Research shows that the smaller the scorpion, the deadlier

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Androctonus mauretanicus in Morocco. Credit: Dr Michel Dugon

Researchers in NUI Galway have shown, for the first time, that smaller species of scorpions, with smaller pincers, have more potent venoms compared to larger species with robust claws.

The scientists tested the theory from Indiana Jones and the Kingdom of the Crystal Skull, which warned of the dangers of small scorpions, and that "when it comes to scorpions, the bigger the better".

While this may have simply been a throwaway movie line from the adventurous archaeologist Indiana Jones, the research shows there is truth to it.

The team of scientists at NUI Galway's Ryan Institute put the quip to the test by analyzing 36 species of scorpions to show that larger scorpions have less potent venoms and really are better in terms of avoiding a nasty sting.

The results of the research have published in the international journal *Toxins*.

It shows the smallest scorpions in their analysis, like the Brazilian yellow scorpion, were over 100 times more potent than the largest species they studied, such as the rock scorpion.

The potency pattern was not just about body size, but also pincer size, with venoms found in species with the smallest pinchers, including the South African thick-tail scorpion, which is more than 10 times more potent compared to species with the largest and most robust pinchers, such as the Israeli gold scorpion.

Dr. Kevin Healy, Lecturer of Zoology at NUI Galway and senior author of the study, says that "outside of entertaining movie trivia there are good evolutionary reason to expect the results and important medical implications for such patterns."

The researchers highlighted that while scorpions use both their venomous sting and their pinchers to capture prey and for defense there is an evolutionary trade-off between these weapons. Energy used to make bigger pinchers means less energy is available for its chemical arsenal. This results in larger scorpions which can use their physical size are less reliant on venoms, while smaller species have evolved more potent venoms.

Dr. Healy added that "when we look at the most potent, and dangerous, scorpion venoms we find they tend to be associated with species such as the deathstalker which are relatively small. In contrast, the biggest species such as rock scorpions have venoms that are likely to only cause slight pain."

Alannah Forde, an NUI Galway graduate student and lead author of the study, says that "not only did we find that bigger is better—when it comes to people being stung—we also found that bigger pinchers are better when it comes to assessing the danger level of a scorpion. While species such as large-clawed scorpion might be small to medium in size, they mainly rely on their large pinchers instead of their relatively weak venom."
Scorpion stings are a global health problem with more than 1 million cases and thousands of deaths every year. Identifying the species involved with a sting is vital for treatment, hence general rules such as "bigger is better" are often used to help with treatment.

The team aim to test these evolutionary rules to what makes some species more potent to help develop better medical approaches to scorpion stings.

Dr. Michel Dugon, Head of the Venom System Lab at NUI Galway and a senior author of the study, says that "as scientists, our job is also to put popular wisdom to the test. Most victims hospitalized with severe symptoms following scorpion stings are children below the age of 15. Identifying the species responsible is essential to administer the correct treatment, and a simple rule such as 'bigger is better' is a first small step toward saving lives."


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