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TORTOISES AND TURTLES

Yellow-margined Box Turtle

Cuora flavomarginata

Cuora flavomarginata is a medium-sized turtle with a hinged plastron, a strongly domed, dark brown carapace, a yellow dorsal stripe and yellow stripes behind the eyes. The shell reaches 14-19 cm, and the species comes from China, Taiwan and the Ryukyu Islands. It lives mostly on land in humid forest and needs a large, humid setup with a water tray, a basking spot, UVB and a cool season. The species is threatened in the wild.

Family: Geoemydidae Former name: *Cistoclemmys flavomarginata; Cyclemys flavomarginata; Cuora evelynae*

KEY FACTS

THE ANIMAL

Adult size	**14-19 cm** total length incl. tail
Weight	**400-1,000 g**
Lifespan	**15-25 years**
Active	**By day and at dusk**
Lifestyle	**Terrestrial and semi-aquatic**
Habitat	**Wetland and temperate woodland and meadow**
Difficulty	**Intermediate**

CARE

Min. enclosure	**120 × 60 × 40 cm** L × W × H for 2 adults
Temperature, day	**22-26 °C**
Basking spot	**28-32 °C**
Temperature, night	**18-22 °C**
Humidity	**60-80%**
Water	**Water section** depth 5-10 cm
Water temperature	**20-25 °C**
UVB	**Essential** Ferguson zone 2
Diet	**Insects, fruit, complete diet, plants and worms/snails**
Kept	**Singly, in pairs or in groups**

BREEDING

Reproduction	**Egg-laying**
Clutch size	**1-4 eggs**
Incubation	**60-100 days** at 26-30 °C

PROTECTION AND PAPERWORK

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

About the species

Cuora flavomarginata is a medium-sized turtle with a hinged plastron that can be closed completely against the carapace, so head, legs and tail are protected. All measurements in the text are shell length (carapace). The carapace is strongly domed and dark brown, and over the ridge of the back runs a pale, cream-yellow stripe, which is often broken into a yellow spot on each vertebral scute. The growth rings on the scutes are distinct. The plastron is dark with lighter edges, and the species name *flavomarginata* means "yellow-edged". The head is greenish to greyish on top, the face and neck are pale pink to peach, and from each eye a broad yellow stripe runs backwards. The limbs are brown. The forelimbs have five claws and the hind limbs four.

Typical adults are 14-19 cm, and females are larger and sturdier than males. Males have a broader and longer tail, which is almost triangular at the base. Hatchlings are about 4 cm and more distinctly marked than adults, and their carapace is rough.

The taxonomy is not entirely settled. The species was described in 1863, and two subspecies are generally recognised: *C. f. flavomarginata* on the mainland and Taiwan and *C. f. evelynae* on the Ryukyu Islands. Some also separate the mainland animals as *C. f. sinensis*. Husbandry is the same for all of them. The species has been crossed with other turtles in the family in captivity, so animals of unclear origin should not be used for breeding.

C. flavomarginata is alert and shy and not an animal for handling. It becomes tame enough to take food from the hand, but it is not a pet turtle. The species is threatened in the wild (IUCN: EN), because habitats are disappearing and because animals are collected for food, traditional medicine and the pet trade. Captive-bred animals are the only right choice.

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

Distribution and habitat

Cuora flavomarginata lives in southern and central China, on Taiwan and on two of the Ryukyu Islands in Japan. On the mainland the species occurs especially in the Yangtze River basin, with records in, among others, Hunan, Anhui, Hubei, Zhejiang, Jiangsu and Fujian. The delimitation on the mainland is uncertain, and a few provinces are documented by only a few records. On Taiwan the species lives in the northern part of the island, and in Japan the subspecies *C. f. evelynae* occurs only on Ishigaki and Iriomote.

The map shows the original range. The species is threatened throughout the area.

> **Native range:** China, Taiwan and Japan.

HABITAT

Cuora flavomarginata lives in a humid, warm-temperate to subtropical climate with mild, humid winters and warm summers. The animals occur at 200-500 m in dense, evergreen forest, scrub, grassland and farmland and in and by rice paddies, streams, ponds and rivers.

The species is mostly a land animal, but it seeks water and wades out into waterholes, and it hunts earthworms at the water's edge and in rain puddles. Activity follows the seasons: the animals are most active from April to October and much less active the rest of the year. In the cool season they dig down under logs, leaf litter and undergrowth or into abandoned burrows. Females stay at the forest edge during the egg-laying season and inside the forest the rest of the year. The size of the home range varies greatly from animal to animal.

Care

THE ENCLOSURE

A pair of adult *Cuora flavomarginata* needs a terrarium or enclosure of at least 120 × 60 × 40 cm, so the animals have room to get out of each other's way. Each extra adult turtle requires 10-20 % more floor area. The wall must be at least 35-40 cm high and smooth on the inside, so the animal cannot climb out.

The species is a land turtle with a strong attachment to humid land, not an aquatic turtle. Furnish the terrarium accordingly as a humid forest-floor terrarium: a deep layer (at least 10 cm) of a mixture of unfertilised garden soil, bark and sphagnum, where the animal can dig down. Lay hides of bark pieces, cork tubes and leaf litter, plant grass, ferns and other robust plants, and sink a large, flat water tray into the substrate. There must be dry ground under the basking spot and damp ground at the other end. Avoid sand alone and small stones, which the animal swallows.

The species is hardy and does best when it can use an outdoor enclosure in summer. An enclosure must be at least 120 × 60 cm for a pair, be escape-proof and buried 20-30 cm down along the edge, have grass and bushes for shade, a dry hide and a flat water tray. Animals that have been moved outside must come in again when the nights become cool and damp.

Hatchlings dry out quickly and must be kept indoors for the first years, in a clear plastic box or a small terrarium of about 40 × 25 cm with 1 cm of water and an easily accessible island of sphagnum.

Read more: Heat and temperature

TEMPERATURE

By day the terrarium must be 22-26 °C, and the basking spot must be 28-32 °C, measured with an infrared thermometer on the shell. At night the temperature can fall to 18-22 °C. Hatchlings are kept warmer, at about 29 °C. Give the animal a distinct gradient, so it can choose between sun and shade itself, and warm up with a halogen lamp or a reflector lamp over the basking spot. Heat cables and heat rocks do not give the warmth the animal seeks in the wild and should not be used alone.

The species is subtropical and has a cool season in the wild, when activity falls from autumn and the animal digs down. A cool period with shorter days belongs to husbandry. Keep 15-20 °C and 8-10 hours of light in the winter months, without a heat lamp, and let the animal dig down in a thick layer of moss and leaf litter. Temperature and duration for a proper hibernation are not documented for the species, so a cold hibernation below 10 °C is not recommended. Animals that are not well should not be put through a rest, and the young must be kept warm all year.

Overheating is more dangerous than cold. The animal must always be able to get away from the lamp, and the air must not become stagnant and hot.

Read more: Brumation and the seasons

HUMIDITY AND WATER

Humidity must be 60-80 %, and the substrate must be damp but not wet. *Cuora flavomarginata* comes from a humid climate, and hatchlings dry out quickly. Mist the terrarium heavily every day, so the leaf litter and fine plants are damp, and let the substrate dry out a little between mistings to avoid mould. Keep one end of the terrarium damper than the other, so the animal can choose.

Adults like to go out into rain puddles and waterholes, especially when it rains, and they hunt earthworms in the water. The large water tray must always be filled with fresh water. The animal drinks, wades and defecates in the water, so the tray must be emptied and rinsed every day or every other day. An outdoor enclosure can have a piece of a rain puddle or a soil area that is kept wet.

Read more: Humidity, misting and ventilation

WATER AND WATER QUALITY

The water tray must be large enough for an adult to wade in and lie down, but shallow enough that the animal can stand on the bottom with its head above water at all times. Water depth is 5-10 cm, and the edge must be flat, so the animal can easily get in and out. The species is not a good swimmer. The water must be 20-25 °C and changed often, because the animal defecates and leaves food in the water. Use decalcified or chlorine-free water, and avoid filters and pumps that can suck in legs and head. Preferably feed in a separate tub, so the water tray is kept clean. Hatchlings are kept in 1 cm of water.

LIGHTING AND UVB

UVB light is necessary for an animal kept indoors. *Cuora flavomarginata* lives in forest and forest edge and gets sun for parts of the day. Zone 2 suits a species from forest and forest edge. Use a high-quality UVB tube over the basking spot with no glass or plastic in between, measure the UV index with a meter, and replace the tube according to the manufacturer's instructions, since its output falls. The light must be on for 10-12 hours a day in summer and 8-10 hours in winter, so the rhythm of the seasons is followed. Outdoors natural sunlight gives everything the animal needs, but the animal must have shade and a hide.

Read more: Lighting and UVB

FEEDING

Cuora flavomarginata is omnivorous. In the wild it eats snails, earthworms, molluscs, insects, berries and leaves. Adults prefer earthworms, snails and insect larvae and also take fruit and vegetables. Give a mixed diet: earthworms, snails without shells, mealworms, feeder grasshoppers and other insects, and in addition fruit such as strawberries, melon and papaya and vegetables such as grated carrot and squash. Leafy greens are often not eaten. Good-quality dry turtle food can be offered sparingly, and occasionally a thawed pinkie.

Avoid cat food and dog food, which are far too fatty and cause liver and kidney disease. Adults are fed every other day, hatchlings daily in small amounts. Overfeeding causes too-rapid growth and growth deformities, so adjust the amount so the animal can eat its fill in half an hour. Hatchlings most readily take small water worms and chopped earthworms, which are placed in the shallow water, and they must be offered dry food from day one.

Supplements: dust the food with calcium without D3 two to three times a week and a vitamin supplement once a week. A cuttlebone in the terrarium provides calcium and keeps the beak worn down.

Read more: Calcium, vitamins and supplements

BEHAVIOUR AND HANDLING

Cuora flavomarginata is alert and shy. The animal withdraws quickly and closes its shell when startled, and immediately returns to hiding, even after many years in captivity. It is most active by day and at dusk, in humid weather and after rain. In cold and drought it digs deep down and is not seen for several weeks. It is not an animal for handling. Pick it up with both hands under the shell, and wash your hands afterwards.

The species can be kept singly, as a pair or in a small group. Males fight over the females, so a group needs more space, many hides and only one male. A pair is the safest way to keep them. A female without a male can lay eggs, but the eggs are infertile.

An animal that hides all the time, will not eat or loses weight is either stressed or sick.

Breeding

SEXUAL MATURITY AND SEXING

The male has a broader and longer tail, which is almost triangular at the base, and the female has a shorter and narrower tail. Females become larger than males and grow for longer. Males stop growing when they are sexually mature, while females go on growing more slowly for many years. Females grow until about 18 years of age. The age at sexual maturity is not documented. Animals under 10 cm shell length should not be used for breeding, and animals that are not fully grown should be allowed to finish growing.

MATING

The species can mate all year, but most matings take place from November to March. Mating lasts about ten minutes, and the male mates with several females. Males can be rough and bite and chase the female. Therefore keep an eye on the animals, and separate them if the female gets wounds or is stressed. A cool period in winter followed by warm, humid weather starts egg-laying. The female must be in good condition and have access to sun and a large area before she lays.

EGG-LAYING AND CLUTCHES

The female lays 1-4 eggs per laying and several layings during the season, 4-9 eggs in all. Egg-laying takes place from May to September, with a couple of weeks to a month between layings. The eggs are elongated, 38-52 mm long and 13-25 mm wide, and weigh 11-18 g. The female is shy when laying and chooses shady, soft and damp soil or sand, digs a shallow nest, lays the eggs and covers them. The nest is so small that it is hard to find. Give the female a laying area of at least 30 × 30 cm with 10-15 cm of loose, damp soil in shade, and keep an eye on the animal when she digs.

INCUBATION

The eggs are thin-shelled and must not be turned or shaken. Move them carefully to an incubator with damp vermiculite at 26-30 °C; the incubation temperature is borrowed from related turtles. The eggs hatch after 60-100 days. Keep humidity high, so the eggs do not dry out. Sex may be temperature-dependent, but this is not documented for the species. The hatchlings weigh 8-13 g at hatching.

Read more: Incubating eggs

REARING THE YOUNG

The hatchlings are about 4 cm and more delicate than the adults: they dry out quickly and must be kept indoors under controlled conditions for the first years. Keep them in a clear plastic box or a small terrarium with 1 cm of clean water and an easily accessible island of sphagnum, at about 29 °C, with UVB and hides. Feed them daily with small water worms and chopped earthworms, which are placed in the water, and offer dry food from day one. They can take a long time to take dry food. Feed preferably in a separate small tub, so the rearing box is kept clean. The young grow slowly, and overfeeding causes deformities in the shell. Keep them singly or in small groups of the same size.

Health and common mistakes

Captive-bred animals are hardy, but animals from the wild often arrive with parasites and disease. The most common problems are: - Dehydration, especially in hatchlings and wild-caught animals. - Shell rot and skin infections, if the substrate or water is dirty. - Respiratory infection from draughts, cold and too high humidity without heat: runny nose, wheezing

breathing and open mouth. - Calcium deficiency and growth deformities from too little UVB or calcium or too rapid growth. - Ticks (*Amblyomma geoemydae*) and intestinal worms in animals from the wild. Ticks can survive in a terrarium for years, so new animals must be examined thoroughly, and the ticks removed at once. - Obesity and liver disease from too fatty food.

Take a fresh faecal sample to the vet as soon as you have acquired an animal. Animals that do not eat, lose weight or have swollen eyes must be examined. All reptiles can be symptom-free carriers of *Salmonella*, so wash your hands before and after contact, and do not let children under 5 handle the animal.

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.