

Which came first, hermits or kings?

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Hermit crab species range in size and shape, from species a few millimeters long to some the size of a coconut.

Heather Bracken-Grissom, marine sciences professor in the FIU Department of Biological Sciences, has helped answer one of the most debated questions among evolutionary biologists: Did the hermit crab evolve into the king crab, or did the king crab evolve into the hermit crab?

Since the 19th century, science has suggested [hermit crabs](#) and king crabs are close relatives, despite their strikingly different appearance. Hermit crabs are small and depend on a shell for protection. King crabs are one of the largest [crustaceans](#) and do not have a shell, since they use their [external skeleton](#) to defend themselves. Both species belong to the infraorder Anomura – with more than 2,500 species within the infraorder, they are all very diverse in structure and ecological adaptations. As science would have it, hermits evolved into kings.

"The reason why it's taken so long to solve this mystery is because now we can use modern technologies and techniques that weren't available before," Bracken-Grissom said. "DNA sequencing has evolved leaps and bounds in the past few decades and now we can collect data like never before. Also, it's taken about 30 years of collecting samples to really be able to do a comprehensive study of this group."

Despite their seemingly different body structures, both crabs have one, key feature in common: an asymmetrical abdomen. The hermit's abdomen is concealed and coiled inside its shell. The king's asymmetrical abdomen is found in the adult form.

"The similarity of some hermit crabs and female king crab abdomen certainly gave us a clue, but you can't rely on appearances alone. At first glance, you wouldn't even think these two are related because they look so different on the outside," Bracken-Grissom said. "A combination of morphological and DNA sequencing techniques helped us confirm that these organisms were definitely related."

Together with an international research group made up of biologists, geologists and [zoologists](#), Bracken-Grissom examined 156 different morphological characteristics, including body shape, shell morphology, mouth parts, and larval morphology across 137 species of Anomurans. By combining the results with DNA sequencing, the group concluded the king crab evolved from hermit crab ancestors.

"By revealing the relationships between hermit and king crabs we begin to understand the evolutionary patterns within this diverse group of invertebrates," Bracken-Grissom said. "This information also provides insights into the ecology, origins, and physical characteristics of organisms which can aid in future conservation and biodiversity studies."

Anomurans are commercially important as evident in major [king crab](#)

and squat lobster fisheries. Hermit crabs are also popular aquarium pets.

Bracken-Grissom led the research group that included experts from the U.S. and Australia, including George Washington University, the Smithsonian National Museum of Natural History, and Australian Museum. Their findings are detailed in an article titled "A comprehensive and integrative reconstruction of evolutionary history for Anomura (Crustacea: Decapoda)," which was published in *BMC Evolutionary Biology*. Their research has resulted in the most complete evolutionary picture for the Anomura infraorder to date.

More information: www.biomedcentral.com/1471-2148/13/128

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