

# 琉球大学学術リポジトリ

## 頭足類における環境エンリッチメント効果に関する行動学的研究

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## 論文要旨

### 論文題目

Effect of environmental enrichment on the behaviour of cephalopods

(頭足類における環境エンリッチメント効果に関する行動学的研究)

I demonstrated following experiments to reveal the effect of environmental enrichment, which created by social factors (e.g., competition and potential inter-individual communication with conspecifics) and physical factors (e.g., arrangement of abiotic objects as well as movement or coloration of conspecifics), on the behaviour of cephalopods.

First, I investigated the effects of enrichment of the physical environment on the ontogeny of cryptic behavior in pharaoh cuttlefish (*Sepia pharaonis*). The cuttlefish were reared from 7 to 117 days in one of three environments, namely, Poor (artificial bottom without objects), Standard (sandy bottom), and Enriched (sandy bottom with objects). I found that physical enrichment promotes crypsis and accelerates the maturation of this ability in cuttlefish.

Seconds, I investigated the effects of environmental enrichment on the ontogeny of cognitive abilities in pharaoh cuttlefish (*Sepia pharaonis*). The cuttlefish were reared from 7 to 171 days in one of four environments: Isolated (neither objects nor conspecifics), Poor, Standard and Enriched. I found that the richness of social and physical information in the habitat improves and maintains memory and depth perception in *S. pharaonis*.

Thirdly, I investigated the effect of architectural lighting design, which significantly affects the occupants' physiology and psychology, on the ontogeny of cognitive abilities in the cuttlefish. The cuttlefish were reared from 35 to 136 days in one of the following four tanks that have the same physical and social factors but different lighting conditions; Even (the objects evenly illuminated by two LED light bulbs), Diffuse (the objects indirectly illuminated by downward two LED light bulbs), Focal (the objects were directly illuminated by downward two LED light bulbs) and Video projected (an hour long footages of coral landscape were concurrently presented from two side walls in the focal lighting tank). It was found that architectural lighting design act on the ontogeny of cognitive abilities in cuttlefish as environmental enrichment.

Lastly, I investigated the effects of environmental enrichment on the exhibition of behaviour of the octopus, and observed the behaviour of cuttlefish in the field to reveal whether the effects could be generally found on the cephalopods and the behavioral repertoire caused by the enrichment could be observed in the field. Octopuses were more exploratory in the standard environment and the enriched environment than in the poor environment. Octopuses in the enriched environment often showed the body pattern resembling the sandy bottom. Cuttlefish formed groups containing 2 to 9 members. The cuttlefish hovered just above the bottom but also sometimes rested on the bottom. The cuttlefish usually exhibited mottled or disruptive pattern depending on surroundings. These facts indicate that richness of physical factors affects the exhibition of behaviour on octopus as well as cuttlefish, and the behavioral pattern in the enriched habitation was roughly consistent with that in the field.

Therefore, these results indicate that the formation and acquirement of complex behaviour and high degree of intelligence in cephalopods are strongly correlated with the complexity of physical and social environment.

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