博士論文要約（Summary）

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タイトル	Ecology of *Simplisetia erythraeensis* (Annelida, Nereididae) in the southern limit of distribution （分布南限域におけるコケゴカイ *Simplisetia erythraeensis* の生態学的研究）

キーワード（*Simplisetia erythraeensis*）（Nereididae）（Ryukyu Islands）（Life history）（Maturity）（Distribution）

Chapter 1: Introduction

Simplisetia erythraeensis is common species and frequently dominate the macrobenthic fauna of estuaries and tidal flats, and thought to have an important role in the ecosystem function of tidal flats. In late years, benthic species in tidal flats are threatened by decreasing their habitat caused by coastal development. However, little is known about the ecology of most species of Nereididae including *S. erythraeensis*. This study investigated the life history including maturation characteristics of *S. erythraeensis* and their distribution in Ryukyu Island, their southernmost distribution area in North Pacific.

Chapter 2: Reproductive season and life span of an estuarine polychaete, *Simplisetia erythraeensis* (Annelida, Nereididae), in Southern Japan

The life history of *S. erythraeensis* was clarified by the seasonal change in the population density and size distribution in Kagoshima Bay and Amami-Oshima Island. Population densities in both sites rapid decreased from spring and increased from late summer to autumn. The cohort analysis detected two cohorts in summer and single cohort from the end of autumn to early summer in both sites. Ovigerous females were observed from March to August in Kagoshima Bay and from April to July on Amami-Oshima Island.

These results show that *S. erythraeensis* has an annual life cycle and reproduced only once in Southern Japan. The juvenile settle on the bottom from summer to autumn and begin to sexually mature at approximately seven months after settlement. The peak of reproduction is approximately eleven months after settlement.

Chapter 3: A process of sexual maturation of *Simplisetia erythraeensis* (Annelida, Nereididae)

It is suggested that they die after reproduction, because the histological study in chapter three showed that their muscular layers were slimed or disappeared with their sexual maturity. Most of the coelom is occupied by layers of muscular tissue in immature individuals. In specimens with oocytes and cell clusters of spermatogenesis released into the coelom, their muscular tissues degenerated. In this stage, muscular tissues on the dorsal side dissolved, and the muscular layers became thinner as they sexually matured. The guts and longitudinal muscles of Nereidida break down during metamorphosis (histolysis) when approaching maturity (epitokous metamorphosis) (Fischer & Dorresteijn 2004). Therefore, muscles of *S. erythraeensis* exhibit histolysis as they sexually mature and probably expend the majority of its energy reserves supporting monotelic reproduction in chapter three. This species was shown to be monotelic like most species of Nereididae (Eckelbarger 1983, Olive 1983).

CHAPTER 4: Distribution of two types of *Simplisetia erythraeensis* (Annelida, Nereididae) in southern Kyushu and Ryukyu Islands

The distribution of *S. erythraeensis* was investigated in the Ryukyu Islands, where is the southern limit of the distribution of this species. Two morphological types were

found to coexist on Ryukyu Islands. One of them was thought to have the same morphology as the original description. According to these results, *S. erythraeensis* may be composed of plural species and two of them occurrence sympatrically in Ishigaki and Iriomote.

CHAPTER 5: General discussion

This study suggests that *S. erythraeensis* do not have a long pelagic period (lecithortophic development) from their egg size of this species in Chapter two and Chapter three. Dorsey (1981) reported that *S. erythraeensis* deposited its fertilized eggs in a tube. This suggests that their larval do not disperse so long distance, they may stay in the original habitat or to move to very near habitats. If *S. erythraeensis* have lecithortophic plankton or direct development, the decrease of tidal flats can be a risk of their population sustainability, because their local population may be isolated each other. Chapter four indicated the morphological difference of the same type among islands, then it is suggested that the genetic exchange between islands is low. Although more examination of the genetic structure of *S. erythraeensis* is necessary to evaluate the above mentioned risk, we should regard that a disappearance of tidal flats on coastal areas may give an important problem on *S. erythraeensis* especially in Ryukyu Islands.

Simplisetia erythraeensis has important and wide variety of roles in tidal flats, for example, to remediate the environment of tidal flats by decomposing organic matter in the sediment through feeding and digesting and turning over the sediment by digging, to prey as feed for migratory birds and fisheries resource fishes. The consideration of taxonomy and mechanism to maintain population of *S. erythraeensis* are important for improving the management of tidal flats.