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Fire Salamander **(*Salamandra salamandra*)** **Husbandry Guidelines**

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1) Introduction

Fire Salamanders are a very popular species of amphibian and have been kept and bred in captivity for many years. It is said that their name was given to them by Europeans that thought they came from fire. This however is not exactly true; they are a terrestrial amphibian and live under log piles and in holes in pieces of wood. So, when people had fires in the forests, they would be hiding under the wood that was about to be lit and eventually the heat would be too strong for them and they would run from the fire. Hence why people thought they came from fire. There are fifteen different subspecies of fire salamanders which all vary in their size, colour and patterns.

S. s. salamandra: This subspecies is the most widespread and can be found throughout the Alps through Bavaria, the Czech Republic, and Baltic Peninsula towards the Carpathian Mountains. It is found from sea level to 1250m above sea level.

S. s. terrestris: This subspecies is found throughout France towards the central and eastern Pyrenees and the northern population through Switzerland, Catalonia, Belgium, Netherlands, Luxemburg and eastern Germany. It is absent from the Alps.

S. s. morenica: This subspecies is found in Spain in Sierra Morena, Sierra de Alcaras and Sierra de Cazorla between the rivers Guadiana and Gudaguivir in the northern parts of Jaen Province which is in south central Spain.

S. s. almanzoris: This subspecies can be found in Spain in Sierra de Gredos.

S. s. gallaica: This subspecies is found throughout Portugal and in North West Spain. It is not found in the extreme south of Portugal.

S. s. crespoi: This subspecies is found in the extreme south of Portugal in Serra de Monchique.

S. s. fastuosa: This subspecies is found in south west France from the central Pyrenees west towards the Cantabrian Mountains.

S. s. beschkovi: This subspecies is found in the south west of Bulgaria in the Sandanski Bistrica Valley in the Pirin Mountains.

S. s. bernardezi: This subspecies is found in northern Spain in the Cantabrian Mountains.

S. s. gigliolii: This subspecies is found in Italy from Calabria and eastern Liguria the length of the Apennines right to the extreme south of the Italian peninsula.

S. s. hispanica: This subspecies is found in the south east Pyrenees Mountains. It is questionable whether it is a valid subspecies or if it is synonymous with *S. s. terrestris*.

S. s. longirostris: This subspecies is found in the south of Spain in Sierra de Ronda, Cadiz Malaga province, southern Andalusia and in a small area near Marbella.

S. s. weneri: This subspecies is found in Greece in the Pelion Mountains, Kyllini and Taygetos Mountains.

S. s. bejarae: This subspecies is found in central Spain in the sierras between Madrid, Salamanca and Burgos right towards the Toledo mountains.

S. s. alfredschmidti: This subspecies is found in north west Spain in the Rio Tendi and Marea valleys.

The fire salamander has been introduced into the UK by escapees or those animals released illegally by pet owners. Their status in the UK is unknown and it is thought that populations are not sustainable unless further illegal introductions occur. Their world status is least concern because of their wide distribution across Europe, large populations and ability to live in a wide range of habitats. However there are some subspecies that are classed in their country of origin as threatened because of their restricted range. The Spanish have listed two subspecies *S. s. almanzoris* and *S. s. longirostris* as vulnerable.

2) Taxonomy

Nomenclature

Class Amphibia
Order Caudata
Family Salamandridae
Genus Salamandra
Species salamandra

Common name

It is referred to as the Fire salamander or common salamander.

3) Natural History

Physiology and Morphology

All of the subspecies are physically different and their markings vary.

S. s. salamandra: Stoutly built with large parotoid glands on the head and a rounded snout. The tail is about the same length as the body with the limbs being relatively long. Upper body is black with yellow, orange or red spots and they have a yellow spot on the joint of each limb. The underside is grey, black or brownish, sometimes with yellow spots. They can grow up to 28cm in length.

S. s. terrestris: More slender than *S. s. salamandra* the spots are often arranged to form lines along the top of the body. The yellow can extend the whole length of the body or it can have breaks in the strips. They can grow up to 28cm in length.

S. s. morenica: This subspecies has long toes with small yellow spots covering the body together with some red spots. The head has a large amount of red colouring on it especially around the parotoid glands. They can grow up to 19.5cm in length.

S. s. almanzoris: This subspecies can be almost entirely black but most of the time has a small amount of yellow spots on the body with a large amount of yellow on the paratoid gland. They have a triangular shaped head with large parotoid glands. They can grow up to 19cm in length.

S. s. gallaica: This subspecies usually has a lot of spots which are in the shape of spirals, horse shoes and hooks. They can often have red spots as well as the throat and head being dusted with red. They have a pointed snout and can grow up to 28cm in length.

S. s. crespoi: This subspecies is very similar to *S. s. gallaica* in shape and size but has very small yellow spots along the lateral flanks. They also have a pointed snout and can grow up to 28cm in length.

S. s. fastuosa: This subspecies is slender with a short rounded snout. The tail is very long, as are their toes, and they have small parotoid glands. They have two yellow stripes running along their body, the width of these stripes can vary between different individuals.

S. s. beschkovi: This subspecies is large with a big head and very short tail and limbs. They have yellow spots on the top of their body with the spots being much smaller along the flanks.

S. s. bernardezi: This subspecies is very similar to *S. s. fastuosa*. It is slightly smaller in size and stockier.

S. s. gigliolii: This subspecies is not very large with thin limbs and toes. It is quite slender, with a broad head and long tail. The yellow is very prominent with only small amounts of black present and the belly is sometimes similar with more yellow than black.

S. s. hispanica: This subspecies is very similar to *S. s. terrestris* with little variation.

S. s. longirostris: This subspecies is stocky with big yellow spots and has a distinctive four yellow spots on its head. It has a very long snout which extends well above the lower jaw. This subspecies can grow up to 19cm in length.

S. s. weneri: This subspecies is very similar to the nominative form *S. s. salamandra* with the spots arranged in a very similar pattern. They have a big tail and a triangular head with the lower jaw projecting. Sometimes a red pigment can be seen on the underside of the chin.

S. s. bejarae: This subspecies is large and stocky with a large head and a pointed snout with the tail being very small. The yellow spots are usually small and irregularly arranged with the patterns being very different between individuals. Sometimes a hook shaped pattern can be seen with yellow also spreading over the head and the parotoid gland can sometimes have some red colouring.

S. s. alfredschmidti: This subspecies is very small, only growing to approximately 10cm. Colouration varies but they have a dorsal stripe which is entirely yellow with a very slight black area on the tail. They sometimes have a black or brownish dorsal band which can be broken olive green, brown olive, grey brown to orange, blackish, chocolate brown to yellowish brown with a slightly darker stripe.



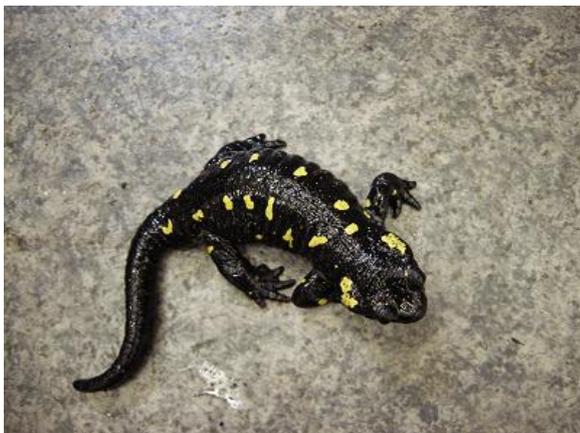
S. s. fastuosa



S. s. crespoi



S. s. gallaica



S. s. almanzoris



S. s. terrestris



S. s. morenica

Heart rate

Requires further research

Respiratory rate

Requires further research

Longevity

Fire Salamanders live for an average of approximately 20 years but one was recorded to have lived for 50 years. In the wild they are probably much shorter lived depending on predators, habitat and food availability.

Ecology

Fire Salamanders have a vast distribution with their range extending from central and southern Europe to eastern Europe. They live in a range of habitats which vary depending on subspecies. They are most often found in highly vegetated forests and woodlands with plenty of moss and leaf litter for them to shelter within. Most subspecies give birth in water so streams, ponds and brooks are often present or nearby. Some subspecies can be found on mountains with very little vegetation.

Diet and Feeding

Fire salamanders are very good feeders and will feed on live food almost as soon as they are born. As previously mentioned most fire salamanders give birth to larvae so they can immediately feed on aquatic foods such as protozoa, crustaceans, daphnia, shrimps, worms, and insect larvae in the wild. When they are young they are quite active and eat a large amount of food to help them develop. When they finally leave the water to join their parents and others on land their diet changes to small invertebrates such as woodlice, slugs, earthworms, centipedes and crickets. As they grow they will start to

gradually increase the size of their prey. They will sometimes even grow large enough to take small vertebrates such as other amphibians and rodents. They usually hunt at night but are sometimes seen in the day, often when it rains. They catch their prey by using two techniques depending on the speed of the prey. If catching a slow moving animal they will snap at it, if the prey is fast they will flick out their tongue.

Reproduction

This takes place on land and the time of year depends on the subspecies in the wild. In captivity they usually breed in autumn but can be conditioned to breed at any time of the year. Males can be identified by size as they are often smaller and not as plump as females and also by their swollen cloaca during breeding. The male will confront the female and show he is interested in breeding by rubbing her with his head along the side of her body. Eventually when he is side by side with the female he will go underneath her and, using his front legs, grip on to her front legs. While the male is carrying the female on his back they will both rub and wiggle from side to side. Eventually after a while of this ritual he will deposit a spermatophore, and encourage the female to collect it in her cloacal lips by moving his back end to the side forcing her to lower her back end directly on the spermatophore. This package will fertilise her eggs and allow development to begin. It will take between five and nine months for her to give birth depending on the subspecies and their environment. She will then give birth to larvae that are about 2.5cm long in shallow pools, ponds, ditches and streams. She will usually deposit her young at night over a period of four weeks. Depending on the subspecies numbers range between 5 and 60 larvae. However *S. s. fastuosa* and *S. s. bernardezi* have been known to give birth to metamorphed individuals on land. They only give birth to between two and ten young which tend to be bigger individuals at birth than the larvae of the other subspecies. In captivity they can be encouraged to breed by repeating seasonal variation in temperature and rain fall, usually temperature does the trick. Larvae can be reared as individuals or in small groups where individuals are similar in size. This is usually advisable as they are cannibalistic and will eat smaller offspring. Shallow water of about 4cm depth with a gravel slope so they have an easy route onto land is very important as I have witnessed drowning. From my observation, from larvae to metamorphosis it can take between one and four months depending on food and temperature.



S. s. almanzoris larvae at two weeks old.



S. s. gallaica at 5 months old.



S. s. gallaica at 3 months old.



Cannibalism is common.

4) Husbandry of captive stock

Health checks

All animals should be observed daily and there should be a check on the animals every week looking at their behaviour and general physique. Full health checks should be done on individuals at least once a month looking for any lesions or fungus and any torn skin or damaged limbs they may have picked up during feeding. Make sure their eyes are clear and there is no signs of cloudy eye or swelling. Faeces should be taken on a monthly basis and checked for any nematodes or other pathogens. I have witnessed young larvae having fungal growth on their gills. To try to avoid this you can rear them in a solution called tadpole tea. Weighing of animals weekly or monthly should be carried out as weight loss can be an early sign of disease.

Identification

You can use photographic identification to tell animals apart, as individuals have different spot patterns on their body, although this can still be challenging. I would rather stay clear of toe clipping and

silicone colour injections. I feel that it is invasive and may cause health problems.

Cleaning

If the enclosure is maintained at a high level of cleanliness, health problems should be scarce. Water bowls should be changed daily if you have small pond areas with gravel and pond weed to provide a birthing place. Full water changes should be done every month depending on how clean the water is. Moss, leaves and substrate should be replaced when looking tired. I replace the moss and leaves with fresh ones once a month. A depth of 3cm of the top soil is removed and replaced by fresh soil once a month with a full soil change every three months.

5) Housing requirements

Aquariums and pens

You can house up to six adults in “Clear-seal Basic” aquariums that are 32in x 15in x 15in. When I use these I put a glass divide in to make a corner pool, the piece of glass measures 9cm high and 35cm long. This provides a place for the salamanders to bath and give birth. You can also build pens out of brick and use tiles for an overhang to prevent escape.

Water quality

Salamanders are fairly hardy and don't tend to have many health problems with their skin as long as the pH remains around 6.5-7.5, which is the range in which pond life thrives. An air pump can create good oxygenated water so having one is very beneficial.

Vegetation and substrate

This species is terrestrial to a large extent and remains on land all year round but will sometimes venture into the shallow water to bath and give birth. It is best to provide a small area of water, a shallow water bowl is fine if you don't intend to breed with them. I use coco blocks as a main substrate about 9cm deep but you can use other soil based substrates. The substrate has a layer of moss put on top of it and is then littered with oak leaves. A lot of rocks, logs, plants and oak leaves are a good idea and provide them with places to hide. The birthing pool has a gravel substrate with a slope to allow the salamander easy access into and out of the water. I usually put some weed in the pool for the larvae to hide in.



Adult setup.



Lots of leaves provide hiding places.



Bits of bark and oak leaves make great hides. Rearing tank.



6) Feeding in captivity

Salamandra salamandra larvae will eat any aquatic food that is available to purchase e.g. Daphnia, Brine shrimp, Bloodworm, White worm and Tubifex. They are not fussy eaters and will happily take food from tweezers. It would be worthwhile farming earth worms as they are a good diet for these animals. Juveniles and adults will take crickets, wax worms, lobworms, slugs, mealworms, earthworms and even pinkies depending on the size of the individual. When feeding them crickets it is good to feed the crickets a range of fruit and vegetable so the salamanders are getting extra vitamins. You can also gut load or dust food with nutrobal which contains vitamins and calcium which keep the animals healthy if they are not getting a range of food to give them a balanced diet.

7) Injured or Sick animals in captivity

Skin infection: I have come across this a few times it seems that there is no explanation for it that is documented. The skin appears to have dried so they do not have a shiny look, and their colours seem to dull with the yellow markings going dark yellow. I have seen it be fatal to the salamander in some cases. The salamander will eventually die because it struggles to breathe through the skin and can quickly become stressed, stop eating and die. Post mortem results have shown bacteria in the skin but we do not yet have information on the type and therefore a successful method of treatment.

Fungus: I have also seen fungus develop on larvae it usually happens around the gills. We have used potassium permanganate to treat it and in some cases were successful. The potassium permanganate bath was 200mg/L and we put them in it for 3 minutes.

Bite and open wounds: I have come across this a few times they can quickly become infected by septicaemia. It happened to a young *S. s. fastuosa*, in this case it was treated with an injection of baytril (enrofloxacin) which is an antibiotic. This was done everyday through injection into its hind leg we alternated legs each day. We did this for five days then had a break of two days and did a further five days. It had lost at least eight toes from separate limbs but it recovered very well and developed all its digits again.

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Caudata Culture Species entry

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