From the Ocean... Evolutionary Transitions in Animal Forms' Colonization of Land

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Summary

Life on the Earth began in the ocean, but we human live on the land. How did animals colonize the land? In this lecture, we will discuss the ecological and physiological aspects of the evolutionary transitions that allowed the marine animals to the terrestrial (and freshwater) habitats. We will also show how the advances in comparative genomics and EvoDevo contribute to our understanding of the colonization of land in the animal lineages.

Key Concepts

- Colonization of land took place independently in multiple lineages.
- Each of the freshwater and terrestrial habitats has a distinct set of physical and chemical properties from the marine habitats.
- Organisms colonizing the land must evolve physiological adaptations to the new habitats.
- Comparing the land colonizers to their marine relatives is a viable way to understand how the adaptation took place.
- In each independent land-colonizing event, a distinct set of adaptations may evolve to meet the same kind of environmental challenge.
- Adaptation to land frequently involves significant evolutionary innovations.
- Integrative research approaches, such as comparative genomics and EvoDevo, are critical for understanding why a particular type of adaptive strategy is taken by a specific lineage and how the major innovations arose during such evolutionary transitions.

Group Discussion

The coconut crab (*Birgus latro*) is a terrestrial hermit crab in the Indo-Pacific. It is the largest living terrestrial arthropod. Its weight can reach 5-6 kg and the leg span can be as long as 1 meter. In Taiwan, the coconut crab populations are found along the southern segment of the east coast (Taitung County). The population on the main island has diminished in recent years, but they can still be sighted on Green Island and Lanyu occasionally.

Use the coconut crab as an example, please list the type of environmental challenges it may encounter on the terrestrial habitat. Compared to the crabs that you have seen in the intertidal survey, what kind of new features should be evolved to adapt to the terrestrial habitat?

Coconut crab is terrestrial, but it is always found in the coastal region, never inland. What are the factors that might have prevented the coconut crab from invading further inland?

Further Readings

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