

Food and feeding habits of the seahorses *Hippocampus spinosissimus* and *Hippocampus trimaculatus* (Malaysia)

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Two seahorse species, Hippocampus spinosissimus and Hippocampus trimaculatus, sampled in east and west coastal waters of Peninsular Malaysia, fed mostly on crustacean prey; small caridean shrimps and amphipods as adults (both species), and copepods and larval meroplankton as juveniles (for H. trimaculatus only). The similar short relative gut length (~0.4) of both species is consistent with a carnivorous diet. Both species are considered specialists in prey selection, focusing on slow-moving epibenthic, hyperbenthic and canopy-dwelling crustaceans that dwell on the mud-sand seabed, or are associated with seagrass or mangrove areas. In this light, seahorses with their juveniles in shallow waters are vulnerable to coastal reclamation and development.

Keywords: Syngnathidae, food habits, stomach content, crustacean prey, preponderance index, PCA, diet overlap, ontogenetic shift, relative gut length

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INTRODUCTION

Seahorses are globally traded in large volumes in the aquarium and marine curio trade, and in traditional Chinese medicine (Lourie *et al.*, 2004). Demersal trawl fishing has also greatly affected their habitats (Baum *et al.*, 2003). As a result, wild seahorse populations appear to be declining (Perry *et al.*, 2010), prompting concern and their listing in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. They are now described as endangered or vulnerable (Baillie *et al.*, 2004).

Malaysia is among the tropical and subtropical regions where seahorse diversity and abundance is high (Lourie *et al.*, 2004), with at least 12 species of seahorses being found in the region along with 50 species of other related members in the family Syngnathidae (Lim *et al.*, 2011). Unfortunately, there are very few studies on Malaysian seahorses, particularly on their ecology. These include the first documented report on seahorse diversity and its distribution in Malaysia (Choo & Liew, 2003, 2004), later updated by Lim *et al.* (2011) and Lawson *et al.* (2014).

No studies have been conducted to determine the feeding habits of any species of seahorse or their relatives in Malaysian waters, but such studies have been conducted in other regions. However, studies conducted elsewhere have indicated that the type of food consumed by seahorses depends

on the species and habitat. In the Aegean Sea, *Hippocampus guttulatus* Cuvier, 1829 and *Hippocampus hippocampus* Linnaeus, 1758 were reported to commonly feed on decapod larvae, mysids, amphipods and other unidentified prey (Gurkan *et al.*, 2011). A study in north-eastern Brazil revealed that *Hippocampus reidi* Ginsburg, 1933 and *Hippocampus subelongatus* Castelnau, 1873 consumed cyclopoid copepods, amphipods and caridean shrimps (Castro *et al.*, 2008). Another study in New Zealand reported the dietary items of *Hippocampus abdominalis* Lesson, 1847 as being largely composed of crustaceans, especially amphipods, caridean shrimps and peracarids (Woods, 2002). The size of the seahorse's snout apparently determines the diet of the seahorse; for instance, the small snout of the lined seahorse, *Hippocampus erectus* Perry, 1810, is adapted to take small or slender-bodied amphipods living in seagrass and seaweed beds, such as *Ampithoe longimana* S.I. Smith, 1873, *Gammarus mucronatus* (Say, 1818) and *Caprella penantis* Leach, 1814 (Teixeira & Musick, 2001). Diets shift significantly as seahorses move from juvenile to adult life stages. *Hippocampus hippocampus*, *H. guttulatus*, *Hippocampus mohndikei* Bleaker, 1854a and *H. reidi* prefer smaller planktonic animals as juveniles, while adults consume larger pelagic prey (Kanou & Kohno, 2001; Castro *et al.*, 2008; Gurkan *et al.*, 2011).

Two species of seahorses, *Hippocampus spinosissimus* Weber, 1913 and *Hippocampus trimaculatus* Leach, 1814, are commonly found in Malaysian waters (Choo & Liew, 2003; Lawson *et al.*, 2014). They are commonly traded for traditional medicine and are vulnerable to trawl fishing and habitat destruction (Choo & Liew, 2005; Perry *et al.*, 2010). These seahorses are known to occur in variable bottom

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