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TORTOISES AND TURTLES

Eastern Mud Turtle

Kinosternon subrubrum

Kinosternon subrubrum is a small, dark mud turtle from the south-eastern USA. The shell reaches 8-12 cm, and the species walks mostly along the bottom of shallow, planted water. It has two movable hinges on the plastron, so it can close itself in almost completely, and it can live 20-50 years. The species is shy and most active at dusk and needs a filtered tub with shallow water, a heat lamp and UVB.

Family: Kinosternidae Former name: *Kinosternon pensylvanicum*

KEY FACTS

THE ANIMAL

Adult size	**8-12 cm** total length incl. tail
Weight	**90-260 g**
Lifespan	**20-50 years**
Active	**At dusk**
Lifestyle	**Burrowing and semi-aquatic**
Habitat	**Wetland and temperate woodland and meadow**
Difficulty	**Intermediate**

CARE

Min. enclosure	**80 × 40 × 40 cm** L × W × H for 1 adult
Temperature, day	**24-29 °C**
Basking spot	**30-33 °C**
Temperature, night	**20-24 °C**
Humidity	**40-60%**
Water	**Aquaterrarium** depth 15-20 cm
Water temperature	**21-24 °C**
UVB	**Recommended** Ferguson zone 2
Diet	**Insects, complete diet, plants, vertebrates and worms/snails**
Kept	**Singly or in pairs**

BREEDING

Reproduction	**Egg-laying**
Sexually mature	**36-96 months**
Clutch size	**2-5 eggs**
Clutches per year	**1-3**
Incubation	**75-125 days** at 26-29 °C

PROTECTION AND PAPERWORK

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

About the species

Kinosternon subrubrum is a small mud turtle in the family Kinosternidae. All measurements in the text are shell length (carapace). Adults are 8-12 cm, and females and males are about the same size; in a few cases females reach slightly over 12 cm. Weight is typically 90-260 g. The shell is smooth, oval and without a keel in adults, and the colour ranges from yellow-brown and olive-brown to almost black, often without pattern and often with algae on it. Young animals have three faint keels on the shell.

The plastron is large and has two hinges, one at the front and one at the back, so the animal can draw in its head, legs and tail and close the shell almost completely. The colour is yellow-brown to brown, sometimes with dark markings. In newly hatched young the plastron is orange, yellow or red with black spots, and this explains the species name, which means roughly "under red" (Latin *sub*, under, and *rubrum*, red). The chin and throat are yellow-grey with brown stripes and spots, and the legs and tail are greyish. The eye is yellow with dark clouding, and the feet are webbed.

The male has a larger head, a longer tail with a spine at the tip, a deeper notch at the rear of the plastron and a patch of raised scales on the hind legs. There are three subspecies, *K. s. subrubrum*, *K. s. hippocrepis* and *K. s. steindachneri*, which are distinguished by range and pattern. The species of *Kinosternon* and *Sternotherus* resemble one another and are confused in the trade; *Sternotherus odoratus* has only one weak hinge and more distinct stripes on the head. Like other species in the family, *K. subrubrum* releases a foul-smelling fluid from glands at the plastron when startled, and it can bite hard with its horny beak.

Distribution and habitat

Kinosternon subrubrum is native to the south-eastern and eastern USA. The range runs from the tip of Long Island in New York and New Jersey along the east coast through Delaware, Maryland, Virginia and the Carolinas to Georgia and Florida, and along the Gulf coast through Alabama, Mississippi and Louisiana to eastern Texas. In the north and west it follows the Mississippi valley up to southern Illinois, Tennessee, western Kentucky and Arkansas, and there are separate populations in Indiana and western Missouri. The species is found from sea level upwards, but not high in the mountains.

A population in central Italy is possibly introduced. The countries on the map show only the native range.

> **Native range:** United States.

HABITAT

Kinosternon subrubrum lives in shallow, still or slow-flowing fresh water: ponds, swamps, cypress swamps, lagoon edges, ditches, streams and rivers with dense aquatic vegetation and a soft bottom. The species also tolerates brackish water and is seen at salt marshes and on coastal islands. The animals are weak swimmers and walk mostly along the bottom, but can dive to 1-3 m. They seldom bask, and when they do, it is on rocks or driftwood in the water.

The species is most active at dusk. It regularly leaves the water and moves between wetlands, especially in drought, and it spends a large part of the year on land. In winter, from about November to March, the animals dig down at the edge of the wetland or into leaf litter and pine needles on land and hibernate; the beginning and end vary with the climate. Females lay eggs on open, sandy or loamy soil close to the water.

Care

THE ENCLOSURE

Kinosternon subrubrum is kept in an aquarium or a shallow tub with a land area, not in an ordinary terrarium. Little is known about the care of this particular species, so several of the figures are based on the species' way of life and on close relatives such as *Sternotherus odoratus*. The tub must be at least five times as long as the shell and half as wide as it is long, but never smaller than 80 × 40 cm for an adult. One adult therefore needs a tub of at least 80 × 40 × 40 cm with 15-20 cm of water, corresponding to about 50 litres. A pair or two females need at least 100 × 50 × 45 cm, and two males must not be kept together. The species is active and walks along the bottom, so floor area matters more than water depth.

Furnish the tub mostly as water with a basking spot above the water: a floating platform, a flat stone or a frame, so the animal can easily get up and down. Plants, roots and stones provide cover, and varying depth with flat stones makes it easy to reach the surface. The tub must have a lid, because the species can climb, and the rim must stand at least 20 cm above the water. A bottom of large, flat stones or no substrate at all is easiest to keep clean; fine gravel clogs the filter. The species is a messy eater, so a separate feeding tub makes cleaning easier.

Juveniles need a small tub of 40 × 20 × 20 cm with water no deeper than the shell is long, until they swim confidently.

Read more: Heat and temperature

TEMPERATURE

The water should be 21-24 °C, and a water heater with a guard is normally necessary. The basking spot should be 30-33 °C measured on the surface, and the air in the tub 24-29 °C by day. At night the temperature may fall to 20-24 °C. Use a heat lamp over the basking spot, and keep branches and edges away from the bulb. Avoid heat mats under the tub, because the animal walks along the bottom.

Juveniles do best in slightly warmer water, about 25 °C. In the wild the species hibernates from about November to March. A winter rest is not necessary in captivity when water and light are kept constant, and the temperatures needed for a controlled winter rest are not documented.

HUMIDITY AND WATER

Air humidity matters little for an aquatic turtle; 40-60% in the room is suitable. The air above the tub must not be cold or draughty, because that increases the risk of respiratory infections.

The water must be clear and clean. Use chlorine-free water, change part of the water every week, and empty and clean the tub thoroughly every second or third month.

Read more: Humidity, misting and ventilation

WATER AND WATER QUALITY

The water is 15-20 cm deep for adult animals, with flat and shallower areas where the animal can rest and stretch its neck up to the surface. The species is a weak swimmer, so deep water causes stress. The temperature is 21-24 °C (see Temperature).

The filter must clean both mechanically and biologically and be rated for at least three times the water volume, preferably an internal filter that can sit fully submerged, with a gentle flow. Use chlorine-free water and change part of the water once a week. Put all electrical equipment near the water on a residual-current device (RCD), and unplug before touching the filter or heater.

LIGHTING AND UVB

UVB is recommended, so the animal can make vitamin D3 and absorb calcium, and the basking spot should have both a heat lamp and a UVB tube, even though the species only seldom basks. Zone 2 is suitable, because the species is active at dusk and does not bask much. Use a high-quality UVB tube over the basking spot with no glass or plastic in between, and replace it every six to twelve months, because the output falls.

The light should be on for about 12 hours a day and off for 12 hours. Give the animal the chance to retreat into shade and cover.

Read more: Lighting and UVB Read more: Calcium, vitamins and supplements

FEEDING

Kinosternon subrubrum is omnivorous but mostly carnivorous. In the wild it eats snails, mussels, worms, insects, spiders, crustaceans, tadpoles, carrion, algae, aquatic plants and seeds. It takes its food from the bottom and in the water, and young eat the same as adults, only in smaller pieces.

In captivity, aquatic turtle pellets work as the staple. In addition give earthworms, captive-bred snails, black soldier fly larvae, mealworms, crickets, bloodworms, pieces of freshwater fish, prawns and small feeder fish. Also offer dark green leaves such as dandelion and kale and aquatic plants such as duckweed in small amounts, and dust the food with calcium once a week. Vary the food. Adults are fed every second day with what they eat in a short time, and remnants are removed. Feeding in a separate tub keeps the main tub clean. Juveniles are fed more often than adults, with more protein and in small pieces.

Read more: Feeder animals: keeping and breeding Read more: Rearing tadpoles Read more: Buying animals: captive-bred, wild-caught and transport

BEHAVIOUR AND HANDLING

Kinosternon subrubrum is shy and active, especially at dusk, and is seen mostly when it investigates the bottom. It is not an animal to pick up: it can bite hard with its horny beak and release a foul-smelling fluid. If the animal must be moved, take it at the rear of the shell with your fingers away from the head, and wash your hands afterwards.

The species lives alone in the wild and does not defend a territory, but males may fight head to head and inflict serious wounds on one another. Preferably keep one animal. Females can be kept together in a large tub if there is space and cover, and a pair needs extra attention during mating. The species can climb and dig down, so the tub must have a lid and a place with a soft substrate or land area.

Breeding

SEXUAL MATURITY AND SEXING

The male has a larger head, a longer tail with a spine and a deeper notch at the rear of the plastron, and a patch of raised scales on the hind legs. The female has a shorter tail. Both sexes reach sexual maturity at about 8 cm shell length: males after 3-7 years and females after 3-8 years, on average after 4-5 years. Growth is fastest in the first years and then slows.

MATING

In the wild mating takes place from March to May, mostly in the water but also on land. The male investigates the female's tail with his neck, rides on her and bites her on the head and shell. Courtship can be rough, so the pair must be monitored, and the female must be able to get away. A cool period as preparation is not documented for the species.

EGG-LAYING AND CLUTCHES

The female lays 2-5 eggs per clutch, in a few cases up to 9. The eggs are elongated, pale and have a brittle shell, and measure 17-32 × 13-20 mm. The female lays 1-3 clutches a year, most in the southern populations. She digs a nest 8-13 cm deep on open soil close to the water and packs soil over the eggs. Give her a box with moist soil or sand on the land area so she can dig. Egg laying takes place in May-June.

INCUBATION

The eggs hatch after 75-125 days, on average about 100 days. The incubation temperature determines the sex: at 21-27 °C males are produced, at 27-30 °C both sexes and above 30 °C females. If the eggs are incubated at 26-29 °C, mostly males result. The eggs are incubated in moist vermiculite as in other aquatic turtles; the exact incubation humidity is not documented for the species. In the wild most young hatch in August-September.

Read more: Incubating eggs

REARING THE YOUNG

The young are 17-27 mm and weigh 2-3 g at hatching and have black legs and orange to red spots on the plastron. They need a small tub with shallow water only as deep as the shell is long, plants and cover, and the water should be about 25 °C. They need small pieces of food high in protein and with a little greens, and UVB and a basking spot as adults. Keep the young apart from adults, and make sure all get food.

Health and common mistakes

Turtles hide illness, so watch for changes. Weigh and measure the animal regularly, and keep a log of weight, appetite and behaviour. A healthy animal has a smooth shell without lumps, clear eyes and is active and inquisitive.

Typical problems and faults in husbandry: - Lack of UVB or calcium: this causes a deformed shell with pyramided scutes and bone disease. - Respiratory infection from cold or draughty air: runny nose, watery eyes and lethargy. - Shell rot and shedding of scutes in dirty water. - Vitamin A deficiency from a one-sided diet: swollen eyelids and respiratory problems. - Overfeeding: obesity and deformities. - Injuries from sharp stones and unguarded heaters.

All reptiles can be symptom-free carriers of *Salmonella* and infect humans. Wash your hands before and after contact with the animal, water and equipment. After a bite, the wound should be rinsed under running water and cleaned with mild soap.

See a vet with reptile experience if the animal loses weight, does not eat, has an open mouth or seems lethargic.

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.