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Phylogenetic study of orders Zoantharia and Actiniaria (Cnidaria: Anthozoa: Hexacorallia)

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論文要旨

論文題目

Phylogenetic study of orders Zoantharia and Actiniaria (Cnidaria: Anthozoa: Hexacorallia)
(六放サンゴ亜綱の系統分類学的研究—スナギンチャク目の単系統性の検証—)

In this study, I focused on the intra- and inter-order phylogenetic relationships between orders Zoantharia and Actiniaria. Zoantharia is considered to be the order most possibly ancestral in suborder Hexacorallia, and Actiniaria is phylogenetically closely related to Zoantharia. These two orders are considered to be important taxa to reveal the evolutionary history of not only of the subclass Hexacorallia and class Anthozoa, but also of the phylum Cnidaria.

In chapter 2, taxonomic features and molecular phylogeny of the highly divergent zoanthid family Microzoanthidae are reviewed. This family can be clearly distinguished both morphologically and genetically from other zoanthids by their very small size, reduced or absent stolon, habitat usually on the bottom side of rubble zone rocks, and divergent and distinct DNA (cytochrome oxidase subunit I, mitochondrial 16S ribosomal DNA, internal transcribed spacer region of ribosomal DNA) sequences. My phylogenetic analyses clearly showed Microzoanthidae to be genetically far different from all other hexacorallians at the order level, but the macrocnemic arrangement of mesenteries and other morphological characters (colonial specimens with narrow stolons, two rows of tentacles, sand encrustation) clearly place these specimens within the order Zoantharia.

In chapter 3, the features and molecular phylogeny of the diminutive zooxanthellate zoanthid family Nanozoanthidae are reviewed. Nanozoanthidae polyps occur in 'pools' of sand upon hard substrates in coral reef environments. The results of my molecular phylogenetic analyses of mitochondrial 16S ribosomal DNA and cytochrome oxidase subunit I suggest that Nanozoanthidae is genetically closely related to both family Microzoanthidae and *Isozoanthus sulcatus* at the intrafamily-suborder level. The Nanozoanthidae-Microzoanthidae clade is clearly and highly divergent from all other known zoanthid families and from the order Actiniaria at the suborder level or higher.

In chapter 4, I analysed the molecular phylogeny of order Actiniaria while focusing on the suborder Endocoelanthae, a group that has unusual mesenterial arrangements. The results of my molecular phylogenetic analyses in this study support the theory previously based on morphological features that the Endocoelanthae are highly divergent from other sea anemones that have "exocoel" mesenterial arrangements.

In chapter 5, I analysed the phylogenetic relationships between order Zoantharia and Actiniaria. The relationship between Zoantharia and Actiniaria is poorly known and is still under discussion. The highly divergent zoanthids and actinarians in this thesis (chapters 2-4) formed highly divergent clades within each order although my results suggest the order Zoantharia is monophyletic. The results also suggested order Actiniaria is polyphyletic. Further analyses with poorly known taxa, such as genus *Isozoanthus* in Zoantharia or sub order Gonactinia in Actiniaria, is required to confirm the relationships between Zoantharia and Actiniaria.

This study demonstrated that the genetic diversity within Zoantharia and Actiniaria is much higher than has been previously thought and reported. To understand higher-level (family level or higher) genetic diversity within each order and the phylogenetic relationships between the orders of Hexacorallia, the continued accumulation of taxonomic information, such as from field surveys, is required.