CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of all species of the genus *Hippocampus* (*Hippocampus* spp.) in Appendix II of CITES.

H. comes, *H. spinosissimus*, *H. barbouri*, *H. reidi*, *H. erectus*, and *H. ingens* qualify for listing in Appendix II in accordance with Article II, paragraph 2 (a) of the Convention, and satisfy Criterion Bi) in Annex 2a of Resolution Conf. 9.24.

The other 26 described species qualify for listing in Appendix II in accordance with Article II, paragraph 2 (b) of the Convention, and satisfy Criterion A. in Annex 2b of Resolution Conf. 9.24.

B. Proponent

The United States of America.

C. Supporting statement

1. Taxonomy

1.1	Class:	Actinopterygii	
1.2	Order:	Syngnathiformes (Gasterosteiformes)	
1.3	Family:	Syngnathidae	
1.4	Genus and species:	*Hippocampus* spp. See Appendix A	
1.5	Scientific synonyms:	See Appendix B	
1.6	Common names:	English:	Seahorse, sea pony, horsefish
		French:	Hippocampe, Cheval de mer
		Spanish:	Caballito de mar
1.7	Code numbers:	None	

Seahorses are listed in the UNEP-WCMC *Animals of the World Database*. http://www.unep-wcmc.org /species/animals/animal_redlist.html and are included on the 2000 IUCN Red List. However, there have been several recent taxonomic revisions described in Lourie et al., 1999 and changes regarding the global status of seahorses included in the 2000 IUCN Red List. The species nomenclature used throughout this proposal is based on Lourie et al., 1999, and includes recent revisions that will appear in the 2002 IUCN Red List.

2. Biological parameters

2.1 Distribution

Seahorses inhabit marine or brackish water, occurring primarily in shallow temperate, subtropical and tropical coastal environments between 52° north and 45° south latitude (Lourie et al., 1999). Of 32 species described by Lourie et al. (1999), the highest diversity occurs in the Indo-Pacific region. Australia is a range state for thirteen described species (and possibly a number of additional endemic species described in Kuiter, 2001) and Southeast Asia and Japan have at least seven seahorse species living in their waters (Lourie et al, 1999). By contrast, only four species are

known to inhabit the coastal waters of the Western hemisphere. The range states for individual seahorse species are summarized in Appendix A.

Most seahorses are found in coastal areas, typically at depths of 1-15 meters, occurring in relatively protected environments among sea grasses, kelp beds, algal and rocky reefs, mangrove prop roots and coral reefs. A few species prefer open sand or muddy bottoms, as well as areas influenced by strong currents and tidal flow, and deeper reef environments (15-60 m depth) (Kuiter, 2001). Seahorses are also found in estuaries exposed to varying salinities, although they do not tolerate extended periods of low salinity (freshwater); others have been identified in the open ocean associated with floating *Sargassum* weed, and at least two species have been identified in trawls from 80-100 m depth off Australia and New Zealand (Froese and Pauly, 2002). Certain seahorses utilize different habitats depending on their life stage or size class, with larger animals occurring in deeper water (45 to 60 meters); some exhibit short-range seasonal migrations, retreating to deeper and warmer waters in the winter months (Vincent, 1996).

Most seahorse species examined to date show high site fidelity, with males having smaller home ranges than females, especially during the breeding season. For instance, *H. whitei* had home ranges averaging 8-12 m^2, while the home ranges of *H. guttulatus* on average was less than 30 m^2 (Vincent, 1996). In *H. comes*, males often ranged only 1 m^2 on coral reefs in the Philippines. In contrast, *H. abdominalis* does not show site fidelity, and often ranged over an area of several hundred meters (Vincent, 1990).

Low mobility, limited home range, and certain other life history traits may reduce the potential for re-colonization in locations where they are heavily fished. Dispersal is reported to occur during storms or through transport on floating debris and detached marine algae. In addition, young seahorses may have a planktonic stage that lasts up to eight weeks, allowing them to be carried to new locations by tidal currents, especially when attached to floating debris and algae. Recent work from the Philippines has identified a number of potential barriers to dispersal, including deep water channels, unusual current patterns and large expanses of unsuitable habitat (Casey, 1999).

2.2 Habitat availability

Because of their worldwide distribution and occurrence throughout most coastal environments, potential seahorse habitat is extensive. However, seahorse populations may exhibit a high degree of fragmentation due to the patchy nature of suitable habitat, and extensive habitat loss resulting from human activities such as coastal development, dredging, infilling, and removal of mangroves and seagrasses. In addition, seahorses exhibit microhabitat preferences, occupying only the edges of particular habitat types such as that observed in certain seagrass beds; thus, large areas of seemingly suitable habitat are unoccupied (Vincent, 1996).

Pollution, shoreline development and alteration, and destructive fishing methods such as trawling, dynamite fishing and cyanide fishing are contributing to the worldwide degradation of shallow, coastal habitats that support seahorses populations. For example, mangroves formerly occupied an estimated area of 1.7 X 10^5 km^2, occurring from 25° N to 30° S latitude; close to 3000 km^2 of this habitat has been lost each year since the early 1980s, representing roughly 35% of the total aerial world-wide coverage of mangroves (Valiela et al., 2001). Mangroves continue to disappear at a rate of 2.1% each year as a result of clearcutting for shrimp farming, building materials, firewood and other uses. Mangrove loss is a major concern in Asia, Bangladesh, Brazil, Ecuador, Kenya and other locations. Coral reefs represent another important habitat for seahorses that have declined substantially over the last two decades. The Global Coral Reef Monitoring Network reports that an estimated 11% of the world's coral reefs had been lost by 1992, and another 16% are no longer fully functional due to widespread coral mortality during the 1997-1998 El Niño-La Niña events (GCRMN, 2000). An additional 14% of all remaining coral reefs are predicted to disappear in the next 2-10 years unless fishing pressure, pollution, and other human pressures affecting reef ecosystems are reduced and sustainable management approaches are implemented. Southeast Asia

and India have some of the most expansive and suitable seahorse habitat, supporting diverse and abundant *Hippocampus* populations, but these habitats are being lost at an accelerated rate (Table 1). Heavy fishing pressure in this region generates the majority of global seahorse landings (see below), and exacerbates the threat of habitat loss for seahorses in the Indo-Pacific.

2.3 Population status

Seahorses are characterized by sparse distributions and low population density, which may be related to their limited mobility, small home ranges, mate fidelity and other life history traits. Lifespans for seahorses are estimated to range from about one year in small species to about 3-5 years for the larger species. Seahorses reach sexual maturity between six months and one year of age; however, fecundity is orders of magnitude lower than that of most fishes taken by large-scale fisheries (Froese and Pauly, 2002). Males produce from 5 to1572 offspring per pregnancy, depending on the species and size of the animal, with most species releasing an average 100-200 young during each pregnancy (Vincent, 1996). The ability to compensate for exploitation pressure through increased juvenile survivorship is limited in seahorses because of their low fecundity, short lifespan and considerable investment of energy and parental care, especially when adult males are removed.

In most populations for which transect data are available, densities are reported to range from 0.002 to 0.1 per square meter, although densities may be as high as 10-15 seahorses per square meter in localized patches of seagrass (Table 2). The low densities recorded in some areas may be an artifact of heavy fishing pressure and overexploitation, as historic abundance data are unavailable and certain unfished species are locally abundant (Vincent, 1996). For example, *H. bargibanti* are found in clusters of up to 28 pairs on a single gorgonian. Also, *H. breviceps*, a species endemic to southwest Australia, often occurs in aggregations of hundreds of animals (Lourie et al., 1999).

2.4 Population trends

Based on fishery-dependent data and interviews with fishers and traders, seahorses have declined in abundance in many range states that have seahorse fisheries. There are reports and strong circumstantial evidence of both recruitment overfishing (declining numbers) and growth overfishing (diminishing size) among a number of the commonly traded species. Three species (*H. comes*, *H. spinosissimus* and *H. barbouri*) are reported to have experienced substantial declines in heavily fished areas. Fishers, exporters, and buyers interviewed during 1995 in the five largest known seahorse-exporting countries all reported declines in seahorse catch of 15-75% over a period of 3-10 years. This includes: 1) 15-50% decline since 1990 in Indonesia; 2) 69% decrease in *H. comes* seahorse catch between 1985-1995 in northern Bohol, Philippines; 3) 50% decline between 1993-1995 in Thailand; 4) 30-60% decline between 1990 1995 in Viet Nam; and 5) declines of up to 75% between 1992-1995 in India (Vincent, 1996). These landings are largely believed to encompass the three species described above, and possibly *H. fuscus*, *H. kelloggi*, *H. kuda* and *H. trimaculatus* (A. Perry, pers. comm.). In addition, changes in the length frequency distribution of catch data indicate that populations are over-exploited; sizes of individuals in the trade have declined, and fishers are targeting juveniles and less preferred species to meet an increasing international demand (Perante et al., 1998).

Seahorse numbers in the wild appear to have declined in the Western Atlantic and Eastern Pacific, with fishers reporting decreases in catch of *H.reidi*, *H. ingens* and *H. erectus*. For *H. erectus* and *H. reidi* in the Western Atlantic this includes 1) estimated declines of between 75-90% in Mexico in the past 10-20 years; 2) a decrease in catch in Honduras; 3) a decrease in catch in Brazil; and for *H. ingens* in the Eastern Pacific 1) estimated declines of 95% in the past 20-30 years in Mexico; 2) estimated declines in catch in Guatemala from 100-150 animals per trip to 4-15 seahorses per trip in 2000; 3) a decline in numbers within the Gulf of Papagayo, Costa Rica; 4) a decrease in

catch in Panama during 1985-1990; and 5) a decline during the 1990s in Ecuador (Baum and Rosa, in prep).

The Knysna seahorse, *Hippocampus capensis*, is endemic to South Africa, occurring in four estuaries on the southern coast. This species is believed to be threatened with extinction due to its limited distribution, habitat degradation and mass mortalities that have occurred in the Swartvlei estuary (Lockyear, 1999). Between 1985 and 1994, three mass mortalities of *H. capensis* were recorded, the largest of which occurred in 1991 when 3000 dead specimens were collected following the flooding and subsequent breaching of the estuary mouth (Russell, 1994). In addition, pollution and other anthropogenic disturbances may indirectly impact seahorse populations by affecting the seagrass beds inhabited by *H. capensis*. This species is listed as Endangered on the IUCN Red List (Hilton-Taylor, C. (compiler) 2000), but it is not currently in international trade due to national protection in Africa (Table 10).

2.5 Geographic trends

While evidence suggests that localized extirpations and fragmentation of populations have occurred as a result of heavy fishing pressure and loss of habitat, there are no reported losses of seahorse species on a national, regional or global scale. Currently, it is difficult to determine whether the distribution of individual seahorse species has been reduced in extent within individual range states, due to 1) the existence of only very general information on the regional distribution of most species; 2) few temporal and spatial field assessments; 3) taxonomic difficulties and recent species revisions; and 4) a high probability of species misidentifications in fishery catch and trade data. For instance, Kuiter (2001) revised the list of extant Australian seahorses, including the addition of several new presumed species that were previously reported by some other name. In most cases, the newly described species are endemic or highly restricted in their range, and splitting of species may have resulted in a restriction of the former range of a previously described species.

2.6 Role of the species in its ecosystem

Seahorses are carnivorous, preying upon small crustacea such as copepods, amphipods and shrimp, as well as larval fishes and other types of zooplankton. The few studies on their feeding ecology suggest that they may play a substantial role in structuring at least some benthic faunal communities (Tipton and Bell, 1988). Young seahorses are prey for tuna, cod, skates, rays, sea perch, and crabs as well as penguins and other marine birds. Rates of predation on adult seahorses are low probably because they are highly cryptic and heavily armored (Vincent, 1995).

2.7 Threats

Threats to seahorses include over-harvest for commercial trade, bycatch in fisheries, and degradation and loss of habitat due to coastal development, destructive fishing practices and pollution. A rapidly growing trade in *Hippocampus* spp. for traditional medicines (TM), as well as trade for aquarium pets, souvenirs and curios is resulting in overexploitation of wild populations. At least 20 million seahorses were captured annually from the wild in the early 1990s, and the trade is estimated to be growing by 8-10% per year (Vincent, 1996). Based on reports from seahorse fishers and traders, seahorse populations in are estimated to have declined by 25-75% between 1990 and1995 in India, Indonesia, the Philippines, Thailand and possibly other Indo-Pacific countries where these animals are under heavy fishing pressure to supply international markets (Vincent, 1996). Seahorse numbers in the wild appear to have also declined in the western Atlantic and eastern Pacific Oceans, with fishers reporting decreases in catch of *H. reidi*, *H. ingens* and *H. erectus*. See Section 2.4 for details. Global trade and demand is apparently growing despite localized stock depletions. In Asia alone, annual consumption was estimated at 45 metric tons (16 million seahorses) in the 1980s and early 1990s (Vincent, 1996). Demand for medicinal purposes increased 10-fold during the 1980s and continued to grow by 8 to 10 percent per year in

China alone. Trade is thought to have declined in 1998 and 1999 due to the Asian economic crisis, and then increased to as much as 70 metric tons in 2000 (Vincent and Perry, in prep).

Due to a growing trade and heavy fishing pressure in many range states, seahorse supply no longer meets international demand. *H. comes*, *H. barbouri* and *H. spinosissimus*, *H. ingens, H. erectus,* and *H. reidi* are apparently under the greatest threat from unsustainable levels of harvest and international trade to supply TM, curios and pet trades, but at least 20 other species are also in trade. In addition to the large, highly prized specimens that were exclusively harvested in past decades, a substantial proportion of the trade today consists of previously undesirable, small seahorses. For instance, in Bohol, Philippines, seahorse populations have declined by a factor of 5-10 between 1985 and 1995. Fishers noted that only seahorses longer than 100 mm vertical length were collected in the 1970s, while anything over 50 mm was accepted by 1995. In addition, the numbers of dried seahorses per kg increased from 200-350 in 1993 to 300-450 in 1995 due to a continuing decline in size frequency distributions of local populations (Vincent, 1996). This indicates that juveniles and adults, as well as other previously unexploited species (of smaller adult size) are now vulnerable to harvest pressures.

Seahorse populations are particularly vulnerable to over-exploitation due to their social and spatial organization and life history characteristics: a) seahorses brood their young, thus pregnant seahorses must survive if the young are to survive; b) reproductive rates are limited by lengthy parental care combined with a small brood size; c) sparse distribution, low mobility, small home ranges, and mate fidelity of most species limit replacement of lost partners and the ability for juveniles to recolonize depleted areas; d) juvenile seahorses experience high mortality rates as a result of predation; and e) low natural rates of adult mortality are offset by heavy fishing pressure, which exerts selective pressure on populations (Vincent, 1996). Furthermore, because seahorses have low mobility and small ranges, and they may require considerable time to recolonize an area from which they have been eliminated, localized extirpations are very likely in areas affected by heavy fishing pressure.

In Indonesia, Philippines, Thailand, and Viet Nam, four of the largest seahorse exporting countries, overexploitation of fishes and the use of poison, dynamite and fine mesh nets were identified as the most serious cause of reef degradation, followed by sedimentation associated with clear-cutting and removal of mangroves, pollution and coastal development (Chou, 2000). These countries have on average lost about half of their mangroves and less than 50% of their coral reefs remain in good to excellent condition (Table 1).

Bycatch of syngnathids occurs in commercial trawl fisheries directed at food fish, scallops or shrimp/prawns. This type of non-selective fishing gear has been shown to cause considerable habitat damage, and it may seriously impact populations of non-target species such as seahorses by removing all life stages, including juveniles and small seahorses that may have little commercial or medicinal value. In addition, non-selective trawls are not conducive to the survival of syngnathids due to long net deployment times, abrasion and compression, and decompression when animals are brought up quickly from deepwater. The combined effects of an increased demand and heavy fishing pressure, the vulnerable nature of the species due to their biology, and the reduction in available seahorse habitat is having severe consequences on population dynamics and abundance of some of the dominant seahorse species in commercial trade.

3. Utilization and trade

3.1 National utilization

Approximately 23 of the 32 described seahorse species are harvested through directed fisheries, and also as bycatch in non-selective trawl fisheries to supply local and international markets. Bycatch currently accounts for the majority of specimens intended for the TM and curio markets, whereas directed fisheries are usually the source of live specimens for the pet trade, as well as a

portion of the dried specimen trade. India, Indonesia, the Philippines, Thailand, and Viet Nam exhibit significant bycatch for seahorses in trawl fisheries, while other exporting countries like Australia, Ecuador, Mexico, the United States, and possibly Nicaragua and Honduras also trade in seahorses from bycatch (Vincent and Perry, in prep). To meet international demand, and possibly because other marine resources are declining, subsistence and small-scale fishers in Asia are increasingly targeting seahorses by hand, scoop net or small seine, and many obtain the majority of their seasonal income from these fishes (Vincent, 1996). Seahorses are also collected by subsistence fishers throughout other parts of the Indo-Pacific and a growing number of countries in Latin America. Florida has a small directed trawl fishery in shallow grass beds off the west coast for *H. zosterae* and *H. erectus* where they are landed in a live bait trawl fishery. Non-selective push nets and seine nets also catch seahorses in Australia, Mexico, Kenya, Peru, Tazmania and Thailand. Individual seahorse fisheries are small, but collectively they are very large and have the potential to detrimentally affect wild populations. See Section 2.7 for details on global trade.

3.2 Legal international trade

Export sources

Seahorses are traded internationally as dried specimens for use in traditional medicines (TM), for curios, and as live specimens to supply the aquarium trade. During the mid 1990s, the largest known exporters were India, Indonesia, the Philippines, Thailand and Viet Nam, with annual exports for each country estimated at 3 to 15 tons of dried seahorses (Vincent, 1996). Furthermore, seahorses comprise 80 to 100 percent of the seasonal income of some fishers in the Philippines and India, and are among the most valuable export fisheries by weight from Viet Nam and the Philippines (Vincent 1995). Based on new trade data from 1998-2000, the largest exporters in descending order are Thailand, India, Mexico, the Philippines and Viet Nam (Vincent and Perry, in prep). Over the last several years a number of new countries have entered the TM trade, including at least 9 countries in Africa and 9 countries in Latin America, possibly in response to declining supplies in southeast Asia (Table 3). At least 75 countries are now known to trade in seahorses, including 42 nations that export seahorses (Vincent and Perry, in prep). Global harvest, export and import of seahorses are summarized in Tables 4-8.

Transhipment points

Twelve jurisdictions have been identified as trade intermediaries, including Costa Rica, Hong Kong, Japan, Kenya, Laos, Macau, Mali, Norway, Singapore, Switzerland, Chinese Taipei, and Zimbabwe (Vincent and Perry, in prep).

Import destinations

The largest importers for dried seahorses are China, Hong Kong (SAR), Chinese Taipei, and Singapore, respectively. In Asia alone, annual consumption was estimated at 45 metric tons (16 million seahorses) in the 1980s and early 1990s (Vincent, 1996). Demand for medicinal purposes increased 10-fold during the 1980's and continued to grow by 8 to 10 percent per year in China alone. Trade is thought to have declined in 1998 and 1999 due to the Asian economic crisis, and then increased to as much as 70 metric tons in 2000 (Vincent and Perry, in prep). Seahorses are also used in traditional medicines in Indonesia, Japan, Korea, and in Traditional Indian Jamu Medicine, Philippine Folk Medicine, European Alternative Medicine and the rapidly expanding American Alternative Medicine. At least eight medicines prepared from seahorses are now sold in North America (Fratkin 1986). There are currently seven main species that are sold as whole, dried animals (in Hong Kong they are often bleached) for preparation into tonics, and at least six other species traded at lower volumes (Table 9). In the mid 1990s, there was an increased availability of prepared medicines (pills) in Asia possibly in response to decreases in size of individuals obtained in fisheries catch. In China alone, as many as 30-50 medicines are reported to contain seahorse as an active ingredient (Vincent, 1996).

Dried seahorses are also utilized as curios with a high availability in beach resorts and shell shops around the world. Trade surveys and Customs reports indicate that at least 17 species are available as curios, including many species that are unsuitable for TM or aquarium organisms (Table 9). The total global volume of trade in dried seahorses for curios is unknown.

Live specimens for aquaria are imported primarily by North America, Europe, Japan, and Chinese Taipei, with live seahorses also destined for Australia, Hong Kong, and Mexico. The largest exporters of live animals are the Philippines, Indonesia, and Brazil; other exporters include Belize, Egypt and Kenya. Vincent (1996) suggested that up to 1 million seahorses enter the aquarium trade each year, but this is probably an overestimate. More recently, Vincent and Perry (in prep) identified Indonesia and the Philippines as the largest exporters of live seahorses, with several hundred thousand animals exported from each country annually, and some of the primary buyers reporting an annual trade of up to 854,000 animals. Available global import data indicate that numbers may be much lower, although the large discrepancies are probably due to the limited recording of imports. At least 18 species are traded live for aquaria including four Indo-Pacific species in the *H. histrix* complex and *H. kuda* complex, and two North American species, *H. erectus* and *H. zosterae*. Many of the species in the live trade are also valued for TM (Table 9).

Virtually all seahorses for home aquaria come from the wild, although some captive-bred specimens are now available. Wild seahorses are highly unsuitable aquarium fishes, due to their difficult dietary requirements, high susceptibility to disease, injury during collection and transport, and poor aquarium management at all levels of the trade (Vincent 1996). Although captive-bred seahorses are reported to exhibit better rates of survival in home aquaria, the high cost of these animals (USD 30 - USD 150 for one animal in U.S. markets) may limit their demand and marketability.

Overall, the increased trade in the late 1990s appears to be supported by new source countries entering the trade, as well as increased fishing effort, higher retention of bycatch and greater sale of incidental landings (Vincent and Perry, in prep).

3.3 Illegal trade

Illegal, unreported, and unregulated (IUU) fisheries pose a significant threat to many species of fish, compromise attempts at stock assessment, and have prompted new policies within bodies such as the United Nations Food and Agriculture Organization (FAO). In seahorse fisheries, “illegal trade” has limited meaning because most trading countries do not specifically regulate seahorse harvest or shipment. A number of countries have established specific legislation and regulations affecting the harvest, export and/or import of selected seahorse species (Table 10). However, unreported landings, complicated trade routes, and poorly documented imports in major consuming countries (see below) confound analyses of how successful these measures are in conserving seahorses. For instance, Thailand reported exports to mainland China of 300 kg in 2000 and 4300 kg in 2001, while China import data for Thailand was 1690 kg in 2000 and 1568 kg in 2001 (Table 5; 8). The current understanding of trade volumes, patterns, and participating countries has arisen almost entirely because of independent research by non-governmental organizations (Vincent, 1996). These organizations are likely to cease such efforts because of financial considerations (A. Vincent, pers. comm.), and there is no apparent avenue for documenting illegal or unreported trade in the future.

3.4 Actual or potential trade impacts

A CITES Appendix-II listing for seahorses will contribute to a more accurate understanding of the global trade in seahorses due to permitting and reporting requirements. In addition, a CITES listing will improve the ability to obtain global trade data on a species level, which is critical for understanding the impact of fisheries on local and regional seahorse populations. The listing will clarify and should improve fishery management mechanisms undertaken by exporting countries, and could lead to potential revision of appropriate fishery legislation. Since source countries would have to justify non-detriment findings and show that their export volumes are sustainable, an Appendix-II listing should

result in more thorough field monitoring of the resource, collection of fishery-independent and fishery-dependent data, and development of conservation programs at local and national levels. This would theoretically include by-catch fishery management to protect seahorses as non-targeted species. Given that many seahorse fisheries appear to be unsustainable (see Section 2.4), such improved management measures may result in reduced seahorse trade volumes in the near term. However, national and local catches are already declining because of overexploitation and better management practices should lead to sustainable and profitable fisheries over the long-term.

Any significant improvements to seahorse management in developing countries will require continued technical and financial assistance from developed countries. Listing could also help promote certification schemes for environmentally sound collection practices, such as that being implemented by the Marine Aquarium Council.

3.5 Captive breeding for commercial purposes (outside country of origin)

Large-scale captive breeding programs designed to reduce pressure on wild populations have been mostly unsuccessful, due to difficulties in rearing young and the need for repeated removal of adults from the wild to maintain brood stock. Syngnathid culturing has included wild-caught pregnant males that give birth in captivity and syngnathids mating in captivity, with subsequent births, both of which are relatively easily to achieve. The difficulty comes in rearing large portions of the brood to market size, which usually takes many months to a year, but often results in high mortality due to disease and nutritional problems (Vincent, 1996).

Captive breeding programs existed from the 1950's to the 1980's in China, but economic failure (mainly due to high mortality rates and low productivity) forced closure of many facilities (Vincent 1996). Seahorse culturing was also attempted in the Philippines because indiscriminate fishing was depleting populations, but activities have also been abandoned. Currently some Filipino fishers are placing males into pens, to allow them to give birth prior to export, but survival rates for juveniles are unknown. The Seafarming Development Centre in Sumatra, Indonesia reports success in seahorse culturing (53 percent survival of young), although this facility needs to be critically assessed. Captive breeding operations are underway in Viet Nam, New Zealand, the United States, and Australia, and it appears these are capable of supplying at least limited numbers of live specimens for the pet trade. Fry production technology for *Hippocampus kuda* has been preliminarily established by The Taiwan Fisheries Research Institute (Sheu et al., 2002).

Overall, most seahorse culturing programs have found that breeding seahorses in captivity is relatively simple, but rearing the young is highly problematic due to nutritional problems and disease. Common clinical problems encountered include diseases caused by bacteria, ciliates, fungi, trematodes and other microorganisms and parasites.

4. Conservation and Management

4.1 Legal status

4.1.1 National

Seahorses are included in the French, Portuguese and Viet Namese Red Lists of Threatened Animals; however, trade is still legal. Israel, South Africa and the Australian national jurisdictions of Tasmania and Victoria fully protect all syngnathid species, including seahorses. Other countries, such as China and Slovenia, protect particular species (Table 10).

4.1.2 International

Currently there is no international body or organization responsible for the conservation or management of seahorse fisheries, or international regulation through trade controls.

Recommendations of fishery management options were developed at a recent seahorse workshop and are summarized in Martin-Smith and Vincent (in prep), but these have been tested and implemented only on a small local scale.

4.2 Species management

4.2.1 Population monitoring

There are few long-term scientific survey programs in place in range states to monitor populations of seahorses and the impacts of the seahorse fishery. However, a number of countries have established monitoring programs for coral reef fishes over the last 10 years, and some of these record seahorse abundance. For example, in Hawaii, ornamental fishes including seahorses have been monitored since 1998 in an area targeted by collectors (Tissot and Hallacher, 1999). The Florida Marine Research Institute has also collected fishery-dependent and fishery-independent data for seahorses for the last 12 years. This includes extensive trawl and seine surveys conducted in nine survey areas along the Gulf of Mexico, Caribbean, and Atlantic coasts of Florida. The sampling protocol covers all habitat types utilized by seahorses including seven major estuary systems (Stu Kennedy, Florida Fish and Wildlife Commission, pers. comm). Both of these Florida datasets show abundance and harvest data that vary with no apparent trend (no increase or decrease) since 1991 (http://www.floridamarine.org/features/view_article.asp?id=5063). Reef Check, in collaboration with the Marine Aquarium Council (MAC), developed a monitoring protocol for marine ornamentals (including seahorses) in November 2000 and it is being tested and implemented in countries with aquarium fisheries.

In Australia, the Philippines, Portugal, South Africa and Tasmania, biologists have conducted assessments of seahorse density and population dynamics using transect surveys or grids, but they are limited in spatial and temporal scale (Table 2). In the central Philippines, researchers from Project Seahorse and the Haribon Foundation have studied the seahorse fishery since 1995, and extensive field assessments have been conducted, in particular for the most commonly collected species, *H. comes* (Perante et al., in press).

4.2.2 Habitat conservation

In most jurisdictions with large seahorse fisheries there are few conservation measures in place to protect seahorse habitat. Inshore trawling is banned in Indonesia, Chinese Taipei, and Thailand, and possibly other locations, which may provide protection for seahorses in soft bottom habitats such as grassbeds. In the Philippines, Marine Protected Areas (MPAs) have been found to be an effective strategy for protecting seahorse populations and limited data suggest that heavily fished areas will recover through elimination of heavy fishing pressure but this requires considerable time (Project Seahorse, unpubl. data). An increasing number of MPAs are being established throughout southeast Asia, including Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Nonetheless, there are often conflicting responsibilities for the resources, a lack of coordination among different agencies, limited funding and technical expertise, and/or lack of enforcement (Chou, 2000).

4.2.3 Management measures

Management of syngnathid fisheries is not well-developed in most range states because of a lack of information on the biology and population dynamics of most species, and limited reporting of catch data by fishers. In addition, the majority of the harvest and export occurs in developing countries in the tropical Indo-Pacific. Many of these countries lack capacity and financial resources necessary for the development and implementation of sustainable harvest schemes. Human pressures affecting coastal habitats throughout Southeast Asia and the South Pacific need to be addressed through integrated coastal management strategies that are

largely lacking throughout the region. Some countries have targeted conservation strategies or management measures, although many occur only on paper, with limited government staffing, operational funding and enforcement capabilities (GCRMN, 2000).

Community-based management systems are having increasing success at conserving and sustainably managing coastal resources and different models are being applied to suit local situations. For example, small-scale community-based seahorse management projects exist in Viet Nam, the Philippines, Australia and other locations. These include (a) no-take Marine Protected Areas (MPAs), (b) holding pens for pregnant males, to allow them to release young into the sea prior to export, (c) education and outreach, and (d) alternative livelihood programs including low-technology captive breeding (Vincent and Pajaro, 1997). In addition, Project Seahorse has been involved in socio-economic and fisheries research and monitoring, seahorse fishery management, habitat research, and MPA implementation in the Philippines (Project Seahorse, 2001).

While certain initiatives, such as those being undertaken in the Philippines by Project Seahorse are assisting in the conservation of seahorse populations, these are small scale and are limited to few communities. These programs are unlikely to address the growing world-wide seahorse trade due to the scale of the trade, including 1) the large number of range states and locations within individual countries where harvest occurs; 2) the large number of fishers that participate in a seahorse fishery; 3) the prevalence of non-selective trawl fisheries and relative importance of bycatch as a source of TM specimens; and 4) lack of manpower and funding for training, capacity building and enforcement. In particular, the largest exporters of seahorses have few management measures that are designed to protect seahorses at a national level, and unless international regulations are implemented there will be little impetus for these countries to sustainably manage seahorse fisheries.

4.3 Control measures

4.3.1 International trade

Relatively few political entities currently provide measures to limit trade in seahorses at an international level. For example, although export of dried seahorses is banned in India, Mexico and Slovenia and capture and trade of live seahorses are prohibited in India, Mexico, Panama, Slovenia and Thailand (for 3 of 5 native species), it appears that India, Mexico, and Thailand are among the world's largest suppliers of seahorses.

4.3.2 Domestic measures

A recent analysis by Project Seahorse identified 20 countries that control capture and/or trade to varying degrees for dried and/or live seahorses. These measures range from full prohibitions on the take or export to various permitting and licensing schemes (Table 10). In addition, trade is monitored in Australia, China, Hong Kong (SAR), India, Peru, South Korea, Chinese Taipei and USA, although some of this is dependent on voluntary trader declarations (Vincent and Perry, in prep). On January 1, 1998, Australia became the first country requiring permits specifically for exports of syngnathids; permits are only issued for animals derived from approved captive breeding programs, or from the wild under an approved management regime (Moreau, 1997).

5. Information on Similar Species

The taxonomy of seahorses requires additional clarification due to the large numbers of synonyms, several multi-species complexes, and some unnamed species. Four North American, two European and eleven Australian species are well-defined, but many Indo-Pacific species are problematic (Lourie et al., 1999). The most heavily fished Indo-Pacific seahorses are often lumped under one of four species

(*H. kuda*, *H. histrix*, *H. kelloggi* and *H. trimaculatus*); however, *H. kuda* is a complex of ten species; *H. histrix* consists of at least four separate species; *H. trimaculatus* may be two separate species; and *H. kelloggi* is not well described (Vincent, 1996).

Morphological characters used to separate seahorses include the number of rays on the dorsal, pectoral and anal fin; presence or absence of spines; snout length; coronet shape; and occasionally, the color pattern. Nevertheless, identification to species based on morphological features alone is difficult, as individual species may exhibit sexual dimorphism and separate reproductively or geographically isolated species may look similar. Species identification may require a combination of genetic data, environmental data, geographic ranges, and habitat information. Two taxonomic references are available to assist in species identification (Lourie et al., 1999; Kuiter, 2000) and FishBase also includes a discussion of diagnostic features (Froese and Pauly, 2000). The proponents have used Lourie et al. (1999) as a standard taxonomic reference for this proposal.

6. Other Comments

6.1 Range State Consultations

(Note: the proponents consulted range states on the concept of listing the entire family Syngnathidae in Appendix II. The results below, and independent advice obtained at the CITES Technical Workshop on Syngnathid Conservation (May 27-29, 2002; Cebu, Philippines), led to the current proposal to list only the genus *Hippocampus*).

Australia: Australia exported 1294 *H. abdominalis*, 32 *H. angustus* and 29 *H. breviceps* in 200-2001 to six countries. Syngnathids are listed as protected marine species under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), which requires that fishers obtain authorization from the Minister of Environment and Heritage to trade or catch these species in Commonwealth waters. No syngnathid species are classified as threatened under the EPBC Act, but five species are listed on the IUCN Red List. Australia does not feel that listing of the whole family can be justified because the vulnerability and status varies between species. However, they do not object to an Appendix II Listing if research shows that an International initiative will aid in their survival, and the CITES Workshop in the Philippines supports protection of particular species under CITES.

Bermuda: There is no significant trade (export or import) of seahorses. However, the Bermuda CITES Authorities support an Appendix II listing. This was independent of and subordinate to the EU position.

Canada: One species of seahorse, *H. erectus* occurs in the North Atlantic. There is no known commercial, recreational or subsistence fishery, and the species is not regulated by the Federal Government. No information is available on abundance, population size, habitat preference, or ecological significance of this species in Canadian waters.

Cayman Islands: There is no local harvesting of syngnathids. Marine Conservation Law prohibits take of any fish less than 8 inches in length. The Cayman Islands CITES Scientific Authority supports an Appendix II listing.

China: Seahorses are harvested in three provinces, with an estimated annual catch of 20 metric tons. China also reports successful seahorse culturing. The government recognizes the importance of conserving seahorses but pointed out that 1) only a few of all syngnathids are in international trade for TM; 2) some species are being successfully bred on farms; and 3) they are unclear how CITES will address bycatch. A decision on the proposal will be made after the CITES Syngnathid workshop.

Cuba: The CITES Management Authority provided a summary of the habitat preference and life history of three species of seahorses that are found in Cuban waters, *H. erectus*, *H. reidi* and

H. zosterae. They did not indicate whether these species are commercially exploited. They recommend that a separate proposal is developed for each species of concern as the situation for each species may differ.

Hong Kong (SAR): The Agriculture, Fisheries and Conservation Department stated that updated biological and trade information are necessary before determining a suitable and workable conservation plan for seahorses. They state that by-catch in trawling fisheries and loss of habitat are the major threats to syngnathids, and not international trade, and they feel a CITES listing is not the appropriate way to address these threats. Hong Kong Customs and Statistics Department has monitored syngnathid trade since January, 1998.

Mauritius: The Ministry of fisheries reports that seahorses are not common, but they occur in lagoon, algal beds and rocky/rubble substrates. They state that seahorses need protection and can be considered for listing in CITES Appendix II.

Norway: The Directorate for Nature Management commented that they had not received any information on Syngnathids, possibly because the taxon is either rare in Norwegian waters, or does not occur there.

Singapore: One species, *H. kuda*, is recognized as being threatened by habitat destruction and harvesting for medicinal use and the aquarium trade and harvest is not allowed except by permit. Singapore would consider supporting a proposal for listing in the Appendices of CITES if there is sufficient scientific evidence to show that they are globally endangered.

Spain: The inclusion of the entire family Syngnathidae in Appendix II of CITES is not appropriate, but Spain would consider the inclusion of some taxa, pending recommendations of the Seahorse workshop.

Sweden: No seahorses are reported to occur in Swedish waters and trade in these species is thought to be minimal, although they do not have any recent documentation. Sweden considers it reasonable to list the entire genus *Hippocampus*, rather than individual species, but does not support a listing for the entire family.

Chinese Taipei: There is no fishery targeting syngnathids, but they are harvested as bycatch. Seahorses are not listed as protected under Chinese Taipei's Wildlife Conservation Law; some of their major habitats are established as protected areas of fisheries resource, however. The Council of Agriculture indicates that seahorses are "not so abundant" and they feel the price of these species would increase if they were listed on Appendix II. An importers business license is required to import dried seahorses.

Thailand: Exports from Thailand to Asian countries tripled between 2000 and 2001; origins of these seahorses are unknown, although they are thought to represent by-catch from trawl fisheries operating outside Thai waters. Thailand states that an increase in exports may be affecting the availability of seahorses in local waters, and they support a CITES Appendix II listing.

Togo: The government feels that the protection of wildlife is of critical importance and they support an Appendix II listing for seahorses.

United Kingdom: The UK supports any Appendix II listing proposal endorsed by the Seahorse Workshop, held in May 2002 in the Philippines.

United States of America: Seahorses occur in a number of states, but the only existing trawl fisheries are in Florida. Florida has established extensive fishery regulations for seahorses and population status is monitored. Seahorses may be harvested for ornamental purposes in Hawaii, but catch data do not indicate landings in the last 6 years. Hawaii monitors populations of ornamental

species, including seahorses, off Kona, in an area targeted by ornamental fishers. Seahorses are not currently harvested in U.S. territories on a commercial scale. The USA imports and exports seahorses, with 18 species reported in trade at U.S. ports since 1996. Seahorses have been imported from 24 countries, with most coming from the Philippines, Mexico, Australia and China. Between 1996-2002 a total of 664 kg and 408,219 dried seahorses and 16,341 live seahorses are listed in import records; however, the trade may be largely unreported as shipments are often classified as "tropical fish" only.

Vanuatu: The Environment Unit of Vanuatu indicates that there is no commercial fishery or trade in seahorses. Stock assessments have not been conducted, but the general feeling is that seahorse populations are stable and unexploited. Due to the small size of populations, they feel that seahorses could not support a commercial fishery.

Yugoslavia: Two species of seahorses occur in Yugoslavian waters (*H. antiquorum* and *H. guttulatus*), but both are rare and not reported in commerce. Yugoslavia supports an Appendix II listing for these species.

7. Additional Remarks

Attendees at the CITES Technical Workshop on seahorses and other members of the family Syngnathidae (Cebu, Philippines; 27-29 May 2002) reviewed a working draft of this proposal and discussed it in the context of other potential conservation strategies for seahorses. Attendees included Syngnathid researchers, NGO's, industry representatives, Traditional Chinese Medicine traders, and country representatives. The workshop final report to the Animals Committee recommended listing the entire genus *Hippocampus* in Appendix II of CITES, and made several concomitant recommendations to the Parties and the CITES Secretariat. There were three attendees representing China, Indonesia, and the Hong Kong Chinese medicinal traders who voiced objection to the listing because of poor data on population status, potential increases in illegal harvest, and potential socioeconomic impacts. The workshop recommendations, which addressed such things as capacity building, delayed implementation, and legislative action, were subsequently considered by the Animals Committee and shall be addressed in the Chairman's report prior to COP12.

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Table 1. Examples of the condition of seahorse habitat in tropical and subtropical countries with large seahorse fisheries. Mangrove data are from Valiela et al., 2001 and * Wolanski et al., 2000). Estimates of reef area are from Spalding et al., 2001 and coral data are from GCRMN, 2000.

Country	% Loss of mangroves (time)	Remaining area of Mangroves (km^2) (year of observation)	Total Area and Condition of Coral Reefs
India	47% (29 years)	3,565 (1992)	5790 km^2. Four major coral reef areas associated with offshore islands. In three areas, 5-45% of reefs destroyed prior to 1998 and 50-90% of coral died in 1998. Only one area remains in good condition (Andaman and Nicobar Islands).
Philippines	70.5% (70 years)	1,325 (1990)	25,060 km^2. 40% of reefs are in poor condition and 29% are good to excellent.
Viet Nam	62% (50 years)	1,520 (1995)	1270 km^2, including 3260 km of coastline and 3000 offshore islands. 1.4% of reefs are excellent, 31% good, 48.6% fair and 37.3% poor. The healthiest reefs are remote form human population centers.
Indonesia*	local losses of 50-80%*	42,500 (2000)	50,000 km^2. 29% of reefs are good to excellent, 31% fair and 40% poor.
Thailand	55% (32 years)	1,687 (1993)	2130 km^2. Reefs primarily in two locations. 1) Gulf of Thailand: 16.4% of reefs are excellent, 29% good, 30.8% fair and 23.8% poor: 2) Andaman Sea: 4.6% excellent, 12% good, 33.6% fair and 49.8% poor.
Malaysia	12% (10 years)	6,424 (1990)	3600 km^2. Best reefs are oceanic reefs at far east coast and the southern Spratleys. Reefs in other locations have experienced considerable declines in coral cover, and an alarming amount of recently dead and shattered corals from blast fishing. In Tunku Abdul Park coral cover declined from 30% in 1994 to 5% in 2000.
Australia	14% (7 years)	10,000 (1990)	50,000 km^2. The Great Barrier Reef in general is in good condition due to relatively low human pressures and remote, offshore location of the reef system. Some nearshore reefs have been degraded from human impacts.
Brazil	46% (14 years)	13,400 (1997)	1200 km^2. Five major coral reef areas. Nearshore reefs degraded as a result of sedimentation, nutrients, and heavy fishing pressure.
Ecuador	21% (12 years)	1,620 (1991)	< 50 km^2. No information identified.
China	73% (15 years)	178 (1995)	1510 km^2 (China), 940 km^2 (Chinese Taipei). Reefs have been degraded over the last 10 years from coastal development and pollution, dynamite fishing, trawling. Some species of reef fish, gastropods and crustaceans are becoming locally extinct.
Singapore	66% (7 years)	6 (1990)	< 100 km^2. Most reefs have lost up to 65% of live coral cover since 1986; the best reef, furthest from the mainland, has lost 37% of its coral.

Table 2. Population densities of seahorses determined from field surveys using transects or grids.

Species	Location	Density (#/m^2)	Source
H. guttulatus	Ria Formosa Lagoon, Portugal	0.002-0.383; max 10	J. Curtis, unpubl. Data
H. capensis	South Africa	0.0089-0.22	Bell et al, in review
H whitei	Sydney, Australia	0.08-0.215	Vincent et al., in review
H. comes	Philippines	0.02	Perante et al., 2002
H. abdominalis	Tasmania	0.007	K. Martin-Smith, unpublished data

Table 3. Countries known to catch and/or export seahorses. Codes for each country are as follows: 1) Yes: known catch and/or export; volume unknown; 2) (x) low volume of harvest/trade: < 10 kg (dried) or < 1000 (live) 3) x minor: tens of kg (dried) or thousands (live); 4) xx medium: hundreds of kg (dried) or tens of thousands; 5) xxx major: tonnes (dried) or > 100,000; 6) xxxx dominant: > 10 tonnes (dried). Adapted from Vincent and Perry, in prep.

Country	Catches	Exports	Jurisdiction	Catches	Exports
Argentina	Yes		Nicaragua	Yes	?
Australia	x	x	Nigeria	Yes	x
Bangladesh	Yes	(x)	Pakistan	Yes	
Belize	x	x	Panama	x	
Brazil	xx	xx	Peru	x	xx
China	Yes		Philippines	xxxx	xxx
Costa Rica	Yes	live only	Portugal	Yes	
Croatia	Yes		Senegal	Yes	xx
Ecuador	xx	xx	Seychelles	Yes	Yes
Egypt	Yes	live only	Singapore	?	?
France	Yes		South Korea	Yes	(x)
Gambia	Yes	x	Spain	Yes	
Guatemala	xx	(x)	Sri Lanka	Yes	
Guinea	?	xx	Chinese Taipei	Yes	?
Honduras	xx	xx(past) (x)(now)	Tanzania	xxx	xxx
Hong Kong SAR	(x)	(x)	Thailand	xxxx	xxxx
India	xxxxx	xxxxx	Togo	Yes	x
Indonesia	Yes	Yes	USA	xx	x
Japan	Yes	xxx	Venezuela		Yes
Kenya	x	live only	Viet Nam	xxxx	xxxx
Madagascar	Yes	Yes			
Malaysia	xxx	xx			
Mexico	xxxx	xxx			
Mozambique	Yes	Yes			
Myanmar	Yes	?			
New Zealand	x	Yes			

Table. 4. Number of seahorses landed by commercial fishers in the United States (thousands of animals). Data are from Larkin et al., 2001.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Florida, USA	5.97	13.98	83.72	71.82	110.95	23.34	19.1	90.1	16.98

Table 5. Seahorse exports from Thailand (kg dried). Data were provided to USFWS by the Department of Fisheries, Thailand.

Importing area	Chinese Taipei	Malaysia	Hong Kong	China	Total
2000	1630	100	1600	300	3630
2001	3848	720	1670	4300	10538

Table 6. Recorded imports of dried seahorses to Hong Kong from 1998-2000.

All data are in kg.

Country of origin	1998	1999	2000
Thailand	4 894	3 608	9 115
Philippines	6 520	7 189	5 874
India	750	1 354	5 536
Indonesia			728
Malaysia		104	659
Senegal	94	270	605
Mainland China			163
Singapore R	414	178	153
Australia	292	132	100
Peru	321	332	96
Guinea	146	158	30
Mexico		140	23
Togo		19	3
USA		60	
Gambia		66	
Total	13 413	13 610	23 085

Table 7. Recorded imports of dried seahorses to Chinese Taipei (1983-2000) with origin, value and volume (kg) per annum.

Origin	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
China									1271	1500	823	806	538	455	810	587	7	1381
Japan	20	15						75										
Hong Kong	1688	2376	2634	499	788	1346	1121		130	179								
Indonesia						43	168	3	14		50	39		34		22	32	259
Malaysia	120	213	144	100	41	127	506	597	469	350	129	236		194	64	302		
Singapore	96	297	186	16	140	271	45	36	145	22		136	32			113	49	
Philippines	115			480	1050	1191	1297	640	1258	1858	1770	1830	1575	290	136	196	321	898
Thailand	2844	2909	1948	3043	2796	4120	5854	4046	5703	7903	8150	8069	7322	9399	8886	6144	6043	8690
Viet Nam							10	258		20	384	140	39	27			81	149
Other Asian							1317	1564	1369									
Italy		30																
USA		123	160	76		5		18		111								
Ecuador				7														
Surinam																		203
Other	746							35										
Total (kg)	5629	5963	5072	4221	4815	7103	10318	7272	10359	11943	11306	11256	9506	10399	9896	7364	6533	11580
Total Value (USD1000)	637.2	742.3	621.1	459.6	449.6	463.9	585.5	355.3	562.3	644.9	831.3	697.7	669.2	466.8	580.7	513.7	344.9	456
Mean Price (USD/kg)	113	124.5	147.1	108.9	93.4	65.3	56.7	48.9	54.3	54.0	73.5	62.0	70.4	44.9	58.7	69.8	52.8	39.4

Source: Chinese Taipei trade statistics

Table 8. Import data of dried seahorses and pipehorses for mainland China

Year	Source	Quantity (kg dried)
1992	Hong Kong, Japan, Philippines, Thailand Australia, other	15,333
1993	Hong Kong, India, Indonesia, Singapore, Thailand	7,708
1994	Hong Kong, Macao, Indonesia, Singapore, Thailand, Australia	14,545
1995	Hong Kong, Indonesia, Thailand, Singapore	3,815
1996	Indonesia, Japan, Singapore, Thailand	4,904
1997	India, Indonesia, Japan, Thailand, Chinese Taipei	2,290
1998	No data	
1999	Indonesia	184
2000	Thailand	1690
2001	Thailand	1568

Table 9. List of Syngnathid species observed or reported to be traded, dried for traditional medicine (TM), dried as curios or live for aquariums**.** Trade from those countries listed with an * may consist of a complex of these species. Compiled from Vincent and Perry, in prep; Vincent, 1996; and Lourie et al., 1999.

Species	TM	Curio	Live	Important exporting countries
H. abdominalis		x	x	Australia
H. algiricus?	x			West Africa (Gambia and Senegal)
H. angustus			x	Australia
H. barbouri	x	x	x	Philippines, Malaysia
H. borboniensis	x	x		Africa
H. breviceps			x	Australia
H. camelopardalis	x	x	x	South Africa
H. comes	x	x	x	Philippines
H. erectus		x	x	USA; Mexico and Brazil; Western Atlantic
H. fuscus	x	x	x	India
H. guttulatus		x	x	Senegal, Portugal, Croatia
H. hippocampus		x		Guinea, France?,Portugal? Spain?
H. histrix	x	x	x	Thailand*, Philippines*
H. ingens	x	x	x	Pacific coast of Latin America; Mexico and Ecuador
H. kelloggi	x	x		Southeast Asia
H. kuda	x	x	x	India, Thailand*, Indonesia*, Sri Lanka
H. mohnikei	x		x	Japan, Viet Nam
H. reidi		x	x	USA, Mexico and Brazil; Western Atlantic
H. spinosissimus	x	x	x	Indonesia, Viet Nam, Philippines
H. subelongatus			x	Australia
H. trimaculatus	x			Viet Nam, Philippines, China
H. whitei	x			Australia
H. zosterae			x	USA
Total	14	15	17	

Table 10. Summary of regulations affecting *Hippocampus* spp. Data are compiled from Range State Consultations submitted to the US FWS in 1999 and 2002, a review of fishery management plans available electronically, and Vincent and Perry (in prep).

Country	Conservation measures
Australia	Seahorses are listed as protected marine species under the *Environment Protection and Biodiversity Conservation Act (1999)* and permits are required for exports of syngnathids derived from approved captive breeding programs, or from the wild under an approved management regime. Seahorses are currently exported from Victoria, Queensland, South Australia, Western Australia, and Northern territory. Several syngnathids are listed as endangered.
Bermuda	Non- specific harvest regulations that affect seahorses, including a ban on the aquarium fish trade.
Canada	Seahorses are not regulated by licenses or quotas and no import data are collected.
Cayman Islands	No harvest of any fish under 8 inches allowed.
China	*H. kelloggi* is listed as threatened and permits are required for trade.
Ecuador	Export permits required.
European Union	The genus *Hippocampus* is listed in EC regulation 338/97 Appendix D.
France	Illegal to import tropical species under the name *H. kuda*; *H. guttulatus* is listed as threatened.
Hong Kong	The Traditional Chines Medicine community is adopting voluntary conservation measures for the long-term sustainable use, including 1) minimum sizes; 2) seasons; and 3) using substitutes in prescriptions when possible.
India	All seahorses listed on schedule 1 of the Wildlife Protection Act in July 2001, which prohibits capture of seahorses; export permits required.
Indonesia	Inshore trawling is banned. Permits for harvest and trade issued by local governments; exporters have an Ornamental Fishery Permit issued by the Ministry of Marine and Fishery for 5 year duration. No limit on harvest level; no special fishing methods and no monitoring has been undertaken.
Israel	Trade in Red Sea seahorses forbidden; the entire family syngnathidae is proposed for full listing protection.
Mexico	Export is banned; targeted capture of live animals prohibited.
Portugal	*H. hippocampus* and *H. ramulosus* are listed as threatened.
Panama	Collection of seahorses is banned.
Singapore	*Hippocampus kuda* is classified as vulnerable under the Singapore Red Data Book. This species is protected under national legislation and collection is only allowed by permit.
Slovenia	*H. guttulatus* protected under Government Order on the Protection of Threatened Animals Species (October 1993), which prohibits trade and prohibits keeping them in captivity.
South Africa	Harvest of *H. capensis* is illegal without permit from Cape Nature Conservation (CNC) under CNC Ordinance 19, 1974. All syngnathids protected from harvest and disturbance except with permit (Draft Regulations of the Marine Living Resources Bill and Sea Fisheries Act 1988). *H. capensis* is listed as threatened. Export permits required for all seahorses.

Chinese Taipei	Inshore trawling is banned. Seahorses are not listed as protected species, but some of their habitats (Kenting and Green Island) are established as protected areas of fisheries resource.
Thailand	Inshore trawling within 3 km of the shore is banned. Export of live marine ornamentals including 3 species of seahorses is banned.
Ukraine	*H. guttulatus microstephanus* is listed as threatened.
U.S.A.	Managed fishery for *H. zosterae* and *H. erectus* in Florida. Take of seahorses for the aquarium trade is prohibited in the USVI and Puerto Rico.
Viet Nam	*H. histrix*, *H. japonicus*, *H. kelloggi*, *H. kuda* and *H. trimaculatus* listed as vulnerable in National Red Data Book. Seahorse fishery began in 1998; Annually, Viet Nam exports at least 5 metric tonnes of dried seahorses (one kilogramme of seahorses comprises about 300-400 individuals) and there is also a domestic seahorse tonic trade. Current supply does not meet demand and the heavy exploitation has resulted in catch consisting of fewer and smaller seahorses.

APPENDICES

A. Species of *Hippocampus*

There are 32 recognized species in the genus *Hippocampus*, as determined from morphometric and genetic analyses (Lourie et al., 1999). 2002 IUCN Status for seahorses is included (Hilton-Taylor in prep.)

Taxa	Range and comments	IUCN Red List Category
Hippocampus abdominalis Lesson, 1827	Southwest Pacific: Australia and New Zealand	VU A2cd
Hippocampus algiricus Kaup, 1856	Mediterranean and Eastern Atlantic: Algeria, Benin, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone.	DD
Hippocampus angustus Günther, 1870	Australia.	DD
Hippocampus barbouri Jordan and Richardson, 1908	Southeast Asia including the Philippines, Malaysia.	VU A4cd
Hippocampus bargibanti Whitley, 1970	Southeast Asia and western Pacific including: Australia Indonesia, New Caledonia, Papua New Guinea; found only on gorgonians of the genus *Muricella* from 10 to 60m depth.	DD
Hippocampus borboniensis Duméril, 1870	Red Sea and Indian Ocean: Madagascar, Mauritius, Mozambique, Réunion, South Africa, Tanzania.	VU A2cd
Hippocampus breviceps Peters, 1869	Australia, west and south coast.	DD
Hippocampus camelopardalis Bianconi, 1854	Red Sea and Indian Ocean: Mozambique, South Africa, Tanzania.	VU A2cd
Hippocampus capensis Boulenger, 1900	Indian Ocean: South Africa. The species has a restricted and fragmented distribution, only occurring in a few estuaries.	EN B1 + 2c + 3d
Hippocampus comes Cantor, 1850.	Southeast Asia: Malaysia, Singapore, Viet Nam and Philippines.	VU A2cd
Hippocampus coronatus Temminck & Schlegel, 1850	Japan, Viet Nam.	VU A2cd
Hippocampus erectus Perry, 1810	Caribbean, western Atlantic, Nova Scotia to Brazil: Anguilla, Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bermuda, Brazil, Canada, Cape Verde, Cayman Islands, Colombia, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Guatemala, Haiti, Martinique, Mexico, Montserrat, Netherlands Antilles, Panama, Puerto Rico, Saint Helena, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sao Tome and Principe, Suriname, Trinidad and Tobago, Turks and Caicos Islands, United States, Uruguay, Venezuela.	VU A2cd

Hippocampus fisheri Jordan and Evermann, 1903	Australia, Hawaii, New Caledonia.	DD
Hippocampus fuscus Rüppell, 1838	Indian Ocean and Red Sea: Saudi Arabia, Djibouti, and Sri Lanka. *Records from South Africa, Madagascar, Mauritius and Réunion are questionable.*	VU A2cd
H. guttulatus Cuvier, 1829	Mediterranean and Eastern Atlantic: Netherlands, England, France, Spain, Portugal, Senegal, Morocco, Italy, Malta, Croatia, Greece, Cyprus.	VU A2cd
Hippocampus hippocampus Linnaeus, 1758	Mediterranean and Eastern Atlantic: Albania, Algeria, Benin, Bosnia and Herzegovina, Bulgaria, Cameroon, Canary Islands, Côte d'Ivoire, Croatia, Cyprus, Egypt, Equatorial Guinea, France, Gambia, Georgia, Ghana, Gibraltar, Greece, Guinea, Guinea-Bissau, Israel, Italy, Lebanon, Liberia, Libyan Arab Jamahiriya, Mauritania, Monaco, Morocco, Netherlands, Nigeria, Portugal, Russian Federation, Senegal, Sierra Leone, Slovenia, Spain, Syrian Arab Republic, Togo, Tunisia, Turkey, Ukraine, United Kingdom, Western Sahara, Yugoslavia	VU A2cd
Hippocampus histrix Kaup, 1856	Indo-Pacific: Tanzania and South Africa to Hawaii and Tahiti, north to Japan, south to New Caledonia, including China, Egypt, French Polynesia, Guam, Indonesia, Japan, Malaysia, Mauritius, Micronesia (Federated States of), Mozambique, New Caledonia, Papua New Guinea, Philippines, Réunion, Samoa, Seychelles, South Africa, Chinese Taipei, Tanzania, Tonga, United States: Hawaii, Viet Nam. Reported from the Arafura Sea.	DD
Hippocampus ingens Girard, 1858	Eastern Pacific from California to Peru: Colombia, Costa Rica, Ecuador: Ecuador, Galapagos, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, United States	VU A2cd
Hippocampus jayakari Boulenger, 1900	Red Sea and Indian Ocean: Israel, Oman, Pakistan	VU A2cd
Hippocampus kelloggi Jordan & Snyder, 1901	Red Sea, Indian Ocean, Southeast Asia and Australia: from East Africa and the Red Sea to Japan and Lord Howe Island, Australia. *Deep water species.*	DD
Hippocampus kuda Bleeker, 1852	Indo-Pacific: Pakistan and India to southern Japan, Hawaii, and the Society Islands, including American Samoa, Australia, Cambodia, China, Egypt, Fiji, French Polynesia, Hong Kong, India, Indonesia, Japan, Kenya, Korea, Republic of, Madagascar, Malaysia, Maldives, Mauritius, Micronesia (Federated States of), Mozambique, New Caledonia, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, South Africa, Chinese Taipei, Thailand, Tonga, United States: Hawaiian Is, Viet Nam. This name is used for maybe 10 distinct species in the Indo-Pacific.	VU A2cd
Hippocampus lichtensteinii Kaup, 1856	Red Sea and Western Indian Ocean: Little known species *(if type locality is in error it may be synonymous with H. zosterae).*	DD
Hippocampus minotaur Gomon, 1997	Only known from southeastern Australia; prefers deepwater (64-110 m depth).	DD

Hippocampus mohnikei Bleeker, 1854	Southeast Asia: Japan and Viet Nam; occurrence along Chinese coast needs confirmation.	VU A2cd
Hippocampus reidi Ginsburg, 1933	Western Atlantic: from Cape Hatteras, North Carolina and Florida (USA) to Rio de Janeiro, Brazil, including Bahamas, Barbados, Bermuda, Columbia, Cuba, Grenada, Haiti, Jamaica, Uruguay, Venezuela.	VU A2cd
Hippocampus sindonis Jordan & Snyder, 1901	Japan	VU A2cd
Hippocampus spinosissimus Weber, 1913	Indo-Pacific: from Sri Lanka to Chinese Taipei, including Australia, Malaysia, Philippines, Indonesia, Singapore, Viet Nam.	VU A2cd
Hippocampus subelongatus Castelnau, 1873	Southwest Australia.	DD
Hippocampus trimaculatus Leach, 1814	Indo-Pacific, from southern India to Japan, Australia and Tahiti: China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam.	VU A1cd + 2 cd
Hippocampus whitei Bleeker, 1855	Southwest Pacific: Solomon Islands and southeast Australia. Records from southern Mozambique and Natal, South Africa are misidentifications of *H. camelopardalis.*	VU A2cde
Hippocampus zebra Whitley, 1964	Northwestern Australia	DD
Hippocampus zosterae Jordan & Gilbert, 1882	Western Atlantic: Bermuda, southern Florida (USA), Bahamas and the entire Gulf of Mexico, Cuba.	VU A2cd

B. Scientific Synonyms

Taxonomy is particularly problematic for some species when identification is based solely on morphological characteristics. The North American (*Hippocampus erectus*, *H. ingens*, *H. reidi*, *H. zosterae*), European (*H. hippocampus*, *H. guttulatus*) and most Australian (*H. abdominalis*, *H. angustus*, *H. bargibanti*, *H. breviceps*, *H. minotaur*, *H. spinossissimus*, *H. whitei*, *H. zebra*) seahorses are moderately well defined but the Indo-Pacific species are difficult to classify. Trade data for a number of smooth and spiny seahorses from the Indo-Pacific are often lumped under the species *H. kuda* and *H. histrix* (respectively); *H. kuda* includes a complex of at least six species and another four species are closely related based on genetic data, and at least five geographically restricted spiny seahorses may be reported as *H. histrix* (Lourie et al., 1999).

Taxa	Synonym
Hippocampus abdominalis	*H. bleekeri* Fowler, 1907; *H. graciliformis* McCulloch, 1911 *H. agnesae* Fowler, 1907 *H. macleayana*
Hippocampus algiricus	*H. punctulatus* Kaup, 1856; *H. deanei* Duméril, 1861
Hippocampus angustus	*H. elongatus* Castelnau, 1873*; H. subelongatus* Castelnau, 1873
Hippocampus barbouri	*Hippocampus aimei* Roule, 1916
Hippocampus breviceps	*H. tuberculatus* Castelnau, 1875
Hippocampus camelopardalis	*H. subcoronatus* Günther in Playfair & Günther, 1867
Hippocampus coronatus	*H. fasciatus* Kaup, 1856
Hippocampus erectus	*H. brunneus* Bean, 1906; *H. fascicularis* Kaup, 1856; *H. hudsonius* DeKay, 1842; *H. kincaidi* Townsend & Barbour, 1906; *H. laevicaudatus* Kaup, 1856; *H. marginalis* Kaup, 1856; *H. punctulatus* Kaup, 1856; *H. stylifer* Jordan & Gilbert, 1882; *H. villosus* Günther, 1880; *H. tetragonus* Mitchill, 1814
Hippocampus fuscus	*H.obscurus* Ehrenberg in Klunzinger, 1871
Hippocampus guttulatus	*H. longirostris* Schinz, 1822; *H. ramulosus; H. atrichus, H. jubatus, H. filamentosus, H. multiannularis, H. longirostris, H. microcoronatus, H. microstephanus, H. rosaceus*
Hippocampus hippocampus	*H. antiquorum* Leach, 1814 ; *H. brevirostris* Cuvier, 1829; *H. europaeus* Ginsburg, 1933; *H. heptagonus* Rafinesque, 1810; *H. vulgaris* Cloquet, 1821; *H. antiquus* Risso, 1827; *H. rondeletii* Yarrell (ex Willughby), 1841; *H. pentagonus* Ginsburg, 1937
Hippocampus ingens	*H. ecuadorensis* Fowler, 1922 ; *H. gracilis* Gill, 1862; *H. hildebrandi* Ginsburg, 1933; *H. ringens* Jordan & Evermann, 1905
Hippocampus kuda	*H. novaehebudorum* Fowler, 1944; *H. aterrimus* Jordan & Snyder, 1901; *H. hilonis* Jordan & Evermann, 1903; *H. melanospilos* Bleeker, 1854; *H. moluccensis* Bleeker, 1852; *H. polytaenia* Bleeker, 1854; *H. rhynchomacer* Duméril, 1870; *H. taeniopterus* Bleeker, 1852; *H. valentini* Bleeker, 1859; *H. barbouri* Jordan & Richardson, 1908; *H. fisheri* Jordan & Evermann, 1903; *H. natalensis* von Bonde, 1923
Hippocampus trimaculatus	*H. planifrons* Peters, 1877*; H. dahli* Ogilby, 1908; *H. lenis*; *H. biocellatus*, Kuiter, 2001
Hippocampus whitei	*H. procerus* Kuiter, 2001