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.