

論文の内容の要旨

The functional morphology of locomotor system of anole lizards with different ecological habits

(異なる生息環境に適応したアノールトカゲ類の運動器系における機能形態学的研究)

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Understanding the functional relationships between morphological and ecological traits of vertebrates is one of the major goals of evolutionary biology. Especially the morphological characteristics of heads and limbs which are affected by locomotor behavior and habitat use are expected as important traits influencing the fitness. *Anolis* lizards have radiated adaptively and show highly diversity of species and morphological forms. In this thesis, I compared the locomotor system among species, sexes and populations of anoles and examined how morphological traits are related to behavior and habitat.

In the results of interspecies comparison, musculoskeletal systems of limbs show variation depending of microhabitat use. Terrestrial runner species possess larger mass of hindlimb extensors which is advantageous for running fast, whereas arboreal climbers are equipped with highly developed retractor which is adaptive to counteract gravity when climbing. Moreover the differences of forelimb muscles were indicated between arboreal active species and arboreal non-active species. The shorter moment arm producing wide excursion which is adaptive to branch-to-branch locomotion was observed in active species, whereas larger adductor muscles were shown in shoulder and elbow of non-active species which cling onto branch by whole arms and body. These findings suggest that divergent musculoskeletal characteristic in the limbs among *Anolis* species are strongly correlated with locomotor behavior and microhabitat use.

According to comparison of sexes, sexual dimorphisms were observed in forelimb muscles. In runner species which occur in terrestrial broad surface, male possess highly-developed humeral adductor which is adaptive to keep posture of display with expanding the dewlap. Larger extensor of elbow which is advantageous for display in narrow tree substrates was observed in male of arboreal species

which prefer arboreal habitat. These results indicate that significant sexual dimorphisms of appendicular musculoskeletal systems occur and the dimorphisms are related to habitat through the social display of male.

Also I compared the two populations of alien green anole in Ogasawara Islands, Japan. Male from Haha-Jima Island showed larger body and larger heads, whereas male from Chichi-Jima possessed relative wider and taller heads, however no differences of body and head size between Islands were observed in females. I observed the male combat in laboratory and examined the relationships among morphological traits and success of the territorial combat by using Generalized Linear Mixed Model. As a result, the model with head width as explanatory variables was best fitting in Chichi-Jima Islands, whereas the model constructed by body size, head length and dewlap size was selected as most fitting theory in male of Haha-Jima Islands. These models indicate that relative wider head of male in Chichi-Jima and larger body of male in Haha-Jima are adaptive to success of territorial combat. Thus, it is suggested that the morphological differences between the two island populations have occurred only 30 years since isolation, and that the differences are affected by territorial combat between male individuals.

Finally, it is suggested that the locomotor systems of anole lizards have notably diversified among species, sexes and populations. In addition, the varied morphological traits are strongly affected by locomotor performance, habitat use and social behavior. The locomotor systems are considered as the evolutionarily important traits which relate functionally anole lizards to sympatric niche differentiation, speciation and diversification by both of natural and sexual selection.