15. Taxonomy of seahorses with a note on their conservation

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Introduction

The seahorses, seadragons and pipefishes belong to the family Syngnathidae. The seahorses due to their peculiar appearance, with a head like horse and prehensile tail commands premium price and demand among the aquarium hobbyists and in the international live ornamental export trade. Their slow and vertical swimming behaviour captivates the interests of aquarium keepers. These fishes are highly sought after for use in Traditional Chinese Medicines (TCM), particularly in the south-east Asian countries and also, they possess a demand as curios.

The decline in population of seahorses in the wild, across their distributional range is a global concern. The decline is mainly due to the heavy demand in the international export market leading to over-exploitation in the wild. The last global assessment of seahorses conducted in 2016 by Project Seahorse with the IUCN SSC Seahorse, Pipefish and Seadragon Specialist Group established that atleast one-third of the 41 species then recognised were threatened (2 are Endangered, 12 are Vulnerable, 17 are Data Deficient, 10 are Least Concern).
A total of seven species have been reported from the Indian waters *viz*., *Hippocampus kuda*, *H. trimaculatus*, *H. spinosissimus*, *H. histrix*, *H. kelloggi*, *H. mohnikei* and *H. camelopardalis*. Of the seven species, *H. camelopardalis* falls in the category of Data Deficient (DD) in the IUCN Red List of Threatened Species (Table 1) while all the other species are listed as Vulnerable (VU).

Table 1. Seahorse species reported from the Indian waters and their conservation status

Sl. No.	Species	Common Name	Status in the Indian Wildlife (Protection) Act, 1972	IUCN Red List Status	CITES
1.	*Hippocampus kuda* Bleeker, 1852	Spotted seahorse	Schedule I	VU	Appendix II
2.	*Hippocampus trimaculatus* Leach, 1814	Longnose seahorse	Schedule I	VU	Appendix II
3.	*Hippocampus spinosissimus* Weber, 1913	Hedgehog seahorse	Schedule I	VU	Appendix II
4.	*Hippocampus histrix* Kaup, 1856	Thorny seahorse	Schedule I	VU	Appendix II
5.	*Hippocampus kelloggi* Jordan & Snyder, 1901	Great seahorse	Schedule I	VU	Appendix II

6.	*Hippocampus mohnikei* Bleeker, 1853	Japanese seahorse	Schedule I	VU	Appendix II
7.	*Hippocampus camelopardalis* Bianconi, 1854	Giraffe seahorse	Schedule I	DD	Appendix II

Distribution and habitat

The members of Syngnathidae (seahorse, seadragons & pipefish) are generally found distributed from 50° North to 50° South latitude, with most species occurring in the Indo-Pacific region and Western Atlantic Ocean. The seahorses are generally marine, except for some, which are found in estuaries and mangrove habitats. Most species of seahorses are generally found among the seagrasses, seaweeds and coral reefs which are their preferred habitats, while few species prefer the mangrove areas. Some of them are also found to be associated with soft bottom communities such as sponges, sea squirts and gorgonids.

Feeding and reproduction

The seahorses which have a horse-like appearance, swim vertically and are slow moving. They have the ability to camouflage and change their colour in minutes to match their surrounding environment. They hold on to the hold-fast like seaweeds, corals, seaweeds etc. using their prehensile tail. They are generally active during the day and feed on tiny organisms that come on their way. Their preferred prey includes small crustaceans, fish fry and invertebrates (Tipton and Bell, 1988; Vincent, 1996; Do et al., 1998; Teixeira and Musick, 2001).

The seahorses attain first maturity at an age of six months to one year (Jiaxin, 1990; Lourie et al., 1999). Their breeding behaviour is so peculiar that the males become pregnant and give birth to young ones. The male and female fishes form faithful bonds and most species exhibit monogamous breeding behaviour (Vincent, 1994; Vincent and Sadler, 1995; Masonjones and Lewis, 2000). The adult male and female seahorses remain as partners and mate successive times during the entire breeding season and the bond between these two male and female fishes may even continue during the successive breeding seasons. If one of the partners die, the remaining partner might take several weeks to find its new partner (Vincent and Sadler, 1995).

The appearance of brood pouch in male seahorses is an indication of the onset of maturity in males. Seahorses generally have low fecundity and the eggs are pear-shaped and large; they appear orange and semi-transparent. An elaborate courtship culminates in mating, and the male female deposits her entire egg clutch inside the brood pouch of male partner, where fertilization of eggs takes place. The embryonic development takes place inside the male's brood pouch. The gestation period ranges from 12 to 15 days at a temperature of 28 to 20°C. Once the embryonic development is complete inside the brood pouch of male, the young ones are expelled from the brood pouch through muscular contractions, which generally happens during the late night or early morning hours. Most species of seahorse produce about 100 to 300 young ones during one pregnancy and the young ones that come out from the male's brood pouch are 6 to 12 mm long, depending on species and they appear like miniature adult seahorses.

Economic uses

The seahorses are one of the important constituents in the Traditional Chinese Medicines (TCM) practised mainly in countries like China, Hong Kong, Singapore, Taiwan, and ethnic communities worldwide. In the Central Philippines, seahorses are used to treat asthma, gas pains and hyperactivity (Alino et al., 1990). They are also one of the most popular fishes in the marine aquarium trade. They are a favourable choice of marine aquarium hobbyists due to their horse-like head, tubular snout, prehensile tail and camouflaging behaviour. The seahorses in dried form are used as curios in paper weights, key chains and jewellery and are kept as souvenirs in shops and resorts in beaches.

Taxonomy and species identification

Correct identification of species of seahorse is very important for the sustainable fisheries management and to achieve long-term species-level conservation goals. The habitat requirements/preferences, growth and reproductive behaviour may differ from one species to the other, and hence the right identification of species is a prerequisite in any management and conservation efforts.

Morphological characteristics

All species of seahorse have peculiar morphological characteristics with a horse-like head, bony plates, tubular snout and a prehensile tail to coil and hold on to the hold-fast in their habitat. Hence, the morphological characteristics which are considered for the identification of seahorses are slightly different from other teleost fishes. The body rings, tubercles, position and arrangement of coronet, spines on the head, cheek, body etc. are some of the key characteristics which are used in the species identification. The important morphological characteristics are given in table 2 and figure 1.

Table 2. Morphological characteristics of seahorse

Characteristics	**Description**
Height	Distance from the tip of the coronet to the tip of the uncurled tail
Operculum	Flap that covers the gill slits
Keel	Sharp median ridge running down the ventral side of the trunk (in some species)
Tubercles	Raised rounded nodules located at the intersections of rings and ridges (in some species)
Dorsal fin rays	Bones supporting the dorsal fin
Pectoral fin rays	Bones supporting the pectoral fin
Coronet	Large crown-like structure found on top of the head (in some species)
Eye spines	Spines found directly above the eye
Nose spine	Single spine located in front of the eyes on the upper side of the snout (in some species)
Cheek spines	Spines located at the bottom of the operculum on each side of the head

Cleithral ring	Bony ring just behind the operculum
Trunk rings	Raised bony ridges that encircle the body
Tail rings	Raised bony ridges encircling the tail of the seahorse
Snout length	Distance between the bump immediately in front of the eye (not the nose spine) to the tip of the snout
Head length	Distance from the mid-point of the cleithral ring to the tip of the snout
Trunk length	Distance from the mid-point of the cleithral ring to the lateral mid-point of the last trunk ring
Tail length	Distance between the lateral mid-point of the last trunk ring to the tip of the uncurled tail

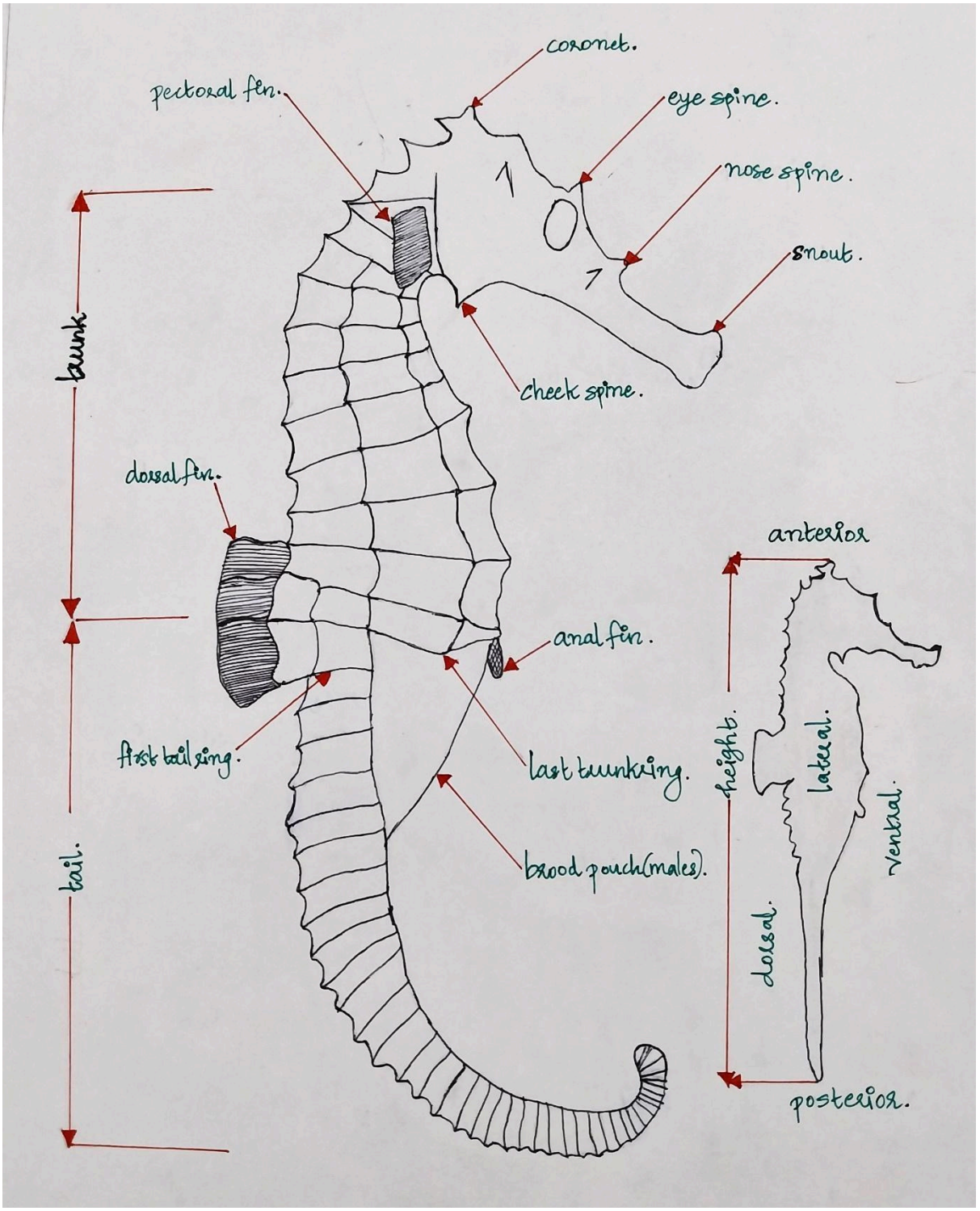

Fig. 1. Lateral view of seahorse

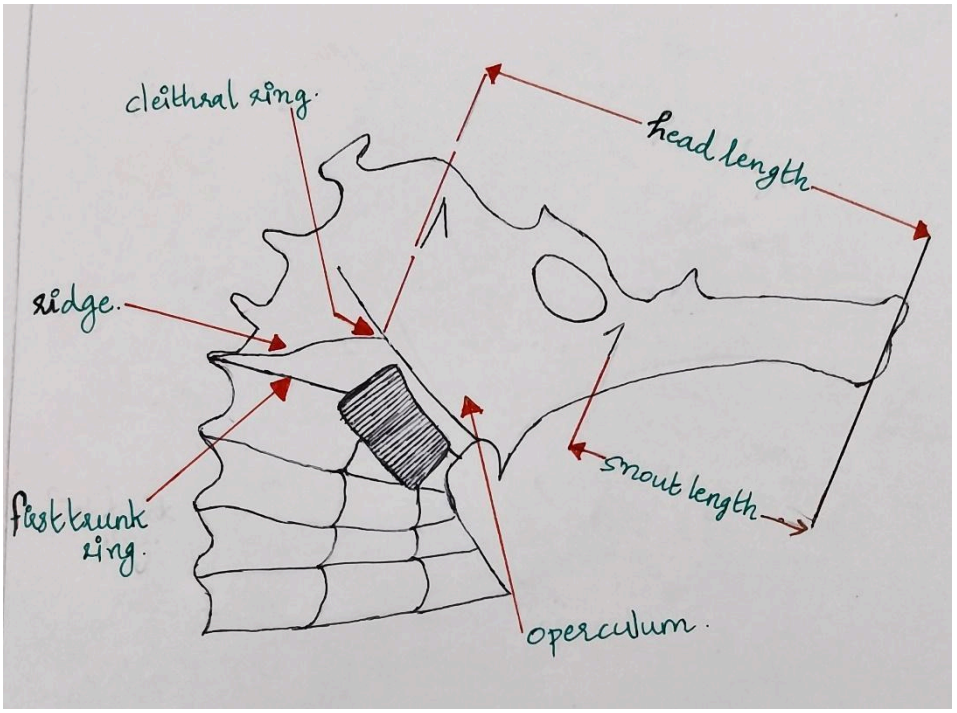

Fig. 2. Lateral view of head of seahorse

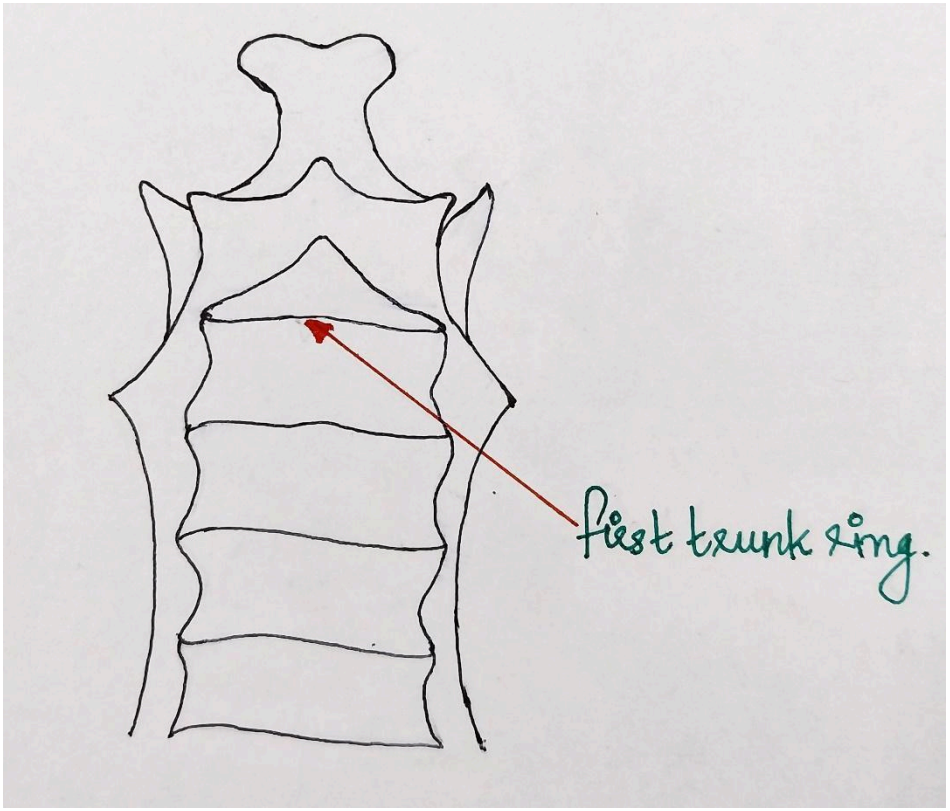

Fig. 3. Dorsal view of seahorse head

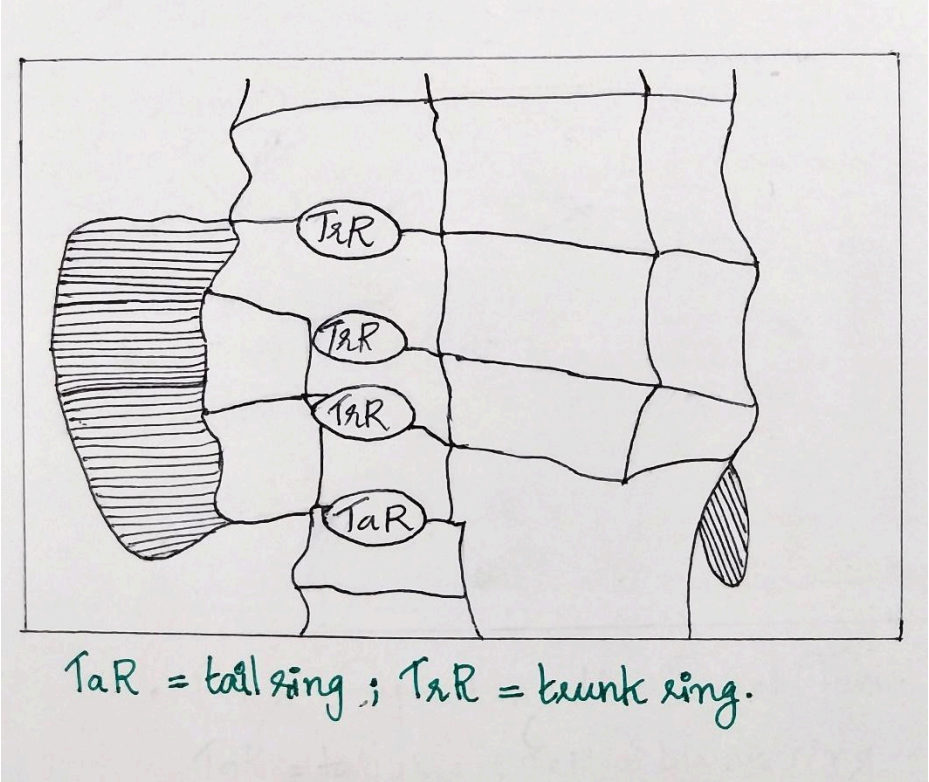

Fig. 4. Lateral view showing the rings supporting the dorsal fin

Steps in identification of seahorse

A) Record the common characters used in seahorse species identification

1.	Record the height of the specimen (Ht): using a string/wire
2.	Measure the head length (HL)
3.	Measure the snout length (SnL)
4.	Calculate the HL/SnL ratio of the specimen
5.	Count the number of tail rings (TaR)
6.	Count and record the number of trunk rings (TrR)
7.	Record the number of cheek spines (CS): counts range from 0 to 2.
8.	Record the number of eye spines (ES): counts range from 0 to 2.
9.	Record the number of trunk rings (TrR) that support the dorsal fin
10.	Record the number of tail rings (TaR) that support the dorsal fin
11.	Record the number of dorsal fin rays
12.	Record the number of pectoral fin rays

***B) Verify the recorded characteristics with the tables provided in the seahorse identification data sheet* (Tables 3 to 7; not an exhaustive table, given as examples only)**

1. Compare the height of the unidentified specimen with information of species in the table.

2. Compare the HL/SnL value.

3. Compare the number of tail rings recorded for the unidentified specimen.

4. Compare the number of dorsal fin rays.

5. Compare the number of pectoral fin rays.

5. Compare the trunk rings, rings supporting the dorsal fin, cheek spines and eye spines.

Table 3. Maximum height of selected species (Step B1)

Species	**Maximum height (cm)**
Hippocampus trimaculatus	17.0
Hippocampus kuda	17.0
Hippocampus histrix	17.0
Hippocampus spinosissimus	17.2
Hippocampus kelloggi	28.0
Hippocampus mohnikei	8.0
Hippocampus camelopardalis	10.0

Table 4. Ratio of Head Length to Snout Length (HL/SnL) of selected species (Step B2)

Species	**Possible range of HL/SnL**	**Most common value**
Hippocampus trimaculatus	1.9 – 2.4	2.2
Hippocampus kuda	2.0 – 2.6	2.3
Hippocampus histrix	1.7 – 2.0	1.8
Hippocampus spinosissimus	2.0 – 2.4	2.2
Hippocampus kelloggi	2.0 – 2.3	2.1
Hippocampus mohnikei	2.8 – 3.9	3.0
Hippocampus camelopardalis	2.7 – 2.9	2.8

Table 5. Number of tail rings in selected species (Step B3)

Species	**Range of number of tail rings**	**Most common value**
Hippocampus trimaculatus	38 - 43	40, 41
Hippocampus kuda	34 - 38	36
Hippocampus histrix	34 - 37	35
Hippocampus spinosissimus	33 - 39	36
Hippocampus kelloggi	39 - 41	40
Hippocampus mohnikei	37 - 40	38
Hippocampus camelopardalis	38	38

Table 6. Number of dorsal fin rays in selected species (Step B4)

Species	**Range of numbers of dorsal fin rays**	**Most common numbers**
Hippocampus trimaculatus	18 - 22	20
Hippocampus kuda	17 - 18	17
Hippocampus histrix	15 - 18	17
Hippocampus spinosissimus	16 - 20	17, 18
Hippocampus kelloggi	17 - 19	18
Hippocampus mohnikei	15 - 16	15, 16
Hippocampus camelopardalis	19 - 22	-

Table 7. Number of pectoral fin rays in selected species (Step B5)

Species	**Range of numbers of pectoral fin rays**	**Most common numbers**
Hippocampus trimaculatus	16 - 19	17, 18
Hippocampus kuda	15 - 18	16
Hippocampus histrix	17 - 20	18
Hippocampus spinosissimus	16 - 19	17
Hippocampus kelloggi	17 - 19	18
Hippocampus mohnikei	12 - 14	13
Hippocampus camelopardalis	17 - 18	17, 18

C) After elimination of the above 5 steps, the following characters need to be considered

1. Height and shape of the coronet

2. Number, distribution and size of spines on the body

3. Patterns or markings such as stripes or spots.

Table 8. Number of trunk rings, trunk & tail rings supporting the dorsal fin, cheek spines and eye spines

Species	Trunk Rings	Rings supporting Dorsal Fin		Cheek Spines	Eye Spines
		Trunk Rings	Tail Rings		
H. trimaculatus	11	2	1	1	1
H. kuda	11	2	1	1 or 2	0 or 1
H. histrix	11	2	1	1	1
H. spinosissimus	11	2	1	1 or 2	1
H. kelloggi	11	2	1	1	1
H. mohnikei	11	2	1	2	0
H. camelopardalis	11	2	1	0	1

Thus, careful examination of the collected specimens, and proper recording of data is essential to arrive at the correct species identification. 'A Guide to the Identification of Seahorses' by Lourie et al. (2004) gives an insight to the step-by-step identification of seahorses, which can be referred to in addition to the other standard literature that are available for species identification.

Conservation - an urgent need

Due to the increasing demand in the export trade, the seahorses were extracted heavily by poor subsistence fishers by skin diving. Also, these resources are components in the by-catch of many fishing gears, particularly the trawl (mechanized and non-mechanized). The behaviour and biology of seahorses indicate that they are highly vulnerable to exploitation. The seahorses are characterized by sparse distribution, low mobility, narrow home range, monogamous breeding behaviour, low fecundity, slow growth, site-specificity and a high degree of lengthy parental care which makes them vulnerable to exploitation. The degradation of habitats like the seagrass meadows and coral reefs, mainly due to anthropogenic activities, contributes to further depletion.

The government of India banned the collection and trade of seahorses and sea cucumbers from 2001 and listed them under Schedule I of the Indian Wildlife (Protection) Act, 1972. Consequent to the implementation of the ban, seahorse fishing considerably decreased during

the last 25 years. However, the demand for these resources in the international markets has resulted in clandestine collection and trade which may continue, if left unchecked. The moratorium imposed by the government will be effective in saving the stocks if only the illegal removals and trade are stopped.

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