Salamanders of the Alps: the Italian Tale

What *salamanders tell us about the health of the Alps, and how a single social media post changed the range map of an amphibian known to inhabit just 31 square kilometres of the world*

The length of a pen. This is roughly the size of the salamanders living in the Alps—organisms that researchers use to monitor the health of one of Europe's most complex ecosystems. It may seem incredible that such a vast mountain range should depend on an animal so small. Yet, due to their unique biology, salamanders present themselves as important indicators for the region.

Their survival is closely tied to temperature, humidity and environmental stability. For this reason, their populations indirectly reflect the ecosystem around them. If they are doing well, so is the environment they depend on. If they start to disappear, it may signal that something in the balance has already broken.

Several species live in the Italian Alps, some among the rarest in Europe. One in particular, the Aurora salamander—black with unmistakable golden spots on its back, each spot unique to the individual—was estimated to inhabit only 31 square kilometres of the entire world. Or so it was thought, until a social media post surprised everyone.

From Social Media Post to New Discovery

It all begins with a hiker enjoying a walk in Val di Sella, Trentino. He notices an unusual animal on the ground and takes a photograph. He then does what now comes naturally to many of us: shares it online.

Nothing so out of the ordinary until a forest ranger came across the photo. He recognized the Aurora salamander, a species known to live within a very restricted area. It should not have been there! The ranger contacted MUSE, the Trento Museum of Science, which is active in research on the particular subspecies. Could the species be present in other locations than originally thought? In autumn, the confirmation arrives: researchers find a gravid female in a habitat that was once considered unsuitable.

The discovery, led by MUSE in collaboration with the CNR and the Universities of Oviedo, Florence and Genoa, was published in *Acta Herpetologica* in March 2026. It was considered one of the most significant findings in Italian herpetology in recent years.

The Salamanders of the Alps

The salamanders living in the Italian Alps are varied. They are elusive animals, tied to humid, rocky and woodland environments. They move mainly at night or on rainy days. Spotting one is not easy, even when they live just a few steps from the hiking trails.

The most common is *Salamandra salamandra*, found throughout Italy up to moderate elevations. Known as the fire salamander, its distinctive yellow and black colouring signals to predators that its skin is toxic.

Higher up, reaching 2,500 metres, live strictly alpine species. *Salamandra atra*, from the Latin, black, is the most widespread at high altitude across the central and eastern Alps. Its dark skin helps absorb solar heat, an important advantage in such a cold environment.

In the Cottian Alps of Piedmont lives *Salamandra lanzai,* or Lanza's salamander, described for the first time in 1988. It was one of the last vertebrate species to be discovered in Europe.

A unique subspecies of *Salamandra atra* is the *Salamandra atra aurora*e, the Aurora salamander, with unmistakable golden markings. It lives in the Pre-Alps of Veneto and Trentino and is among the most geographically localized, endemic vertebrates in Italy.

The Aurora salamander is a vulnerable species protected under both European and Italian law. Studying it in the field requires a special permit from the Italian Ministry of the Environment.

Adaptation to Life at High Altitude

Most salamanders depend on water to reproduce. In an alpine environment, where water is an unreliable resource and favourable seasons are brief, this dependence could be a serious problem.

The salamanders of the Alps have adapted by "freeing themselves" from water. Both *Salamandra atra* and *Salamandra lanzai* are fully viviparous: they do not lay eggs in water but give birth to fully formed young after a gestation that can last up to four years. They have become entirely terrestrial animals.

How Salamanders Respond to Change

Salamanders have existed since before the dinosaurs, which might suggest they are anything but fragile. The truth is that they have adapted very slowly, over geological timescales. And the world around them is changing at a speed they have never encountered before.

Their biology leaves them highly exposed. They breathe through their skin, which is permeable and vascularised. Meaning any variation in the environment—humidity, temperature, pollutants—enters the body directly. They are ectothermic, cold-blooded organisms. External temperature governs vital functions such as digestion, reproduction, and movement with no internal regulation mechanism. And they are not very mobile. Making them unable to move in search of better conditions.

For the Aurora salamander, this is amplified by its limited range. Any localized disturbance threatens the health of the world population. This is why monitoring the habitat carries such extraordinary weight. The species' suffering is the consequence of a larger change upstream in the system.

Italian Conservation and Research Efforts

MUSE has been studying the Aurora salamander since 2017, systematically monitoring its populations as part of the Natura 2000 network, the European Union's system of protected areas. From 2027, a dedicated monitoring programme will be launched for the newly discovered population in Val di Sella.

The photograph taken by the hiker, an ordinary citizen like any of us, shows that we can all play an active role in expanding our understanding of even the smallest of creatures. The next sighting could come from anyone. You just need to keep an eye out.