

# Adaptive locomotion in centipede : the role of body stiffness and morphology

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Recent biomechanical studies have shown that the behaviour of animal such as locomotion is affected by not only the neural control with force sensors but also the morphology and the material property of the body. For example, in most vertebrates, the axial skeleton is known to form the framework for lateral undulation that plays an invaluable role for walking and running.

Centipedes are soft-bodied arthropods with many legs. There are five orders of centipedes, and their gaits have been characterised by each order [1]. During locomotion, they also combine axial and leg movements. However, we found the combination was very different even among species in an order *Scolopendromorpha* of centipedes, *Scolopendra subspinipes mutilans* and *Scolopocryptops rubiginosus*, during not only fast running but also swimming, although it was similar during slow exploratory walking [2].

To investigate such diversity in their gait generations, we conducted the behavioural experiments in which the axial bending and stretching were restricted in a stepwise fashion, together with measurement of their morphology and viscoelastic properties. Based on the experimental results, we will discuss the role of the body stiffness on the adaptive locomotion of the soft-bodied organisms.

## 1 Reference

### References

- [1] Manton, S. 1977. *The arthropoda: Habit, functional morphology, and evolution*. Clarendon press, Oxford.
- [2] S. Kuroda and T. Nakagaki, “*Dynamic gait generation in crawling locomotion of the centipede, Scolopendromorpha scolopocryptops rubiginosus*”, (2016). (in submission)