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Gut content analysis of the snake eel *Pisodonophis boro* (Hamilton, 1822) from estuary of Pranburi River, Thailand

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Abstract : The gut contents of the snake eel, *Pisodonophis boro* collected from the estuary of Pranburi from March to August 2015 were analyzed. Based on the 30 specimens observed, three species of crabs (*Sarmatium germaini*, *Metaplax elegans* and *Ucaper plexa*) were found. Based on the frequency of occurrence (%O), *S. germaini* showed the highest percentage of prevalence (81.48%) whereas *M. elegans* and *U. perplexa* had the lowest percentage of prevalence (3.7% each). Moreover, *S. germaini* had the highest (99.59%) index of relative important (%IRI) followed by unidentified mantis-shrimp (0.33%), *M. elegans* (0.11%) and *U. perplexa* (0.9%), respectively. From these results, the preponderance prey found in the snake eel's diet was crab. It might be suggested that *P. boro* is a specialist feeder on crabs rather than an opportunistic feeder.

Keywords : gut content analysis, Pranburi River, *Sarmatium germaini*, snake eel

Introduction

The snake eel, *Pisodonophis boro* (Hamilton, 1822) belong to family Opichthidae. It is widely distributed in the Indo-West Pacific (Somalia and Tanzania to Natal), southern India, Sri Lanka, Indonesia and Thailand (Froese and Pauly, 2016). Locally, this species has a high economic value. They are found along the estuaries and the tidal zone around the upstream areas of coastal rivers (Subramanian, 1984). They are abundantly found in the estuarine of Thailand, especially in the– Pranburi River (Paphavasit *et al*., 2014). However, the populations of *P. boro* in this area are dramatically decreasing due to several reasons such as the community development and the environmental problems (Personal communication). If the population is still decreasing, it is likely that they will be extinct from the estuary of Pranburi River. This problem could further elevate to the local food security issue. Hence, the ecological knowledge especially the feeding characterization is primarily required because it leads to the ecological roles of this species, population dynamics, resources partitioning (Guedes and Araújo, 2008; Ross, 1986) and trophic ecology (Svanbäck and Bolnick, 2007). Moreover, observation of the feeding information is a great value for developing the conservation strategies (Braga *et al*., 2012). This information is also necessary for the aquaculture of this species. Therefore, we examine the gut content of the snake-eel from the Pranburi River during the fishing season.

Methodology

1. Sampling and gross anatomical study

A sampling of *Pisodonophis boro* was undertaken during low-tide in the fishing season (March 2015 to August 2015) from the mangrove forest at Pranburi Estuary, Prachuap Khiri Khan Province (N 12°24'08.5" / E 099°59'00.2"). Thirty specimens of *P. boro* with various sizes (30.5-97 cm ± 2.38 S.E.) were euthanized by rapidly cooling shock method (Wilson *et al*., 2009). They were measured in both total length (TL to the nearest cm) and weighed (W to the nearest g) before dissection of digestive tracts. Then, the specimens were preserved in Davidson's fixative for about 36-48 hrs at room temperature before transferring to 70% ethanol for gut content study under the

stereoscopic light microscope. The experimental protocol was approved by the Animal Care and Use Committee of Faculty of Science, Chulalongkorn University (Protocol Review No. 1523005).

2. Analysis of gut contents

All specimens were horizontal-opened and dissected out the food items from the digestive tract (from anterior-stomach to posterior-intestine) under the stereoscopic microscope. The identification of the food items was assessed to detail according to the guidelines of Machjajib (1973) and Paphavasit *et al*. (2014).

Afterwards, the frequency of occurrence (%O), the percent by number (%N), and the percent areas coverage (%C) were calculated based on the method described by Hyslop (1980) and Hajisamae (2012). The contribution of each index was also analyzed with the index of relative importance (%IRI) (Hyslop, 1980 and Cortés, 1997).

Results and Discussion

1. Analysis of gut content

The food items of *Pisodonophis boro* were represented from twenty-seventh specimens (90% prevalence). Three specimens (10%) had an empty gut. It is possible that the fish had already digested its food before sampling.

The characterization of the gut content in this fish was only found with a crustacean group including crabs and mantis-shrimp which was similar to what was found in *Conger conger* (O'Sullivan *et al*., 2004), *Anguilla japonica* (Kaifu *et al*., 2013), and *P. boro* in the Vellar River (Tamil Nadu), Bay of Bengal, India (Subramanian, 1984). The crab diet of *P. boro* consisted of three species: *Sarmatium germaini*, *Metaplax elegans, and Uca perplexa*, respectively. The highest percent occurrence (%O) of 81.48% was found in *S. germaini*. In contrast, other crabs including *M. elegans* and *U. perplexa* had low percentage (3.70 each) of occurrence (Table 1). Surprisingly, unidentified mantis-shrimp was also found in the gut content of this snake eel. This has not been reported in previous studies. It is possible that this mantis-shrimp might be the accidental prey or this mantis-shrimp was accidental burrows into the crab hole. However, the studies of food preference in the laboratory would be conducted in the future to clarify this hypothesis.

Based on the relative important index (%IRI), the results showed that *S. germaini* had the highest IRI percentage (99.59%) followed by unidentified mantis-shrimp (0.33%), whereas others preys showed %IRI less than one percentage (Table 1). It is possible that *P. boro* can actually rank a variety of food categories according to their energy value which prey body size, influences energy value, and their escape ability (Townsend and Winfield, 1985). In addition, *P. boro* may focus their prey items on the most abundant food type found in the system (Tinbergen, 1960 in Kaifu *et al*., 2013). This seems to be the congruence with the abundance of *S. germaini,* which found in high concentration in the sampling area (individual observation). They also seem to have less ability to escape than other crab species.

From the data mentioned above, *P. boro* might be considered as a specialist feeder who exclusively feed on crabs. This hypothesize was strongly agreed with the study by Subramanian (1984), who reported that *P. boro* showed burrowing behavior to feed only on the fiddler crab at night. On the other hand, the diet content of *P. boro* differed other Anguilliform species such as Conger eel (*Conger conger*) which feeds mainly on fishes from the water column (O'Sullivan *et al*., 2004).

Conclusion

Overall of our research, this study is a first description of the gut content in *P.boro* at the Estuary of Pranburi River, Thailand. The prey composition of the *P. boro* suggested a high trophic position on benthic decapods at the Estuary of Pranburi River. However, the preponderance of the only group of crabs in their diet suggested that *P. boro*

is a specialist feeder on crabs which were the most abundance species in the system. They also utilize the estuarine habitat as a feeding ground.

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Table 1. Summary of prey items found in the gut contents of *Pisodonophis boro* from Pranburi Estuary, Thailand, during fishing season 2015, n = 27 (empty gut = 3).

Name	O	N	C	%O	%N	%C	IRI	%IRI
Sarmatium germaini	22	30	159.4	81.48	90.91	84.61	7773.05	99.59
Metaplax elegans	1	1	1.8	3.70	3.03	0.96	6.57	0.11
Uca perplexa	1	1	1.2	3.70	3.03	0.64	5.39	0.09
Unidentified mantis-shrimp	1	1	8.5	3.70	3.03	4.51	19.74	0.33

Where *%O* is the percentage of the frequency of occurrence of each prey category, *%N* is the percentage of the number of items in all guts, *%O* and *%N* were based on the method described by (Hyslop, 1980), and *%C* is the percentage of the areas coverage of items in all stomachs, this method designed by Hajisamae (2012).