

## **A FIRST RECORD OF SEAHORSES AND THEIR HABITATS IN PENANG NATIONAL PARK, PENANG, MALAYSIA**

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### **ABSTRACT**

Seahorses are unique, cryptic fish belonging to the family Syngnathidae. This study attempts to validate anecdotal reports of seahorse presence and identify their habitats within the protected waters of Penang National Park, Penang, Malaysia. Opportunistic underwater visual surveys were conducted from November 2014 to April 2015 using SCUBA. Seahorses encountered throughout the surveys were identified, sexed, and measured. The type of holdfasts and encounter depth were also recorded. A total of 11 individuals from two species, *Hippocampus comes* and *H. kuda* were found in the surveyed areas. *Hippocampus comes* was found exclusively on *Subergorgia* sp. and *Menella* sp. sea fans, whereas the sole individual of *H. kuda* was found on artificial substrate, a submerged car tyre. Findings of the study indicate that marine areas within Penang National Park are potentially important habitats for seahorses. Continuous monitoring of seahorses is recommended to ensure the continuous existence of a healthy population within the protected area.

**Keywords:** Seahorse, Syngnathidae, Penang National Park, marine, conservation.

*Received (22-March-2020); Accepted (12-April-2020); Available online (25-August-2020)*

**Citation:** Quek, Y.A., Lim, A.C.O., Loh, T.L. & Latip, N.S.A. (2020). A first record of seahorses and their habitats in Penang National Park, Penang, Malaysia. *Journal of Wildlife and Parks*, **35**: 61-71

## INTRODUCTION

Seahorses (*Hippocampus* spp.) are a flagship species for marine conservation, due to their uncommon occurrence and remarkable features such as an equine-like appearance, male gestation, and upright swimming (Lourie *et al.*, 2016). Such traits have allowed them to serve as “umbrella” species; protecting other marine life occupying the same habitat (Shokry *et al.*, 2009). However, they are threatened worldwide by overexploitation, mainly for use in traditional Chinese medicine (TCM), and to a lesser extent, in aquaria and as curios (Vincent, 1996). Seahorses in the TCM trade are mainly caught as bycatch, with the Southeast Asian region, particularly Thailand, Vietnam, and Malaysia, reported as major exporters of seahorses for the global trade (Giles *et al.*, 2006; Perry *et al.*, 2010). The life history traits of seahorses, which include limited mobility, low fecundity, lengthy parental care, and mate fidelity in some species, have increased threats to this group due to widespread and unsustainable harvesting (Foster & Vincent, 2004).

The total annual catch of seahorses in Malaysia from trawling and artisanal fishing was estimated to be almost one million individuals (Perry *et al.* 2010). Despite the large numbers of seahorses caught and traded each year, information on seahorse species distributions in this region is lacking; seven of the 12 species found in Malaysia are classified as “data deficient” by the IUCN Red List of Threatened Species (IUCN, 2020). The other five seahorse species are listed as “vulnerable” due to declining populations, including the two species, *H. spinosissimus* Weber, 1913 and *H. trimaculatus* Leach, 1814, most prominent in the global trade (Foster *et al.*, 2016). In addition, seahorse catch in the region, including that in Malaysia, was reported by fishers to be declining, based on their perceptions (Giles *et al.*, 2006; Perry *et al.*, 2010). Given that the habitats that support seahorses, such as coral reefs and seagrass beds, are also threatened in-country (Lim *et al.*, 2011), there is a pressing need to assess the local population status of seahorses and identify critical habitats to protect the remaining populations.

A previous study by Lim *et al.* (2011) recorded 11 seahorse species in the waters off Malaysia; *H. barbouri* Jordan & Richardson 1908, *H. bargibanti* Whitley 1970, *H. comes* Cantor 1850, *H. denise* Lourie & Randall 2003, *H. histrix* Kaup 1856, *H. kelloggi* Jordan & Snyder 1902, *H. kuda* Bleeker 1852, *H. satomiae* Lourie and Kuitert 2008, *H. severnsi* Lourie & Kuitert 2008, *H. spinosissimus* and *H. trimaculatus*. More recently, new sightings of individuals of *H. mohnikei*

Bleeker, 1854 were made off Kuala Gula, Perak, increasing the total species richness of seahorses in Malaysia to 12 (Aylesworth *et al.*, 2016). Based on previous studies, six of the 12 seahorses species are found in the Straits of Malacca (Aylesworth *et al.*, 2016; Lim *et al.*, 2011), off the west coast of Peninsular Malaysia where Penang Island is located. No studies however, have specifically focused on seahorse distribution in the waters surrounding Penang Island, a historically important port and trading centre, and a significant node in the seahorse trade in Malaysia (Choo & Liew, 2005).

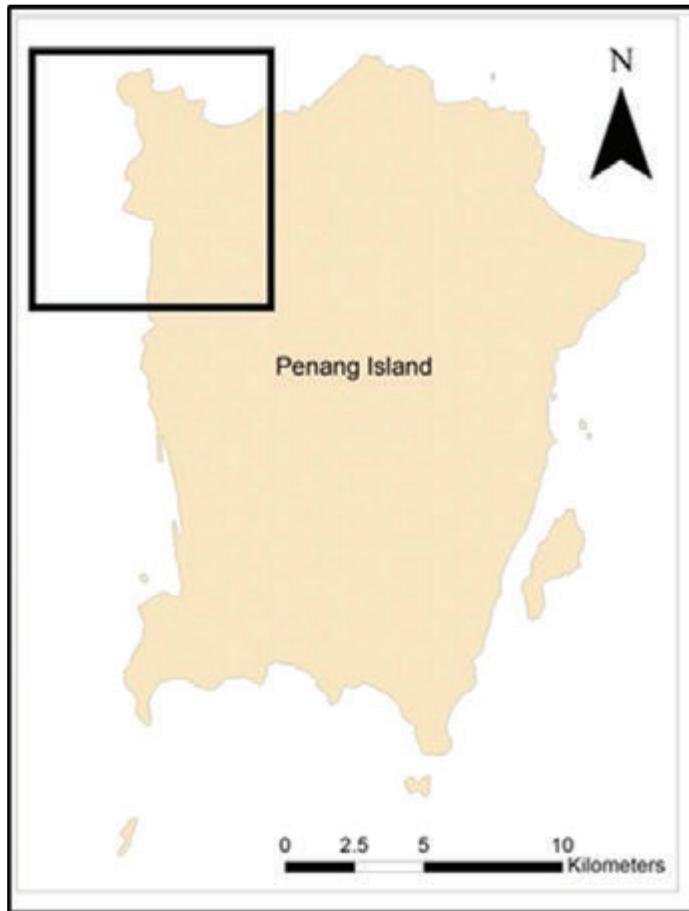
Based on anecdotal reports from members of the public including local fishermen, it appears that Penang Island may host at least five species of seahorses, possibly the highest species richness of seahorses in Peninsular Malaysia in one location. However, there is a dearth of information on seahorses from Penang State; the only seahorse voucher specimen is an individual of *H. comes* collected from Penang Island between 1971–1985, and it is currently stored in the British Museum of Natural History (Lim *et al.*, 2011). Fishers reported drastic declines and even disappearances of seahorse populations along the west coast of Peninsular Malaysia, due to intense trawling and habitat loss (Choo & Liew, 2005). The discovery of extant seahorse populations off Penang Island reported here would signify that there is a potential for population recovery; thus, protective measures should be enacted. In the face of rapid coastal development on Penang Island (Loh, 2015; Looi, 2015; Tan, 2015), seahorse distribution studies are urgently needed to map their occurrences for the conservation and management of these species. To this end, our study aims to identify possible seahorse hotspots in the marine waters off Penang National Park.

## METHODOLOGY

Penang National Park is located at the northwest corner of Penang Island (05°25'N–05°28'N, 100°10'E–100°12'E) and, was gazetted in 2003 under subsection 3(1) of the National Parks Act 1980. The park consists of 1,181.949 ha of terrestrial area and 1,381.014 ha of marine area (a half nautical mile from the lowest water mark). The park is currently under the management of the Department of Wildlife and National Parks, Peninsular Malaysia (PERHILITAN). Opportunistic surveys were conducted exclusively within the marine area of Penang National Park using Self-Contained Underwater Breathing Apparatus (SCUBA). Dive surveys were conducted off the beaches of the Centre for Marine and Coastal Studies-USM (CEMACS-USM), and Teluk Aling, as well as Monkey Beach (Figure 1). Potential sites were identified based on local ecological knowledge of bottom substrates and previously reported bycatch of seahorses from fishermen. Upon finding a seahorse underwater, the depth and type of holdfast were recorded. The individuals were then brought up

to the boat for taxonomic identification to species level according to Lourie *et al.* (2016) and the iSeahorse toolkit (iSeahorse, 2020). Approximately 10 minutes after morphological identification, individuals were released close to where they were found.

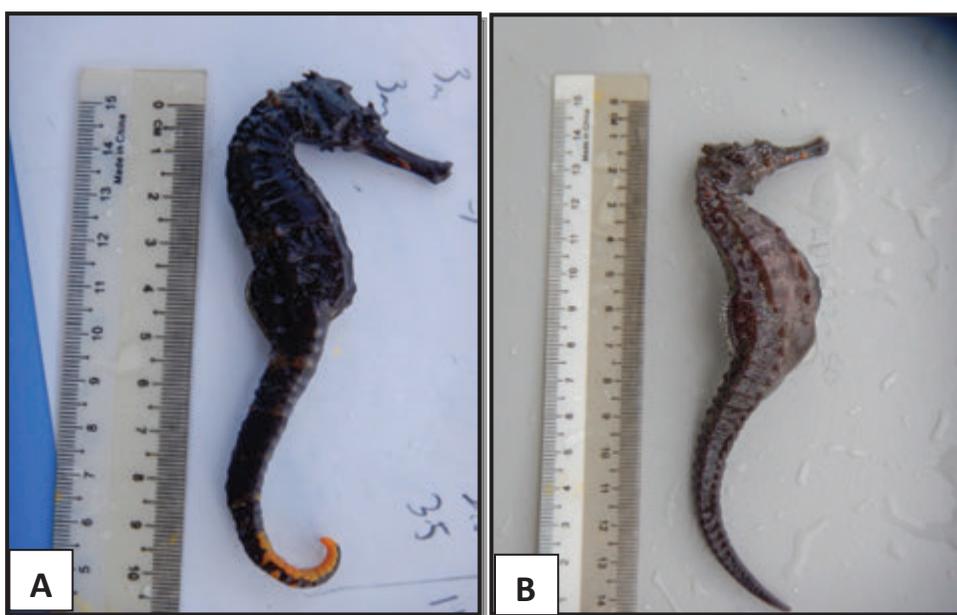
Gorgonian sea fans encountered during the surveys were sampled and preserved in 75.0% alcohol according to the procedure modified from Janes (2008) and identified using the pictorial guide in Fabricius and Alderslade (2001).



**Figure 1** Location of Penang National Park on Penang Island.

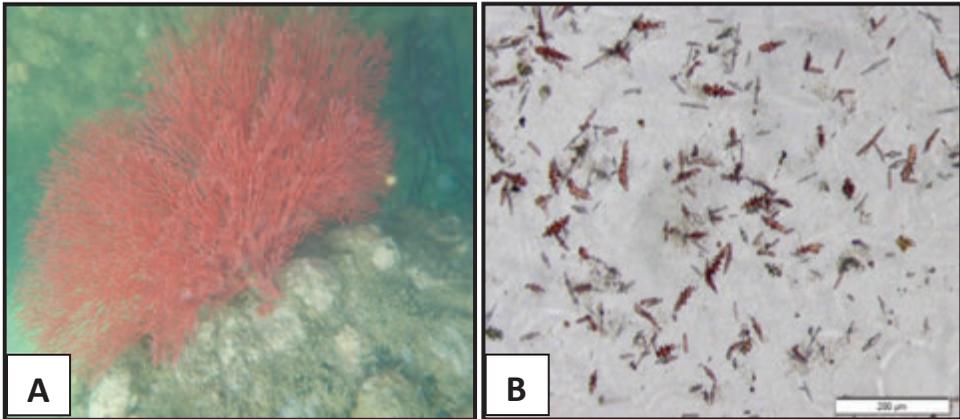
## RESULTS

Eleven seahorse individuals (10 *H. comes* and one *H. kuda*) were found during the two surveys conducted at the study sites (Figure 2). Five female and five male specimens of *H. comes* were found, whereas the sole specimen of *H. kuda* was male. All seahorses were encountered at shallow depths (1.0–3.0 m), approximately 3.0–5.0 m from the coast line.

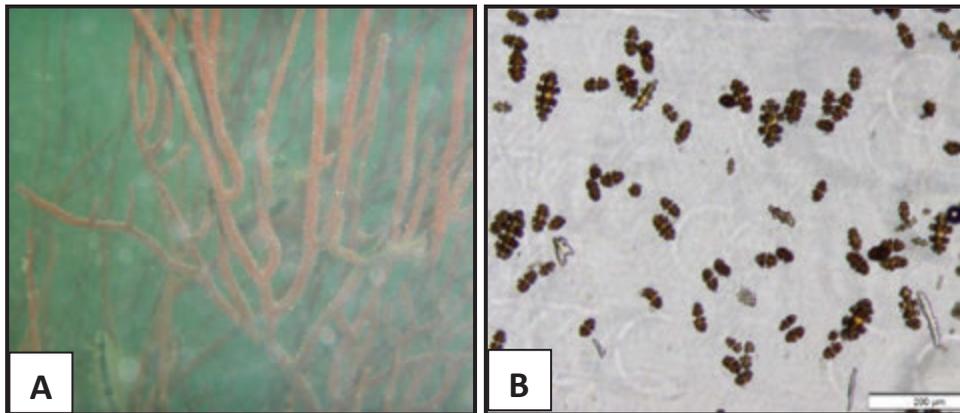


**Figure 2** Female *Hippocampus comes* (A) and male *H. kuda* (B) specimen found during the survey.

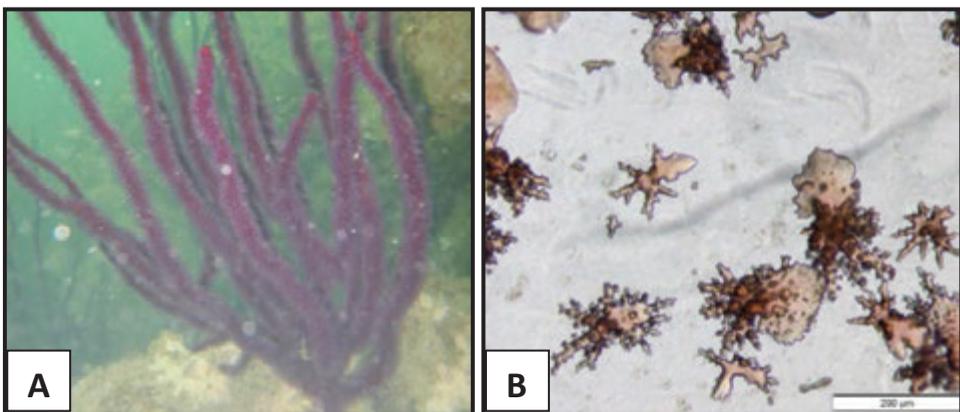
All 10 *H. comes* specimens were found attached to gorgonian sea fans belonging to the *Subergorgia* and *Menella* genera during the surveys. The single *H. kuda* specimen was found in a submerged vehicle tyre. Three morphologically distinct sea fans found in the area were sampled and identified to genus level (Figures 3–5) to determine if *H. comes* used certain genera of sea fans more commonly as holdfasts (Table 1).



**Figure 3** A: *Acabaria* sp. at one of the study sites; B: Sclerites of *Acabaria* sp.



**Figure 4** A: *Subergorgia* sp. at one of the study sites; B: Sclerites of *Subergorgia* sp.



**Figure 5** A: *Menella* sp. at one of the study sites; B: Sclerites of *Menella* sp.

**Table 1** Sea fan genera found in Penang National Park and seahorse (*H. comes*) occurrence on each genus of sea fans.

Gorgonian family	Gorgonian genus	Seahorse occurrence
Melithaeidae	<i>Acabaria</i>	Absent
Subergorgiidae	<i>Subergorgia</i>	Present (6 individuals)
Pleaxauridae	<i>Menella</i>	Present (4 individuals)

## DISCUSSION

During the surveys carried out at Penang National Park, two species of seahorses were found. This result confirms the anecdotal reports from Teluk Bahang fishermen who place their nets in park waters that seahorses are present in the area. In our surveys, *H. comes* and *H. kuda* were found in shallow waters (1.0–3.0 m) approximately 3.0–5.0 m from the coast line, consistent with the known habitats mentioned by Lourie *et al.* (2016) and Perante (2002). *H. comes* appears to be the dominant seahorse species in Penang National Park. This seahorse species may exhibit a holdfast preference for at least two gorgonian sea fan genera found in the park marine waters. This habitat specificity might render *H. comes* more vulnerable to increasing anthropogenic disturbances as their survival might be dependent on gorgonian sea fan habitats within park boundaries. Anthropogenic disturbances to the marine habitat include tourism development, environmental pollution, poaching, and poor enforcement, as highlighted by Chan *et al.* (2015). Other disturbances that were observed during the surveys include artisanal fishing, aquaculture, and increased boat traffic arising from tourism activities within park boundaries.

It should be noted that eight of the 10 *H. comes* individuals were found during the first survey in November when the water visibility was better (2.0–4.0 m). During this survey, the divers dived deeper (up to 3.5 m) and covered a larger area (approximately 25 m<sup>2</sup>). The other two individuals were found during the March survey, where low visibility only permitted diving in shallower waters (~1.0 m depth). Nonetheless, as a large number of seahorses (9 of 11) were found during the first survey, Penang National Park waters may be a seahorse hotspot. However, because *H. comes* inhabits waters up to a depth of 20.0 m, and *H. kuda* has been reportedly found at a maximum depth of 55.0 m (Lourie *et al.*,

2016), there is a possibility that seahorses might be found in deeper waters off the park if suitable substrate is available.

The sole *H. kuda* specimen was found on artificial substrate; i.e., a vehicle tyre. This illustrates the possibility of seahorse holdfast adaptability. No *H. trimaculatus* and *H. mohnikei* specimens were found in the surveys despite the former being the most common species found in a survey of fishers at ports around Penang Island (Quek, 2015). More studies are recommended to verify this. The presence of seahorses in the area marks the first confirmed sighting of live seahorses in their natural habitat off Penang Island.

Because *H. comes* individuals were found exclusively on gorgonian sea fans, the area off Monkey Beach, where comparatively more sea fans are found, very likely hosts a substantial *H. comes* population and is thus of conservation importance. In this habitat, gorgonian sea fans are likely the most preferred holdfast for seahorses due to their perpendicular orientation to currents, allowing maximum feeding access for organisms that rely on plankton for food (Goh *et al.*, 1999; Wainwright & Dillon, 1969). Hence, it was important to identify the species of sea fans that hosted seahorses to inform further conservation efforts. Of the three gorgonian sea fans genera identified in this study, only two genera were observed to be used as seahorse holdfasts, *Subergorgia* and *Menella*. Both genera are common in the Indo-Pacific region; *Subergorgia* is common in 'turbid near shore environments below 5 m depth', whereas *Menella* favours 'fast flowing waters, below depths of high irradiance' (Fabricius & Alderslade, 2001).

The preferences of these two genera can be used to locate potential seahorse habitats off Penang Island and possibly Malaysia for conservation purposes, as these genera are widely distributed throughout the Indo-Pacific region (Fabricius & Alderslade, 2001). Identification of such habitats is especially crucial off Penang Island, given that the island is experiencing rapid development. For example, land reclamation projects, mostly concentrated on the north and east coast of Penang Island, have taken place since 1883 (Chee *et al.*, 2017), threatening benthic communities and thus, seahorse habitats.

## CONCLUSION

In this study, we confirmed the existence of seahorses in the waters off Penang National Park. In total, 11 individuals from two species were encountered. Individuals of *H. comes* were found using gorgonian sea fans of the genera *Subergorgia* and *Menella* exclusively as holdfasts. The potential holdfast specificity might cause this species to be more vulnerable to anthropogenic disturbances, especially because artisanal fishing, aquaculture, and tourism

activities have been observed in park waters. Continuous monitoring is recommended to ensure that the seahorse population within the protected area remains healthy.

### ACKNOWLEDGEMENTS

This paper contains material submitted as a Final Year Honours Project to the School of Biological Sciences, Universiti Sains Malaysia (USM). Approval for research was obtained from PERHILITAN on September 30, 2014 (permit reference number: JPHL&TN(IP): 80-4/2 Jld. 23 (11). The first author would like to thank the project supervisors (Adam Lim Chee Ooi, Loh Tse-Lynn, and Nurul Salmi Abdul Latip), funders (NATGEO Young Explorers Grant (#9668-15), Penang Green Council, Shedd Aquarium, generous donors through Experiment.com), the Department of Wildlife and National Parks (PERHILITAN), and volunteer divers (Lau Chai Ming, Leong Yun Sing, Ooi Boon Leong, Tan Jun Hao, Nur Ain Amani Abdul Mubin, and Yong Yu Lin) for supporting this study.

This project was a collaboration between researchers from the School of Biological Sciences at USM, the Shedd Aquarium (Chicago), and Save Our Seahorses Malaysia. Data from this study were submitted to the iSeahorse global database and serve as a baseline for future surveys.

### REFERENCES

- Aylesworth, L., Lawson, J.M., Laksanawimol, P., Ferber, P. & Loh, T.L. (2016). New records of the Japanese seahorse *Hippocampus mohnikei* in Southeast Asia lead to updates in range, habitat and threats. *Journal of Fish Biology*, **88**(4): 1620-1630.
- Chan, N.W., Mohamed, B. & Hong, C.W. (2015). Potentials, threats and challenges in managing natural heritage in the Penang National Park. *Kemanusiaan*, **22**(2): 47-65.
- Chee, S.Y., Othman, A.G., Sim, Y.K., Mat-Adam, A.N. & Firth, L.B. (2017). Land reclamation and artificial islands: walking the tightrope between development and conservation. *Global Ecology and Conservation*, **12**: 80-95.
- Choo, C.K. & Liew, H.C. (2005). Exploitation and trade in seahorses in Peninsular Malaysia. *Malayan Nature Journal*, **57**(1): 57-66.

Fabricius, K. & Alderslade, P. (2001). *Soft corals and sea fans: a comprehensive guide to the tropical shallow-water genera of the Central-West Pacific, the Indian Ocean and the Red Sea*. Townsville, Australia: Australian Institute of Marine Science.

Foster, S.J., Wiswedel, S. & Vincent, A.C.J. (2016). Opportunities and challenges for analysis of wildlife trade using CITES data - seahorses as a case study. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **26**(1): 154-172.

Foster, S.J. & Vincent, A.C.J. (2004). Life history and ecology of seahorses: implications for conservation and management. *Journal of Fish Biology*, **65**: 1-61.

Giles, B.G., Ky, T.S., Hoang, D.H. & Vincent, A.C.J. (2006). The catch and trade of seahorses in Vietnam. *Biodiversity and Conservation*, **15**(8): 2497-2513.

Goh, N.K.C., Ng, P.K.L. & Chou, L.M. (1999). Notes on the shallow water gorgonian-associated fauna on coral reefs in Singapore. *Bulletin of Marine Science*, **65**: 259-282.

iSeahorse. (2020). Saving Seahorses Together. Available from <https://www.iseahorse.org/Trends/Underwater>. (Retrieved on 19 March 2020).

IUCN. (2020). The IUCN Red List of Threatened Species. Version 2020-1. Available on <https://www.iucnredlist.org>. (Retrieved on 19 March 2020).

Janes, M.P. (2008). Laboratory methods for the identification of soft corals (Octocorallia: Alcyonacea). In *Advances in coral husbandry in public aquarium. Public aquarium husbandry series* (Leewis, R.J. & Janse, M., eds.), pp. 413-426. Arnhem, the Netherlands: Burgers' Zoo.

Lim, A.C.O., Chong, V.C., Wong, C.S. & Choo, C.K. (2011). Diversity, habitats and conservation threats of syngnathid (Syngnathidae) fishes in Malaysia. *Tropical Zoology*, **24**(2): 193-222.

Loh, A. (2015). Penang plans coastal ferry transport. Available from <http://www.thestar.com.my/News/Nation/2015/05/06/Penang-plans-coastal-ferry-transport-Service-will-shuttle-pedestrians-and-vehicles-along-sea-routes/>. (Retrieved on 24 October 2015).

Looi, S.C. (2015). Tanjung Bungah residents upset over plans to develop 'Sore Thumb'. Available from <http://www.themalaysianinsider.com/citynews/georgetown/article/tanjung-bungah-residents-upset-over-plans-to-develop-sore-thumb/tanjung-bungah-residents-upset-over-plans-to-develop-sore-thumb>. (Retrieved on 24 October 2015).

Lourie, S.A., Pollom, R.A. and Foster, S.J. (2016) A global revision of the Seahorses *Hippocampus Rafinesque 1810* (Actinopterygii: Syngnathiformes): taxonomy and biogeography with recommendations for further research, *Zootaxa*, **4146** : 1-66

Perante, N.C., Pajaro, M.G., Meeuwig, J.J. & Vincent, A.C.J. (2002). Biology of a seahorse species, *Hippocampus comes* in the Central Philippines. *Journal of Fish Biology*, **60**(4): 821-837.

Perry, A.L., Lunn, K.E. & Vincent, A.C.J. (2010). Fisheries, large-scale trade, and conservation of seahorses in Malaysia and Thailand. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **20**(4): 464-475.

Quek, Y.A. (2015). *Diversity and Relative Distribution of Seahorse (Hippocampus spp.) off Penang Island, Malaysia*. (B.Sc. (Hons) Aquatic Biology). Universiti Sains Malaysia, Penang, Malaysia.

Shokry, M.R., Gladstone, W. & Jelbart, J. (2009). The effectiveness of seahorses and pipefish (Pisces: Syngnathidae) as a flagship group to evaluate the conservation value of estuarine seagrass beds. *Aquatic Conservation: Marine and Freshwater Ecosystems*, **19**: 588-595.

Tan, D. (2015). Mah Sing plans RM3.4bil projects in KL and Penang. Available from <http://www.thestar.com.my/Business/BusinessNews/2014/08/11/Residential-development-in-Penang-and-KL-over-next-5-years/?style=biz>. Retrieved on 24 October 2015.

Vincent, A.C.J. (1996). *The international trade in seahorses*. Cambridge, United Kingdom: TRAFFIC International.

Wainwright, S.A. & Dillon, J.R. (1969). On the orientation of sea fans (genus *Gorgonia*). *Biological Bulletin*, **136**: 130-139.