

TRADE OF SEAHORSES, *HIPPOCAMPUS* SPP. (ACTINOPTERYGII: SYNGNATHIFORMES: SYNGNATHIDAE), ON THE EAST COAST OF THE GULF OF THAILAND

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Background. Live seahorses are traded mainly for ornamental markets owing to their unique features whereas dried seahorses are mainly traded for use in traditional Chinese medicines. Increased seahorse trade globally has posed a threat to seahorse populations worldwide. Thailand has been reported to be one of the major seahorse exporter countries, but study on seahorse fisheries and trade is limited. The presently reported study surveyed seahorse trade on the east coast of the Gulf of Thailand.

Materials and methods. A total of 23 fishing ports, docks, and villages along the east coast of the Gulf of Thailand were surveyed from March 2011 through November 2012. The fishermen and primary traders were interviewed and samples of captured seahorses were examined aiming to assess the trade species and volumes, fishing method used, prices, trade routes, and the destinations of the trade.

Results. Live seahorses were obtained solely from artisanal fisheries and were mainly supplied for domestic, public, and home aquaria through primary and secondary traders. Live trade comprised 4 species, *Hippocampus mohnikei* Bleeker, 1854, *H. kuda* Bleeker, 1852, *H. spinosissimus* Weber, 1913, and *H. trimaculatus* Leach, 1814. The prices varied dependent on size and species. The majority of seahorse trade was from the dried trade, originating mainly from non-selective trawlers in middle scale fisheries. Three species, *H. kuda*, *H. spinosissimus*, and *H. trimaculatus*, were found in the dried trade. Dried seahorses were mainly exported for their use in traditional Chinese medicine. The prices of dried seahorses depended on their size and fishing method used. Trade routes of both live and dried seahorses involved several levels of traders; more levels of traders were involved in the dried trade.

Conclusion. Non-selective trawlers were the main source of seahorse supply along the east coast of the Gulf of Thailand. Restriction of fishing equipment used or defining protection areas may help conserving the seahorse population in Southeast Asia. Further surveys of seahorse distribution and trades covering Thai waters will provide complete information of trades in Thailand.

Keywords: seahorse, *Hippocampus*, fish trader, fishing equipment, aquarium, traditional Chinese medicine

INTRODUCTION

Seahorses (family Syngnathidae) are unique in characteristics and reproductive behaviour. They have an equine appearance and swim in an upright position. The males exercise their parental care by carrying the embryos in their brood pouches. All seahorses belong to genus *Hippocampus*. They inhabit shallow water where sea grass beds or coral reefs are abundant. Seahorse trade is common in many regions of the world such as in Southeast and East Asia, North- and South America, South- and East Africa (Vincent 1995, Wabnitz et al. 2003). Although the seahorse trade have been reported in many countries, there is still lack of information of this kind of dealings in many major seahorse exporter countries. Supplies of live seahorses in the seahorse trade are mainly from the wild;

only small portions are from aquaculture. Aquaculture of seahorse species such as *Hippocampus abdominalis* Lesson, 1827, *H. barbouri* Jordan et Richardson, 1908, *H. breviceps* Peters, 1869, *H. capensis* Boulenger, 1900, *H. comes* Cantor, 1849, *H. erectus* Perry, 1810, *H. ingens* Girard, 1858, *H. reidi* Ginsburg, 1933, *H. spinosissimus* Weber, 1913, *H. trimaculatus* Leach, 1814, *H. kuda* Bleeker, 1852, *H. whitei* Bleeker, 1855, and *H. zosterae* Jordan et Gilbert, 1882 have been reported (Wabnitz et al. 2003, Koldewey and Martin-Smith 2010). The majority of live seahorses are traded for public and home aquaria. Demand for live seahorses has increased in many regions of the world. According to the Global Marine Aquarium Database (Wabnitz et al. 2003), the main live seahorse importers were United States of America, Netherlands,

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Germany, Italy, Austria, and The United Kingdom whereas the major exporters are the Philippines, Indonesia, Sri Lanka, Brazil, and Singapore (Wabnitz et al. 2003).

Dried seahorses are mainly supplied for their use in traditional Chinese medicine. The majority of dried seahorses are obtained from unintentional catch (by-catch) by non-selective fishing gear such as bottom trawls (Vincent 1995, Baum et al. 2003, Meeuwig et al. 2006, Vincent et al. 2011). Malaysia and Thailand have been reported to be major global exporters of dried seahorses (Nijman 2010, Perry et al. 2010), whereas Hong Kong, Taiwan, and China were the large-scale importer countries (Nijman 2010). Brazil, Malaysia, the Philippines, Indonesia, and Thailand exported both live and dried seahorses. Other countries such as Mexico, India, and Vietnam exported only dried seahorses. Furthermore, Sri Lanka traded only live seahorses (Vincent et al. 2007, 2011). Mexico, South Africa, France, Portugal, Slovenia, Malaysia, and India have presently included seahorses in the list of protected species (Lourie et al. 2004).

Increased demand of seahorses for trading has led to a decline in seahorse populations worldwide. This is a result of overfishing and the use of the non-selective fishing gear. The habitat destruction and anthropogenic environmental pollution exerted additional pressure on seahorse populations (Foster and Vincent 2005, Vincent et al. 2011). All seahorse species are listed on the Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Anonymous 2003) implemented in May 2004. Signatory nations are required to ensure that seahorse exports are not damaging the wild seahorse populations.

Despite the fact that Thailand is a major supplier in the global seahorse trade, we know very little about seahorse fisheries and trade in this country. Previously, seahorse fisheries and large-scale trade in Thai waters both in the Gulf of Thailand and the Andaman Sea during November to December 1998 and June 1999 have been reported (Perry et al. 2010). The presently reported study investigated seahorse trades on the east coast of the Gulf of

Thailand by focusing on the locations of the trade, trade species, volumes, prices, trade routes, and destinations of the trade. These information provide a basis for conservation of seahorse populations and management of seahorse trade under the regulations of CITES (Anonymous 2003).

MATERIALS AND METHODS

The study areas covered 4 provinces: Chonburi, Rayong, Chanthaburi, and Trat (Fig. 1). A total of 23 fishing ports, docks, and villages along the east coast of the Gulf of Thailand were surveyed (Table 1) from March 2011 to November 2012. A total of 115 fishermen were interviewed regarding the morphology of captured seahorses, the volumes of seahorses captured from each type of fishing equipment, the selling prices and the frequency of seahorse sales. Additionally, 30 primary fish traders were questioned regarding the seahorse purchasing prices, the selling prices, and the frequency of seahorse sales to secondary traders, trade routes, and the destinations of the trades.

Samples of live and dried seahorses from each study site were examined. The lengths of snout, head, trunk and tail were measured and the species of seahorses were identified following the description of Lourie et al. (2004). The total volume of live and of dried trades for each species in each location was determined from the sum of the volume captured each month. Furthermore, an estimate volume per year of each species in each location was calculated by dividing the total volume by 21 (the number of months when the survey was conducted) and multiplied by 12.

RESULTS

Live seahorse trade. Live seahorses were captured solely by artisanal fisheries (Table 2) which operated in shallow waters, 3–15 m deep, close to shore, using simple fishing equipment such as gill nets, push nets, or by scuba diving. About 4–10 fishermen were found in each study site. Live seahorse trade was found in 2 provinces, Chonburi and Rayong, and 4 seahorse species,

Table 1
Numbers of fishermen and primary traders interviewed in each location

Location	N	Fishermen		Primary traders
		ART	M-S	L&D
Chonburi	6	10	20	10
Rayong	5	25	0	5
Chanthaburi	5	15	10	5
Trat	7	15	20	10
Total	23	65	50	30

N = number of survey sites, ART = artisanal, M-S = middle-scale, L&D = live and dried trade.

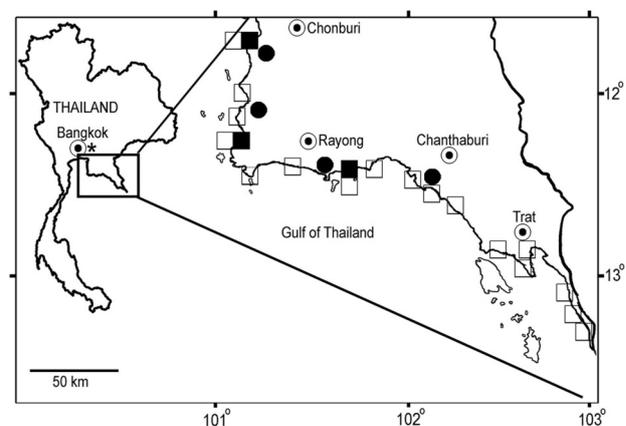


Fig. 1. Locations of live (●) and dried (○) seahorse (*Hippocampus*) trades on the east coast of the Gulf of Thailand (l = public aquarium, * = exporter or retailer)

Hippocampus mohnikei Bleeker, 1853, *H. kuda*, *H. spinosissimus*, and *H. trimaculatus*, were included (Table 2). Low volumes of *H. kuda* (11.11%), *H. spinosissimus* (9.35%), and *H. trimaculatus* (3.79%) compared to high volume of *H. mohnikei* (75.75%) were traded (Table 2). *H. mohnikei* were found only in Chonburi province during September–November whereas the other species occurred all year round in both provinces. Chonburi province contributed the significant portion (91.92%) of the live trade (Table 2). Furthermore, the major sources for *H. mohnikei*, *H. kuda*, and *H. spinosissimus* came from Chonburi province while the sources for *H. trimaculatus* were identified equally at both Chonburi and Rayong provinces (Table 2).

Dried seahorse trade. The majority of seahorse trade along the east coast of the Gulf of Thailand was from dried seahorse trade. Dried seahorses were obtained from two sources: artisanal and middle-scale fisheries. In artisanal fisheries, the specimens were collected from gill nets and push nets. The fishermen kept both live and dead seahorses for selling but tended to release the small ones still alive back to the water. However, the main supply for the dried seahorse trade came from middle-scale fisheries, which operated in waters of the 15–50 m depth range, often within the range of seahorse habitats using squid and shrimp trawlers. Trawlers collected large numbers of seahorses each fishing trip; the majority of the seahorses captured were dead. The specimens were dried under sunlight for dried trade. We determined the existence of the dried seahorse trade in all 4 provinces, Chonburi, Rayong, Chanthaburi, and Trat, located along the east coast of the Gulf of Thailand and 3 seahorse species, *Hippocampus kuda*, *H. spinosissimus*, and *H. trimaculatus*, were found in the dried seahorse trade. Only *H. spinosissimus* (49.78%) and *H. trimaculatus* (49.08%) were traded in large numbers; while *H. kuda* was rare (1.14%) (Table 3). Moreover, Chonburi (38.77%) and Trat (38.88%) provinces were the main sources for the dried seahorse trade while Chanthaburi (13.57%) and Rayong (8.78%) provinces contributed far lesser part of the dried trade (Table 3).

Prices of live and dried seahorses. In live seahorse trade, both purchasing and selling prices varied depending on

seahorse size and species. The live seahorses were sold as individuals; the prices of *Hippocampus spinosissimus* were the highest while those of *H. mohnikei* were the lowest. Two other species: *H. kuda* and *H. trimaculatus* represented the intermediate prices (Table 4). Both purchasing and selling prices in all seahorse species increased approximated by 50 percentage points with each increase in trade level (Table 4). The prices of dried seahorses were based on size and fishing method used to obtain the specimens (Table 5). The dried seahorses were priced either as individuals or by weight depending on the amount available. They were sold as individuals when the volumes weighed less than 200 g. The average dried weight of small-, medium-, and large-sized seahorses were 2.64 ± 0.61 g, 3.95 ± 0.77 g and 5.71 ± 0.89 g, respectively or an overall estimate of 270 seahorses per kg. Dried seahorses obtained from trawlers cost more than those from artisanal fisheries (Table 5). The same primary traders purchased both live and dried seahorses (Table 1) but most traders preferred to deal only with dried seahorses since live seahorses required additional, specialized care. The secondary traders usually purchased dried seahorses 1–2 times a month and the purchasing prices were almost double at some locations (Table 5).

Trade routes. In live trade, low numbers of live seahorses were collected in a single boat trip. Consequently the fishermen gathered them until accumulated adequate numbers preferred by primary traders. The latter required 2–5 days to gather enough live seahorses prior to selling to secondary traders, aquarium exhibitors, or retailers. The majority of aquarium exhibitors ordered live specimens when the numbers of seahorses in their aquaria were depleted to about half of their regular levels. The majority of retailers in ornamental fish markets tended to order live specimens from primary traders upon customers demand. Trade may also pass through secondary traders who sold live specimens to ornamental aquarium markets or ornamental retailers (Fig. 2a). The major aquarium market in Thailand is the Jatujak market in Bangkok.

In the dried seahorse trade, the fishermen gathered approximately 200–300 g of specimens before selling to primary traders. All primary traders involved in dried sea-

Table 2

Trade volumes of different seahorse (*Hippocampus*) species from different locations in live seahorse trade

Seahorse species	Location	Type of fisheries	Total number captured	Estimate number captured per year	Percentage of total volumes	Trade destination
<i>H. mohnikei</i>	Chonburi	Artisanal	3000	1714	75.75	Ornamental markets and public aquaria
<i>H. kuda</i>	Chonburi	Artisanal	350	200	8.84	
	Rayong	Artisanal	90	51	2.27	
<i>H. spinosissimus</i>	Chonburi	Artisanal	220	126	5.56	
	Rayong	Artisanal	150	86	3.79	
<i>H. trimaculatus</i>	Chonburi	Artisanal	70	40	1.77	
	Rayong	Artisanal	80	46	2.02	
		Total	3960	2263	100.00	

horse trade in the presently reported study were local people, such as dock owners, nearby grocery shop owners, seafood dealers or retailers, and fishery junk dealers (dealers who trade unused or throw away fishery equipment). The primary traders usually visited fishing villages 2–5 times per week to gather specimens and the secondary traders bought these gathered specimens 1–2 times a month. The secondary traders assembled dried seahorses from different locations along the coast and sold to traders at higher level, so the merchandise tended to change hands

2–4 times before reaching the exporters (Fig. 2b). The bulk of dried seahorses intended for traditional Chinese medicines were exported to other Asian countries such as China, Taiwan, and Hong Kong; while a few of them were sold to domestic traditional Chinese medicine shops.

DISCUSSION

The presently reported study indicated live seahorse trade was found only in Chonburi and Rayong provinces where artisanal fisheries are more frequently found since

Table 3

Trade volumes of different seahorse (*Hippocampus*) species from different locations in dried seahorse trade

Seahorse species	Location	Type of fisheries	Total amount captured [kg]	Estimate amount captured per year [kg]	Percentage of total volumes	Trade destination
<i>H. kuda</i>	Chonburi	Artisanal	0.2	0.11	0.28	Mainly exported to Taiwan, Hong Kong and China and small volumes used domestically for traditional Chinese medicines
	Rayong	Artisanal	0.4	0.23	0.58	
	Trat	Artisanal	0.2	0.11	0.28	
<i>H. spinosissimus</i>	Chonburi	Artisanal	2.1	1.20	2.97	
		Middle-scale	13.5	7.71	19.10	
	Rayong	Artisanal	3.5	2.00	4.95	
	Chanthaburi	Artisanal	2.1	1.20	2.97	
		Middle-scale	3.0	1.71	4.24	
<i>H. trimaculatus</i>	Trat	Artisanal	1.0	0.57	1.41	
		Middle-scale	10.0	5.71	14.14	
	Chonburi	Artisanal	0.1	0.06	0.14	
		Middle-scale	11.5	6.57	16.28	
	Rayong	Artisanal	2.3	1.31	3.25	
	Chanthaburi	Artisanal	1.5	0.86	2.12	
		Middle-scale	3.0	1.71	4.24	
	Trat	Artisanal	2.3	1.31	3.25	
	Middle-scale	14.0	8.00	19.80		
		Total	70.7	40.4	100.00	

Table 4

Domestic prices of live seahorses (*Hippocampus* spp.) at the level of primary traders and retailers

Location	Seahorse species	Primary traders						Retailers in Jatujak market	
		Purchasing price per individual [USD]			Selling price per individual [USD]			Selling price per individual [USD]	
		S	M	L	S	M	L	S-M	L
Chonburi	<i>H. mohnikei</i> *	0.9–1.0	1.9–2.1	1.9–2.1	1.9–2.1	1.9–2.1	2.5–2.7	3.9–4.1	4.9–5.0
	<i>H. kuda</i>	1.5–1.8	2.1–2.3	2.1–2.3	2.1–2.3	2.1–2.3	2.9–3.1	4.9–5.0	9.7–10.0
	<i>H. spinosissimus</i>	2.6–2.7	3.9–4.1	3.9–4.1	3.9–4.1	3.9–4.1	4.9–5.0	11.3–11.6	22.7–23.0
	<i>H. trimaculatus</i>	2.1–2.3	2.1–2.3	2.1–2.3	2.1–2.3	2.1–2.3	2.9–3.1	4.9–5.0	9.7–10.0
Rayong	<i>H. kuda</i>	0.6–0.7	1.3–1.4	1.6–1.7	2.5–2.7	2.5–2.7	3.2–3.4	4.9–5.0	9.7–10.0
	<i>H. spinosissimus</i>	1.9–2.1	2.1–2.3	2.9–3.1	3.9–4.1	3.9–4.1	4.9–5.0	11.3–11.6	22.7–23.1
	<i>H. trimaculatus</i>	0.6–0.7	1.3–1.4	1.6–1.7	2.6–2.7	2.5–2.7	3.2–3.4	4.9–5.0	9.7–10.0

S = small size (<11 cm); M = medium size (11–15 cm); L = large size (>15 cm); * Sizes for *H. mohnikei*, S = small size (< 4 cm); M = medium size (4–6 cm); L = large size (>6 cm); 1 USD = 30.58 Thai Baht (year 2011–2012).

these two provinces are located in the north region of the Gulf of Thailand where the Chao Phraya River and its tributaries empty their waters. Here, the water is shallower than in the south region of the Gulf. Only small volumes of live seahorses were traded due to the decline in seahorse populations in the wild and the difficulty of catching live seahorses owing to their cryptic behaviour (Foster and Vincent 2005). Of all 13 seahorse species traded in aquarium markets globally, only about 1 to 3 species are traded alive by each exporter country (Wabnitz et al. 2003, Koldewey and Martin-Smith 2010). Among the 7 species of seahorses found in Thailand, 4 species, *Hippocampus mohnikei*, *H. kuda*, *H. spinosissimus*, and *H. trimaculatus* were found in the live trade on the east coast of the Gulf of Thailand. A previous study,

Perry et al. (2010) reported the existence of only *H. kuda* and *H. spinosissimus* in the ornamental market trade in Thailand in a survey carried out during 1998–1999. Such discrepancy with the present study may be due to the seasonal variations. The presently reported survey covered a year round cycle whereas the previous surveys covered the periods of November to December 1998 and June 1999. The seasonal variations were clearly reflected in the abundance of *H. mohnikei*, while small volumes of *H. kuda*, *H. spinosissimus*, and *H. trimaculatus* were traded all year round. High volumes of *H. mohnikei* were traded only during September–November. The presently reported studies also indicated that an estimate of fewer than 1000 seahorses per year of live *H. kuda*, *H. spinosissimus*, and *H. trimaculatus* from the east coast of the Gulf of Thailand

Table 5

Domestic prices of dried seahorses (*Hippocampus* spp.) at the level of primary traders

Location	Type of fishing method	Primary traders				
		Purchasing price per individual [USD]			Purchasing price per kg [USD]	Selling price per kg [USD]
		S	M	L		
Chonburi	Artisanal	0.5–0.6	0.9–1.1	1.2–1.4	98.0–197.0	327.1–392.5
	Middle-scale	0.6–0.7	0.9–1.1	1.5–1.8	196.0–261.7	
Rayong	Artisanal	0.5–0.6	0.9–1.1	1.2–1.4	130.8–294.4	261.7–392.5
Chanthaburi	Artisanal	0.5–0.6	0.9–1.1	1.2–1.4	228.9–261.7	326.7–327.5
	Middle-scale	0.6–0.7	0.9–1.1	1.2–1.4	260.6–262.7	
Trat	Artisanal	0.6–0.7	0.9–1.1	1.5–1.8	260.6–262.7	294.4–327.1
	Middle-scale	0.9–1.0	1.5–1.8	2.1–2.3	228.9–327.1	

S = small size (< 11 cm); M = medium size (12–15 cm); L = large size (>15 cm); 1 USD = 30.58 Thai Baht (year 2011–2012).

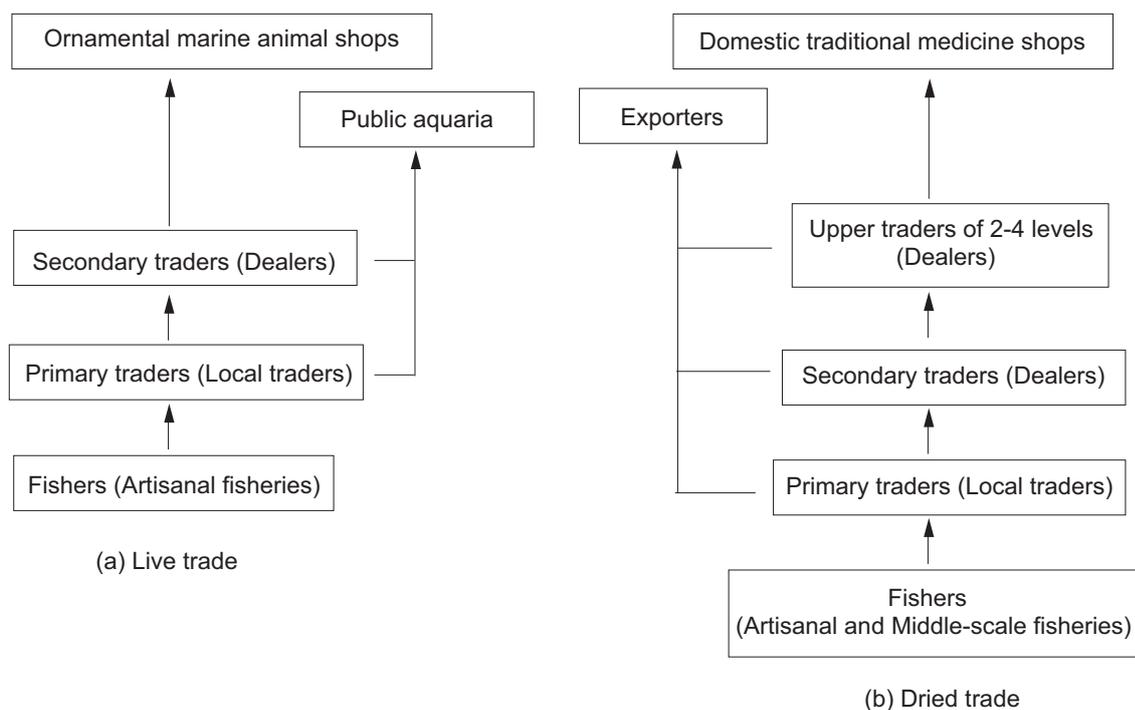


Fig. 2. Trade routes of (a) live and (b) dried seahorses (*Hippocampus*) on the east coast of Gulf Thailand

Thailand were sold for ornamental markets in Thailand. However, an estimate of 9000 seahorses per year, distributed in aquarium retail shops has been attributed to this region (Perry et al. 2010). The majority of seahorses constituting the excess number were probably imported from other countries. A similar estimate of the numbers of live seahorses, i.e., 9800 seahorses per year, were traded in Bahia (Brazil) within 1997–2005 (Rosa et al. 2006).

The major portion of seahorse trade along the east coast of the Gulf of Thailand was obtained mainly as a by-catch by finfish-, squid-, and shrimp trawlers of the middle scale fisheries, which often operated in the range of seahorse habitats. This has posed a threat to seahorse populations. Middle-scale fisheries were found in all 4 fishery provinces, Chonburi, Rayong, Chanthaburi, and Trat. Three seahorse species, *Hippocampus trimaculatus*, *H. spinosissimus*, and *H. kuda*, used in traditional Chinese medicines (Vincent 1995, Perry et al. 2010), were traded. However, a previous study reported 4 seahorse species, *H. kelloggi* Jordan et Snyder, 1901, *H. kuda*, *H. trimaculatus*, and *H. spinosissimus* in the dried trade (Perry et al. 2010). This discrepancy in the number of seahorse species reported resulted from the different areas surveyed. The previous study included surveys of the Andaman Sea where *H. kelloggi* is found in deep water of over 50 m, i.e., deeper than in our study. The same 4 species were also reported in the dried seahorse trade in Malaysia (Perry et al. 2010). Five species, *H. trimaculatus*, *H. spinosissimus*, *H. kuda*, *H. histrix* Kaup, 1856, and *H. kelloggi*, were reported in Vietnam seahorse trade (Meeuwig et al. 2006); while 5 species, *H. borboniensis* Duméril, 1870, *H. spinosissimus*, *H. kuda*, *H. trimaculatus*, and *H. fuscus* Rüppell, 1838 were recorded among seahorses traded in the southern India (Salin et al. 2005).

The price of live seahorses depends on colour, size, and species whereas that of dried seahorses depends on size and fishing methods. The price of *H. spinosissimus*, a colourful species with spines on the body, was the highest and the plain black or yellow coloured *H. kuda* was the lowest, when comparing seahorse species of relatively equal size. The price of *H. mohnikei*, a rare and seasonal species, was lower than that of *H. kuda*, but the latter species are substantially smaller in size. Therefore, *H. mohnikei* are quite costly considering their small size. The selling prices of live seahorses by fishermen were relatively similar to those from the Andaman Sea but the selling prices in aquarium markets were lower (cf. Perry et al. 2010). This is caused by the less colourful and smaller size of seahorses obtained from the Gulf of Thailand. Moreover, the aquarium prices in the presently reported study were approximately 2–3 times higher than previously reported (cf. Perry et al. 2010) because of the increased demand of live seahorses for home aquaria, the decline in seahorse populations in the wild and the low numbers of artisanal fishermen. A decrease in seahorse availability and an increase in live seahorse trade over the time investigated were noted by Perry et al (2010). Both purchasing and selling prices increased approximately 50 percentage points with each new level of trade due to

the costs of maintenance, packaging and transportation to reach the next trade level. Dried seahorses obtained from trawlers were priced higher than those from artisanal fisheries. Traders preferred sourcing from trawlers to artisanal fisheries since large volumes of dried specimens could be acquired in few number of trips and within a short period of 10–15 days while the supply from artisanal fishermen required more trips and took longer time, 3–6 months, to gather large enough volumes for further trade.

There were 4 main trade levels in each trade route:

- fishermen,
- primary/local traders,
- secondary/traveling traders/dealers/aquarium exhibitors, and
- exporters/retailers.

There may be 1–3 more sublevels in each of trade level except at the first and last levels. Trade routes of both live and dried seahorses were similar in exporter countries (McPherson and Vincent 2004, Choo and Liew 2005, Giles et al. 2006, Perry et al. 2010, Rosa et al. 2011). All live seahorse trade in the presently reported study was for domestic purposes while the majority of dried trade was exported to other Asian countries such as Taiwan, Hong Kong, and China; only small volumes were traded for domestic traditional Chinese medicines. The bulk volume of the dried seahorse trade was operated by Thai exporters based mainly in Bangkok or the border provinces. However, Cambodian traders also operated at ports and sold to Vietnamese traders and eventually exported to China. Similarly, in Malaysia and Vietnam, most exporters and secondary dealers were based in the capital or the business cities. The dried seahorses were mostly destined for markets in Singapore, Taiwan, Hong Kong, or China (Choo and Liew 2005, Giles et al. 2006, Perry et al. 2010). Dried seahorses are imported from other Asian countries to be sold on the market in Thailand and exported to other countries (Perry et al. 2010). This caused a discrepancy between the trade volume surveyed in the presently reported study and the official figures of seahorse imports from Thailand.

CONCLUSIONS

Both live and dried seahorse trades are in operation along the east coast of the Gulf of Thailand. Major sources of seahorse trade came from non-selective trawlers, thus, posing a threat to seahorse populations. Restriction of fishing equipment used in the areas encompassing seahorse habitats should be implemented. Besides, the regulations on import and export of seahorses in Thailand may require a revision since import and export of some seahorse species are prohibited. Moreover, certain marine sanctuary areas may be set up. All these will help protecting marine species including seahorses. Further surveys of seahorse distribution and trades covering Thai waters will provide complete information of trades in Thailand. This will be useful for future monitoring of the changes of distribution and trades over time and can be used as a basis for conservation of seahorse populations and management of their trade in Thailand.

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