

**Foraging strategy and social behavior of a snake (*Lycodon semicarinatus*,
Colubridae) feeding on sea turtles**

Kazumasa Matsumoto

Introduction

Snakes are considered to be the least social among non-avian reptiles, therefore, social behaviors unrelated to mating have never been quantitatively observed in wild snakes. On the other hand, previous studies suggest that a few species of snakes exhibit social behavior when foraging on sea turtles. In this study, I conducted field survey on *Lycodon semicarinatus* foraging on sea turtles.

Materials and Methods

Lycodon semicarinatus is endemic to Japan and is a colubrid snake distributed on islands in the central part of the Ryukyu Archipelago, Japan. This snake is considered an apex predator and a nocturnal dietary generalist, preying on almost all types of small terrestrial vertebrates. On Okinawa Island and several islets of the Kerama Group, coastal populations of *L. semicarinatus* have been reported to prey on hatchlings and eggs of green sea turtles, *Chelonia mydas*, and loggerhead sea turtles, *Caretta caretta*.

I conducted the field survey on *L. semicarinatus* foraging on sea turtles on Okinawa Island. To observe foraging behaviors and interactions between individuals, I used route census and fixed videography. To reveal the annual movement pattern and process of forming aggregation, I tracked 18 snakes by radio-telemetry.

Results

I found that the snake always performs active searching at the study site. Snakes visited a small area exactly above the nest of sea turtles and attempted to burrow a tunnel to feed on eggs and hatchlings in the sand. Tunnels leading from the surface of the beach to the inside of the nest were formed only by large snakes. Many other snakes used the already made tunnels to capture eggs and hatchlings in the nest. When snakes failed to find food on a nest, they terminated the intensive search above the nest in approximately 5 minutes irrespective of snake body size, season, and the condition of the nest. Subsequently, they left the nest and resumed extensive searching for other nests.

I quantitatively observed the interactions between individuals of *L. semicarinatus* that occurred on nests of sea turtles. The snakes repelled conspecifics from the nest by using a ritual fighting called 'combat dance'. Whether or not the snakes attack the occupant depended on the opponent on the nest. Several snakes that did not attack exhibited the unique behavior, that is, waiting for occupants to leave the nest.

Most snakes frequently utilized the beach area during the nesting season of sea turtles, from April to September. In the beach area, they were clearly attracted to particular locations and stayed there for a period of time. Therefore, small aggregation consisted of several tracked snakes was occasionally observed.

Discussion

My findings showed that *L. semicarinatus* has different foraging strategies depending on populations, Okinawa Island and islets of Kerama Guroup. Two environmental traits, that is, diversity of available prey animals other than sea turtles and characteristics of sands that consist of beaches, were considered as factors that might cause the difference

in the foraging strategy. Furthermore, the observation that the snake left the nest site after a consistent duration of unprofitable searching supports the giving-up time rule, which has been predicted by a theoretical model concerning the optimal time for predators to leave a patch.

I demonstrated the occurrence of territoriality and dominance hierarchy of *L. semicarinatus* based on my quantitative observations of interactions between individuals. In addition, the presence of three social systems, specialization, waiting rule, and social separation were suggested in the interactions. Furthermore, I compared the social behavior of two species of snakes, *L. semicarinatus* and *Oligodon formosanus*, that forage on sea turtles to postulate the factors that develop the society in snakes.

The data of radiotelemetry demonstrated that various social behaviors of *L. semicarinatus* occur in spatially and temporally limited small aggregation. In other words, solitary snakes develop social behaviors within the accidental aggregation caused by opportunistic foraging.

Conclusion

This study revealed that *Lycodon semicarinatus* forms a limited temporally and spatially aggregation and develops various social behaviors in the aggregation. The findings provide an opportunity to reevaluate the underappreciated sociality of snakes.