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Identifying national conservation status, legislation and priorities for syngnathid fishes globally

Institute for the Oceans and Fisheries,
The University of British Columbia, Canada

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Project Seahorse

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Foreword

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concludes in their Global Assessment[1] that the world's marine biodiversity has been declining for decades because of overfishing, climate change, habitat destruction, pollution, and others human activities. Such losses have wide-ranging and cascading impacts on people's livelihood, health, and wellbeing. Actions to reverse such trend are urgently needed, yet the lack of understanding on the status of marine biodiversity is an important barrier to effective conservation actions. Such knowledge gap is also a syndrome of the broader global conservation and societal challenges.

The research and its findings conducted by the Project Seahorse* and documented in this Fisheries Centre Research Report provide in-depth assessments on the gaps in global extinction risk assessments with particular focus on Syngnathid fishes. Syngnathids include seahorses, pipefishes, pipehorses, and seadragons. They are unique and marvellous in many aspects such as their morphology, reproductive biology, the mythology around them, as well as their societal values. In contrast, the conservation challenges that syngnathid fishes face are common across many other marine species groups. The comprehensive global assessment for syngnathids presented here thus serves as a lens to highlight where effective policies, research and investments are needed to safeguard the conservation of marine biodiversity in general.

Regards,

Prof. William Cheung
Director and Professor, Institute for the Oceans and Fisheries
The University of British Columbia

* Project Seahorse is a partnership between UBC and the Zoological Society of London, UK. Its vision is a world in which marine ecosystems are healthy and well-managed. At UBC, Project Seahorse's work is led by its co-founder and director, Professor Amanda Vincent. Her team of students and staff are engaged in marine research and management around the world, using seahorses as a way to focus efforts in finding marine conservation solutions in a context of sustainable use. They are committed to interdisciplinary collaboration with stakeholders and partners at scales ranging from community initiatives to international accords.

[1] IPBES (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Díaz, J. Settele, E. S. Brondízio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages.

Abstract

Conservation assessments are central to determining the extinction risk of species. They help drive effective management plans and regulations to protect threatened species. The IUCN Red List has led the way in assessing over 120,000 species worldwide. Given that conservation of threatened species is the legal purview of national governments around the world, it is vital that we understand species assessments and protective measures at a national scale. However, national assessments are often lacking in many countries, particularly for marine fishes, and even more so for syngnathid fishes (seahorses, pipefishes, pipehorses, seadragons). About 40% of the 278 species of syngnathid fishes are included in the IUCN Red List, on a global scale as threatened or Data Deficient. We must, therefore, ensure that national governments are engaged with the conservation of these species. We drew on databases, expert knowledge, scientific and grey literature, and other documentation to investigate national engagement with conservation of syngnathid fishes, and to identify gaps in knowledge and action. We have thus far been able to uncover information on 64 of the 140 range states with syngnathids and determined that 28 countries had completed a total of 98 national conservation assessments for 52 distinct species (16 seahorses, 34 pipefishes and 2 pipehorses). Our study found that approximately 20% of range states had completed national assessments for syngnathids.

Focusing on priority species that are classified globally as threatened or Near Threatened, our gap analysis discovered that only 13% of range states had assessed syngnathids at a national level. No range states in Africa, the Middle East, and North America had such national assessments for priority syngnathid species. Specific regulations for the protection of syngnathids at the national level were identified for half of the 64 range states with information, but were patchy and unpredictable with many prominent gaps. Legislation, where it existed, either covered all seahorses or a few species found within their waters, and some even included all syngnathids. Measures varied from constraints on fishing and/or trade to protection of syngnathid habitats. It was notable that many assessments and protective measures had been often developed in a rather arbitrary manner, without good data or comprehensive analysis. Very few countries were found to have government-led monitoring of syngnathids. In order to determine if rules and regulations are helping the conservation status of syngnathids at the national level, laws need to be implemented and monitoring programs need to be initiated. For effective management, conservation assessments need to be grounded in data and analysis, and management-tailored accordingly.

Introduction

Rigorous conservation assessments are an essential precursor to taking strategic action for the world's most imperilled species. The work of compiling and synthesizing data on population sizes and trends, taxonomy, distribution, ecology and threats help identify species of concern. Such work also indicates the steps needed to reduce population declines and the risk of eventual extirpation and/or extinction. Conservation assessments (whether global, regional or national) are vital tools used by decision makers to develop management and/or action plans that can improve the status of priority species or geographical areas (Rodrigues et al. 2006). While they do not necessarily lead to direct measures to protect or safeguard species and habitats, assessments are centrally important in conservation.

Globally, the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (hereafter IUCN Red List) is the primary resource available on the conservation status and extinction risk of plants and animals (IUCN 2020a). The IUCN Red List "is a critical indicator of the health of the world's biodiversity. Far more than a list of species and their status, it is a powerful tool to inform and catalyse action for biodiversity conservation and policy change, critical to protecting the natural resources we need to survive" (IUCN 2020b; Betts *et al.* 2019). Taxa must be assessed first by species at the global level but can subsequently be assessed by populations and/or regionally. Currently, more than 120,000 species have been assessed for the IUCN Red List, with more than 32,000 species threatened with extinction, including 41% of amphibians, 34% of conifers, 33% of reef building corals, 26% of mammals, and 14% of birds (IUCN 2020b). The IUCN Red List uses a transparent and consistent set of indicators to assess species status as Least Concern (LC), Near Threatened (NT), threatened (Vulnerable – VU, Endangered – EN, Critically Endangered – CR), Extinct in the Wild (EW), Extinct (EX), Data Deficient (DD), or Not Evaluated (NE) (IUCN 2012). Data Deficient means we lack sufficient information with which to assess the species.

While IUCN Red List assessments are extremely valuable at the global scale and help guide objectives and targets to ensure species are healthy and well managed, the majority of conservation action occurs at national or sub-national levels. This is why conservation assessments at these smaller scales are so important. According to NationalRedList.org, a focal point for national red lists and species action plans, over 100 countries and regions have so far developed National and Regional Red Lists, such that National Red Lists are becoming a valuable tool for planning and promoting conservation (National Red List, 2021a). That said, the prevalence of national assessments is spotty at best – not all countries have them, and those that do exist vary in their approach, rigour and transparency. Countries use a variety of categories and criteria to access threat. As of 2009, 56% were found to follow the categories and criteria employed by the IUCN Red List whereas others do not (National Red List 2021b) Critically, whereas IUCN Red List assessments do not confer automatic protection, national assessments are more often precursors to action and can add great value to species management and conservation at the national level (Rodríguez *et al.* 2000; Miller *et al.* 2007; Rodríguez 2008).

Syngnathid fishes (seahorses, pipefishes, pipehorses, and seadragons) have all been assessed at the global level, but we have few assessments at the all-important national level, where obligations and capacity for conservation action are centred. The IUCN SSC Seahorse, Pipefish and Seadragon Specialist Group (SPS SG) works to advance conservation of syngnathid fishes (family Syngnathidae), and urges national assessments and national conservation initiatives to protect syngnathids in all their range states. The SPS SG completed global IUCN Red List assessments and re-assessments for all 300 syngnathiform fishes, including 278 syngnathid species under our remit in 2017 (Pollom *et al.* 2021). Since 2017, seven

syngnathid species have been described and have not been assessed on the global IUCN Red List. Overall, we found that at least 6% of syngnathiform fishes are threatened, but a further 39% may be in need of conservation management measures including all species that are threatened (VU, EN, CR), Near Threatened and Data Deficient species (Pollom *et al.* 2021). Overexploitation by non-selective fisheries as well as habitat loss and degradation are the primary threats to syngnathids. In response, priorities for conservation action call for restricting non-selective fisheries and rehabilitating and protecting critical habitats (Pollom e*t al.* 2021). These actions are the responsibility of national or local governments. The areas with the most globally threatened species include South African estuaries and East and Southeast Asia (Pollom *et al.* 2021).

While global assessments are valuable, we urgently need to know the national status of syngnathid species if we are to advance conservation at the level where most responsibility and action occur. Obtaining information on national level assessments will aid in the development of species and country specific conservation action and/or management plans, priority action statements and policy initiatives for the most threatened syngnathid species. In addition, information may provide insight and knowledge to complete global re-assessments of priority threatened and Data Deficient species. Beyond understanding national threat status of syngnathids, we also need to understand national level legislation/regulations to protect syngnathids. Determining the national conservation status and the national laws in place for syngnathids and seahorses, in particular, is highly relevant in the context of their listing on Appendix II of the Convention on International Trade in Endangered Species (CITES). The listing requires CITES Parties (national governments) to ensure their seahorse exports are sustainable, legal and traceable, which in turn requires appropriate and rigorous management measures at the national level.

In this project, our goal for syngnathids is to understand national conservation assessments and national priorities for conservation. Keeping that in mind, we aimed to address two objectives: (1) determine the national conservation status of all syngnathids; and (2) identify national legal and governance measures specifically targeting conservation of syngnathids (Vincent *et al.* 2011). This foundation of knowledge provides the groundwork for three more ventures: probe and understand the functional consequences of such national conservation assessments and national protection; place our new national understanding in the context of global Red List status and global policy instruments (e.g. CITES) and apply new knowledge to support implementation of the IUCN World Conservation Congress Resolution WCC-2020-Res-095-EN – Conservation of seahorses, pipefishes and seadragons (family Syngnathidae).

Methods

Data collection

We obtained the information for this study on both national assessments and syngnathid specific legislation from three sources: (a) National Red List website maintained by the IUCN Red List Committee and the National Red List Working Group in collaboration with the IUCN Red List of Threatened Species and Zoological Society of London; (b) IUCN SSC Seahorse, Pipefish and Seadragon Specialist Group (SPS SG) members and other seahorse experts across the globe; and (c) literature, government documents/reports and/or web based searches. Nomenclature for *Hippocampus* species is drawn from Lourie at al. (2016), or nomenclature used within IUCN Red List. For all other syngnathid species we followed the nomenclature used within the IUCN Red List of Threatened Species (https://www.iucnredlist.org/)

First, we obtained information from the National Red List website (www.nationalredlist.org) by searching the database for records within the Family Syngnathidae or Genus *Hippocampus* and/or specific range states for which we were seeking information on the existence of national assessments. Range states for all priority syngnathid species were obtained from extant (resident) geographic ranges listed on the IUCN Red List assessments. For the purposes of this report we did not include range states where a species presence was deemed to be uncertain.

Second, we provided SPS SG members and other seahorse experts with an excel spreadsheet that asked for country-specific information (and applicable links, reference documents and resources) on:

a) whether conservation assessments for syngnathid species had been completed at the national level;
b) nature of the categories and criteria used to complete the assessment (e.g. IUCN or other?);
c) status assigned to each species assessed;
d) basis for the assigned status (e.g. small population, habitat destruction, overexploitation);
e) existence of and details for any syngnathid specific laws or regulations;
f) existence of and details for any monitoring of wild syngnathid populations; and
g) existence of and details for any subnational (local, state or provincial) assessments of syngnathid species.

Third, our literature searches consisted of reviewing country reports, grey literature or species-specific, peer-reviewed articles for any information on national conservation status, regulations or legislation. We also searched the global IUCN Red List assessments for information on national conservation assessments and legislation/regulations in the section on conservation actions.

To fill specific gaps in our understanding, we additionally searched the web using specific phrases such as "is there a national red list of threatened species in country x" or "are seahorses/syngnathids protected in country?" and by looking at government ministry websites responsible for conservation and species management (e.g. Endangered Species Act in the USA). We further consulted NatureServe (www.natureserve.org), an independent, non-profit organization that assesses the conservation status of species and ecosystems in North America in support of decision-making and conservation action (NatureServe 2020). That group uses its own categories and criteria to assign a status rank based on a weight of evidence approach (Master *et al.* 2012) compared to a rule-based approach used by the IUCN Red List (IUCN 2001).

Gap analysis

We focused our gap analysis on syngnathid species globally assessed as being of conservation concern. Species of conservation concern were those assessed on the IUCN Red List (www.redlist.org) as threatened (Critically Endangered - CR, Endangered - EN, Vulnerable - VU) or Near Threatened (NT).

For each geographic region, we created a matrix consisting of the threatened or NT syngnathid species and their known range states. Then, for each species-range state combination we determined (i) whether the range state had a process for conducting national species assessments and (ii) whether the particular syngnathid species was included among those assessments. This allowed us to identify states that lacked national assessments altogether, and those that had assessments for other marine, terrestrial, or plant species but had not yet assessed the globally threatened syngnathid species under review.

Geographical designations

Countries, territories and jurisdictions are collectively referred to as range states throughout this report. The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the authors concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries.

Results

Data Summary

More than 278 syngnathid species are found across at least 140 different range states around the world. For this review we were able to find information on national assessments for 64 range states (Table 1). Of these, we confirmed that 53 had national threatened species lists (Table 1). About half of these (about 20% of all syngnathid range states) had assessed syngnathids (n=28), with a total of 98 assessments across 52 species, including 16 seahorses (*Hippocampus* spp.) (Table 2), 34 pipefishes and 2 pipehorses (Table 3). No national level assessments were uncovered for seadragons or ghost pipefishes. We found that 11 range states clearly had no national conservation assessment lists at all, and we are still exploring the existence of such lists in the other approximately 76 syngnathid range states.

Table 1. Countries for which we obtained information on the existence of national conservation assessments, whether the assessments included syngnathids, and if so, how many syngnathid species were assessed.

Countries for which information was obtained	Does the country have a process for national conservation assessments?	Have national assessments been completed for syngnathids?	Number of syngnathid assessments	Source of information
Argentina	Yes	No		SPS SG member
Australia	Yes	Yes	1	SPS SG member/Web search
Bangladesh	No	No		Web search
Bahamas	No	No		Web search
Belgium	Yes	No		National Red List
Belize	Yes	Yes	2	Web search
Bermuda	Yes	Yes	2	Web search
Brazil	Yes	Yes	6	SPS SG member
Bulgaria	Yes	Yes	1	National Red List
Cambodia	Yes	Yes	6	SPS SG member
Canada	Yes	Yes	2	Web search
China	Yes	Yes	6	SPS SG member
Columbia	Yes	Yes	3	National Red List
Costa Rica	No	No		Web search
Croatia	Yes	Yes	9	National Red List
Cuba	Yes	No		National Red List
Cyprus	Yes	No		National Red List
Dominican Republic	Yes	Yes	1	National Red List

Ecuador	No	No		Web search
Egypt	Yes	Yes	3	Web search
Eritrea	Yes	No		National Red List
Estonia	Yes	Yes	2	National Red List
France/(Réunion)	Yes	Yes (Réunion)	1	National Red List
Germany	Yes	Yes	3	National Red List
Greece	Yes	No		SPS SG member
Guatemala	Yes	No		National Red List
Honduras	Yes	Yes	2	National Red List
Hong Kong	Yes	No		Web search
India	Yes	No		Web search
Indonesia	No	No		Web search
Iran	No	No		National Red List
Israel	Yes	No		National Red List
Italy	Yes	Yes	10	National Red List
Jamaica	No	No		Web search
Japan	Yes	Yes	9	SPS SG member
Kenya	Yes	No (in progress)		SPS SG member
Malaysia	Yes	No		SPS SG member
Malta	Yes	No		National Red List
Mauritius	Yes	No		National Red List
Mexico	No	No		SPS SG member
Monaco	No	No		Web search
Mozambique	Yes	No		SPS SG member
New Zealand	Yes	Yes	9	National Red List
Nicaragua	Yes	No		National Red List
Pakistan	Yes	No		National Red List
Panama	No	No		Web search
Peru	Yes	No		National Red List
Philippines	Yes	No (in progress)		SPS SG member
Portugal	Yes	Yes	2	SPS SG member
Seychelles	Yes	No		National Red List
Singapore	Yes	Yes	1	National Red List
Slovenia	Yes	No		Web search
South Africa	Yes	No		SPS SG member
South Korea	Yes	Yes	3	SPS SG member
Spain	Yes	Yes	1	SPS SG member
Sri Lanka	Yes	Yes	1	National Red List
Taiwan	Yes	No		National Red List
Thailand	Yes	Yes	2	SPS SG member
Tanzania	No	No		Web search
United Kingdom	Yes	No		Web search

United States	Yes	Yes	2	Web search
Uruguay	Yes	No		National Red List
Venezuela	Yes	Yes	2	National Red List
Viet Nam	Yes	Yes	6	SPS SG member
Total	53	28	98	

Table 2. A summary of global and national assessments and national legislation for *Hippocampus* species. Assessments were based on three approaches: *IUCN criteria; **modified IUCN criteria; ^ non-IUCN criteria. IUCN Categories are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient. Species in bold are those assessed as globally threatened on the IUCN Red List.

***Hippocampus* species**	**Global IUCN Red List status**	**Country and national status for species**	**# of countries with national legislation**	**Countries with relevant national legislation**
H. abdominalis	LC	New Zealand (Not Threatened)^	2	Australia, New Zealand
H. algiricus	VU			
H. angustus	LC		1	Australia
H. barbouri	VU		1	Philippines
H. bargibanti	DD		3	Australia, China, Philippines
H. breviceps	DD		1	Australia
H. camelopardalis	DD		1	South Africa
H. capensis	EN		1	South Africa
H. casscsio	DD		1	China
H. colemani	DD		1	Australia
H. comes	VU	Cambodia (VU)**	5	Cambodia, India, Philippines, Singapore, Viet Nam
H. coronatus	DD		0	
H. dahli	LC		1	Australia
H. debelius	DD		0	
H. denise	DD		1	Philippines
H. erectus	VU	Belize [DD]**, Bermuda [VU]*, Brazil [VU]*, Columbia [VU]*, Dominican Republic [VU]*, Honduras [Importance for eco-tourism]^, Venezuela [VU]*	6	Bermuda, Brazil, Columbia, Guatemala, Mexico, Panama
H. fisheri	LC			
H. guttulatus	DD	Croatia [EN]* Italy [NT]* Portugal	6	Croatia, Malta, Portugal, Slovenia, Spain, UK

		[Undetermined]* Spain [DD]**		
H. haema	NE		0	
H. hippocampus	DD	Croatia [DD] *, Egypt [DD]*, Italy [NT]*, Portugal [Undetermined]*	6	Croatia, Malta, Portugal, Slovenia, Spain, UK
H. histrix	VU	China [Threatened]* South Korea [VU]*, Viet Nam [VU]*	7	Australia, China, India, Philippines, South Africa, South Korea, Viet Nam
H. ingens	VU	Columbia [VU]*	7	Bermuda, Columbia, Guatemala, Jamaica, Mexico, Panama, Peru
H. japapigu	NE		0	
H. jayakari	LC		0	
H. jugumus	DD		1	Australia
H. kelloggi	VU	Cambodia [VU]**, China [Threatened]*, Thailand [VU]*	5	Australia, Cambodia, China, India, Philippines
H. kuda	VU	Cambodia [VU]**, China [Threatened]*, Singapore [VU]*, South Korea [VU]*, Viet Nam [EN]*	7	Australia, Cambodia, China, India, Philippines, Singapore, South Korea,
H. minotaur	DD		1	Australia
H. mohnikei	VU	Cambodia [DD]**, China [Threatened]*, Viet Nam [EN]*	6	Cambodia, China, India, Philippines, Singapore, Viet Nam
H. nalu	NE		1	South Africa
H. paradoxus	DD		1	Australia
H. patagonicus	VU	Brazil (VU)*	1	Brazil
H. planifrons	LC		1	Australia
H. pontohi	LC		1	Philippines
H. pusillus	DD		0	
H. reidi	NT	Belize [DD]**, Bermuda [VU]*, Brazil [VU]*, Columbia [VU]*, Honduras [Importance for Eco-Tourism]^, Venezuela [VU]*	6	Bermuda, Brazil, Columbia, Jamaica, Mexico, Panama
H. satomiae	DD		0	
H. sindonis	LC		0	

H. spinosissimus	VU	Cambodia [VU]**, China [Threatened]*, Sri Lanka [VU]*, Thailand [VU]*	7	Australia, Cambodia, China, India, Philippines, Singapore, Viet Nam
H. subelongatus	DD		1	Australia
H. trimaculatus	VU	Cambodia [VU]**, China [Threatened]*, South Korea [VU]*, Viet Nam [EN]*	8	Australia, Cambodia, China, India, Philippines, Singapore, South Korea, Viet Nam
H. tyro	DD		0	
H. waleananus	NE		0	
H. whitei	EN	Australia [EN]*	1	Australia
H. zebra	DD		1	Australia
H. zosterae	LC	USA [Not threatened]^		

Range states including Italy (n=10), Croatia (n=9), Japan (n=9), and New Zealand (n=9) had the highest number of syngnathid assessments, followed closely by Brazil, Cambodia, China, and Viet Nam with six assessments each (Table 1). Together these eight range states accounted for nearly two-thirds of all national conservation assessments for syngnathids (n=61/98). All other range states with national assessments had assessed between 1 and 5 syngnathid species each (Table 1). Kenya and the Philippines are in the process of conducting national assessments of *Hippocampus* species, but these have not yet been finalized, reviewed and/or published.

Almost half of our information on national assessments by range state was gathered from the National Red List website (n=28 range states and 45 species/range state combinations; Table 1). The National Red List website was last updated in August 2018; therefore, it is unclear if more countries may have completed national assessments since that time. A third of our information on national assessments by range state (n=18) was obtained from SPS SG members and local experts who research and study syngnathids in their country (n=18 range states & 42 species/state combinations). Routine internet and/or literature searches provided information for the remaining range states for which we were able to obtain information (n=18 range states & 11 species/state combinations).

An overview of national assessments

For range states that had completed national assessments for syngnathids (n=28), over 70% used the categories and criteria developed by the IUCN Red List of Threatened Species (IUCN 2012; n = 20 range states; Tables 2 and 3). A further eight range states used a set of criteria different than those applied by the IUCN and were either classified as using non-IUCN (n=3) or modified IUCN Criteria (n=5); specifics regarding their criteria were not obtained in most cases. It was not always clear whether the assigned status represented conservation concern or were more reflective of natural population occurrences of the species - e.g. for species designated as Rare and Sparse by New Zealand and Germany. For the purposes of this report, we did not include the status of Rare or Sparse as designating species of conservation concern.

Table 3. A summary of global and national assessments and national legislation for pipefish and pipehorse species where we found at least one species/state combination. Assessments were based on one of: *IUCN criteria; **modified IUCN criteria; ^ non-IUCN criteria. IUCN Categories are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

Syngnathid species	Global IUCN Red List Status	Country and national status for species
Anarchopterus criniger	LC	Brazil (DD)*
Bulbonaricus brauni	LC	Japan (NT)*
Cosmocampus spp. (C. howensis)	LC	New Zealand (DD)^
Entelurus aequoreus	LC	Germany (Rare)^
Hippichthys cyanospilos	LC	Japan (DD)*
Hippichthys heptagonus	LC	Japan (EN)*
Leptonotus elevatus	LC	New Zealand (Not Threatened)^
Leptonotus norae	LC	New Zealand (Not Threatened)^
Lissocampus filum	LC	New Zealand (Not Threatened)^
Maroubra yasudai	DD	Japan (DD)*
Microgmathus erugatus	DD	Brazil (CR)*
Microphis argulus	LC	Japan (CR)*
Microphis brachyurus	LC	France (Réunion) (EN)*
Microphis jagorii	DD	Japan (CR)*
Microphis retzii	LC	Japan (CR)*
Nerophis maculatus	DD	Croatia (DD)*, Italy (DD)*
Nerophis ophidion	LC	Bulgaria (EN)*, Croatia (DD)*, Estonia (DD)*, Italy (DD)*
Pseudophallus mindii	DD	Brazil (DD)*
Solegnathus hardwickii	DD	Viet Nam (Threatened)*
Solegnathus spinosissimus	DD	New Zealand (Not Threatened)^
Stigmatopora argus	LC	New Zealand (Sparse)^
Stigmatopora macropterygia	LC	New Zealand (DD)^
Stigmatopora nigra	LC	New Zealand (DD)^
Syngnathus abaster	LC	Croatia (DD)*, Egypt (DD)*, Italy (DD)*
Syngnathus acus	LC	Croatia (DD)*, Germany (EN)^, Italy (DD)*
Syngnathus fuscus	LC	Canada (Secure)^
Syngnathus leptorhynchus	LC	Canada (Secure)^
Syngnathus phlegon	DD	Croatia (DD)*, Italy (DD)*

Syngnathus scovellli	LC	USA (Secure)^
Syngnathus taenionotus	DD	Croatia (DD)*
Syngnathus tenuirostris	DD	Croatia (DD)*, Italy (DD)*
Syngnathus typhle	LC	Croatia (DD)*, Estonia (DD)*, Germany (EN)^, Italy (DD)*
Trachyrhamphus serratus	DD	Viet Nam (VU)*
Urocampus carinirostris	LC	Japan (NT)*
Urocampus nanus	DD	Japan (Locally Threatened Population)*

For Canada and the USA, we drew primarily on national assessments by NatureServe that run parallel to the formal statutory national conservation assessments. Canada has not assessed any syngnathids through its official Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2020), but NatureServe has assessed two pipefish species in Canada as Secure: *Syngnathus fuscus* and *Syngnathus leptorhynchus*. The USA has assessed *Hippocampus zosterae* as Not Threatened through its Endangered Species Act (National Marine Fisheries Service 2020) processes while NatureServe has assessed *Syngnathus scovellli* as Secure in the United States (Table 3). According to NatureServe, a status of Secure indicates that the species is "at a very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats" (Master *et al.* 2012). NatureServe has deemed another six species including *Hippocampus erectus*, *Hippocampus zosterae*, *Syngnathus floridae*, *Syngnathus fuscus, Syngnathus louisiane* and *Syngnathus pelagicus* to have "No Status Rank" meaning the species have not been assessed or are under review.

National threat status of syngnathids

The 98 national assessments for syngnathids included 49 assessments for 16 *Hippocampus* species across 22 range states, and 49 assessments for 34 pipefish and 2 pipehorse species across 14 range states (Table 2, Table 3). About one-third of the assessed syngnathid species – ten seahorse species and seven pipefish species – were found on national red lists of more than one country.

Hippocampus

Of the 49 national level assessments found for seahorses, three-quarters (75%) resulted in evaluations of conservation concern, classified as either Endangered (n=5), Vulnerable (n=24), Threatened (n=6) or Near Threatened (n=2) (Table 2). A further 8% were assessed as Not Threatened (n=2) or considered of Importance for Eco-tourism (n=2). The remaining 16% of national assessments for seahorses classified species as DD (n=6) or Undetermined (n=2) because not enough information was available to assess their status.

Overall, 81% of seahorse species with national assessments were considered of conservation concern in at least one country. Most national assessments for seahorses (n =33/49) were completed on species classified as EN or VU on the global IUCN Red List with five notable exceptions: (1) *H. abdominalis* (globally LC) in New Zealand (Not Threatened); (2) *H. guttulatus* (globally DD) in Croatia (EN), Italy (NT), Portugal (Undetermined), Spain (DD); (3) *H. hippocampus* (globally DD) in Croatia (DD), Egypt (DD), Italy (NT) and Portugal (undetermined); (4) *H. reidi* (globally NT) in Belize (DD), Bermuda (VU), Brazil (VU), Columbia (VU), Honduras (Importance for Eco-Tourism) and Venezuela (VU); and (5) *H. zosterae* (Globally LC) in USA (Not Threatened).

In total, the national conservation status of *Hippocampus* species mirrored the global assessments in 32 species/state combinations (65%). Almost all globally VU species were also classified as VU or threatened at a national level, including the following ten species: (1) *H. comes* in Cambodia; (2) *H. erectus* in Bermuda, Brazil, Columbia, Dominican Republic and Venezuela; (3) *H. histrix* in China, South Korea and Viet Nam; (4) *H. ingens* in Columbia; (5) *H. kelloggi* in Cambodia, China and Thailand; (6) *H. kuda* in Cambodia, China, Singapore and South Korea; (7) *H. mohnikei* in China; (8) *H. patagonicus* in Brazil; (9) *H. spinosissimus* in Cambodia, China, Sri Lanka and Thailand; and (10) *H. trimaculatus* in Cambodia, China and South Korea (Table 2). Similarly, *H. abdominalis* and *H. zosterae* is LC globally and Not Threatened in New Zealand and the United States, respectively.

The seahorse species assessed as most threatened on a national list was *H. guttulatus,* listed as EN in Croatia, *H. whitei* listed as EN in Australia as well as H. *kuda, H. mohnikei, H. trimaculatus* all listed as EN in Viet Nam. China's list included the greatest number of seahorses, with all six species in their waters assessed as Threatened (Table 2). All of Cambodia's five *Hippocampus* species were also assessed as VU. Viet Nam had four species of conservation concern and South Korea had three (57% and 60% of all species found in their waters, respectively). All of Brazil and Columbia's three threatened species were assessed as VU.

Assessment by country

Six species were assessed by only one country: *H. abdominalis* (Not Threatened in New Zealand); *H. comes* (VU in Cambodia)*; H. ingens* (VU in Columbia); *H. patagonicus* (VU in Brazil); *H. whitei* (EN in Australia); and *H. zosterae* (Not Threatened in the United States). The results of these national assessments echoed the global IUCN Red List status for the species (Table 2).

Ten seahorse species were assessed by more than one country: *H. erectus*, *H. guttulatus*, *H. hippocampus*, *H. histrix*, *H. kelloggi*, *H. kuda*, *H. mohnikei*, *H. reidi*, *H. spinosissimus,* and *H. trimaculatus* (Table 2). The conservation status of *H. erectus*, *H. guttulatus*, *H. hippocampus, H. mohnikei*, and *H. reidi* saw the greatest variation across the range states where they were assessed.

Hippocampus erectus had the greatest number of assessments (n=7) with one of Belize, Bermuda, Brazil, Columbia, Dominican Republic, Honduras, and Venezuela (Table 2). All range states assessed *H. erectus* as VU, which aligns with its global assessment of VU, except for Belize where it was considered DD and Honduras where it was classified as a species of Importance for Eco-tourism.

The assessments for some species varied greatly across countries with some having national assessments that indicated a greater level of extinction risk than that indicated by the Global IUCN assessments. Of particular note for its varying status is *H. guttulatus,* which is globally assessed as DD but is considered EN in Croatia, NT in Italy, DD in Spain and Undetermined in Portugal. Similarly, *H. hippocampus* – also globally assessed as DD – was assessed nationally as NT in Italy, DD in Croatia and Egypt, and Undetermined in Portugal. Finally, *H. mohnikei* – globally assessed as VU – was EN in Viet Nam, Threatened in China and DD in Cambodia. Similarly, Viet Nam assessed *H. kuda* and H. *trimaculatus* nationally as EN whereas the other range states deemed the species to be VU or threatened.

Hippocampus reidi has been assessed in Belize, Bermuda, Brazil, Columbia, Honduras, and Venezuela. Although the global status for *H. reidi* is NT, four range states have deemed its conservation status to be

VU – including Bermuda, Brazil, Columbia, and Venezuela. *Hippocampus reidi* is classified as DD in Belize and is classified as a species of Importance for Eco-tourism in Honduras.

Pipefish, Pipehorses, and Seadragons

A total of 49 national assessments were completed for 34 pipefishes and two pipehorses across 14 range states (Table 3). No national conservation assessments were found for the three species of seadragons. This constitutes about one-sixth of the total number of pipefish, pipehorse and seadragon species (n=236). Of the 49, just over one-quarter (28%) of national assessments indicated conservation concern: CR (n=4), EN (n=5), VU (n=1), Threatened (n=1), Locally Threatened (n=1) or NT (n=2). A further 14% were assessed as not of conservation concern: Not Threatened (n=4), Secure (n=3). Two species had assessments of Rare (n=1) and Sparse (n=1), but it is not clear whether these imply conservation concern, and one species was Not Evaluated. The final 53% of the 49 were assessed as DD (n=26), which means not enough information was available to determine their status.

Overall, 11 out of 34 pipefish species were considered of national conservation concern (CR, EN, VU, NT, Threatened, or Locally Threatened) in at least one range state (Table 3). This is in contrast to their global assessments where all 34 pipefishes and the two pipehorses with national assessments had a global IUCN Red List status of either LC (n=24) or DD (n=12) (Table 3). At the national level, 16 pipefishes were classified as DD and seven as either Not Threatened or Secure in at least one range state.

The range state with the most threatened pipefishes was Japan with seven species considered of national conservation concern out of 9 species assessed (77%): three listed as CR, one EN, two NT, and one Locally Threatened (Table 3). Of the 38 species of pipefishes found in Japan only 24% of species have been assessed. The other nationally CR and EN species were found in Brazil (*Microgmathus erugatus*, CR 1/9 pipefish species, 11%), Bulgaria (*Nerophis ophidion*, EN 1/6 pipefish species, 17%), and France (Réunion) (*Microphis brachyurus*, EN, 1/14 species, 7%).

Assessment by country

About 80% of pipefish and pipehorse species with assessments (n=29 of 36) had been evaluated in only one range state; only seven pipefishes had more than one national assessment. For the species with only one assessment, we found over a third (n=11) were of conservation concern with a national status of CR (n=4), EN (n=2), VU (n= 1), Threatened (n=1), NT (n=2), or Locally Threatened (n=1). The remaining species were either DD (n=9), Not Threatened (n=4), Secure (n=3), Sparse (n=1), or Rare (n=1).

Only species found at least partly in Europe had more than one national assessment: *Nerophis maculatus, Nerophis ophidion, Syngnathus abaster, Syngnathus acus, Syngnathus phlegon, Syngnathus tenuirostris,* and *Syngnathus typhle* (Table 3).

Nerophis ophidion and *S. typhle,* both globally LC according to the IUCN Red List, each had four national assessments. *Nerophis ophidion* was assessed as DD in Croatia, Estonia and Italy but EN in Bulgaria, and *S. typhle* was assessed as DD in Croatia, Estonia, and Italy but EN in Germany (Table 3). *Syngnathus acus* also globally considered LC, had three national assessments and was assessed as DD in Croatia and Italy but EN in Germany (Table 3).

The remaining pipefish species assessed in more than one range state included: *Syngnathus abaster* – globally considered LC, but assessed as DD in Croatia, Egypt and Italy; *Nerophis maculatus, Syngnathus phlegon* and *Syngnathus tenuirostris,* globally DD and also assessed as DD in both Croatia and Italy.

Gap analysis for species of conservation concern

Our gap analysis included 15 seahorse and five pipefish species globally assessed as threatened (CR, EN, VU) or NT on the IUCN Red List for a total of 20 species encompassing 126 range states (Table 4). Only 13% of range states to syngnathids of global conservation concern (n=16) had assessed syngnathids at a national level. The 15 seahorse species considered globally threatened or near threatened had been assessed by no range states (n=3), one range state (n=4), three range states (n=4), four range states (n=1), six range states (n=1), or seven range states (n=2). All five globally threatened pipefish species are endemic to only one or two range states and none had national level assessments in their range states.

Table 4. Summary of results by region from the gap analysis of national conservation assessments for priority syngnathid species (species globally assessed on the IUCN Red List as threatened or Near Threatened).

Regions	# of range states in region	# of priority syngnathids	#of priority seahorses	# of countries with a process for national conservation assessments	# of countries that have assessed ≥ one priority species (% of countries in region)	# of priority species with national assessments (% priority species in region)	# of countries for which information on national assessments is lacking
Africa	36	6	5	9	0	0	27
Asia	19	11	9	16	8 (42%)	7 (64%)	3
Middle East	12	3	3	2	0	0	10
North America	3	6	5	3	0	0	0
Caribbean	26	2	2	7	2 (8%)	2 (100%)	17
Central America	7	3	3	4	2 (29%)	2 (67%)	3
South America	10	4	4	6	3 (30%)	4 (100%)	4
Oceania	13	6	6	1	1 (8%)	1 (17%)	12
Total	126	20*	15*	32	16 (13%)	16**	76

* Total number of priority species identified
** Total number of assessments for priority species

Of the 46 *Hippocampus* species, 15 were classified as globally threatened (EN or VU) or NT by the IUCN Red List and were identified as priority species for our gap analysis. Our analysis found that all but three threatened seahorses on the IUCN Red List were assessed by at least one range state. For example, *H. capensis (*globally EN), *H. algiricus* and *H. barbouri* (both globally VU) were not assessed by any of their range states (Table 2).

A quarter of range states with priority seahorse species in their waters were found to have national threatened species lists (n=32, Table 4). Of these, half had assessed at least one priority seahorse species (n=16, Table 4), most for just one species (n=4/16).

Across regions, Asia had the greatest proportion of range states with national assessments for priority syngnathid species (all seahorses), with over a third (42%) having assessed at least one species of conservation concern (Table 4). No assessments for priority syngnathids were completed in the regions of Africa, the Middle East or North America. Also, by region, at least one nation in the Caribbean and South America had a national assessment for all priority syngnathid species (all for seahorses) found in their waters including Bermuda, Brazil, and Columbia (Table 4). This was followed by Asia and Central America, with at least one assessment for two-thirds of their priority syngnathids (again all for seahorses).

Africa

The African continent has six priority syngnathid species and is home to two of the most threatened species: *H. capensis* (globally EN) and *Syngnathus watermeyeri* (globally CR). In total, 36 range states in Africa are known to be home to globally threated syngnathids, but none had assessed syngnathids at the national level.

The west coast of Africa is home to one priority syngnathid, the globally VU *H. algiricus*. Just one of the 22 west African range states had a national list of threatened species, but *H. algiricus* had not been assessed (Table 5). We were unable to find information for 21 range states in this region.

Table 5. Gap analysis of national conservation assessments for priority syngnathid species in Africa. Green = range state has a process for national conservation assessments, green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**					**Other syngnathids**
Range States	*H. algiricus*	*H. capensis*	*H. histrix*	*H. kelloggi*	*H. kuda*	*Syngnathus watermeyeri*
West coast of Africa						
Western Sahara		X	X	X	X	X
Canary Islands (Spain)		X	X	X	X	X
Mauritania		X	X	X	X	X
Cape Verde		X	X	X	X	X
Senegal		X	X	X	X	X
Gambia		X	X	X	X	X
Guinea- Bissau		X	X	X	X	X
Guinea		X	X	X	X	X
Sierra Leone		X	X	X	X	X
Liberia		X	X	X	X	X
Côte d'Ivoire		X	X	X	X	X
Ghana		X	X	X	X	X
Togo		X	X	X	X	X
Benin		X	X	X	X	X
Nigeria		X	X	X	X	X
Cameroon		X	X	X	X	X
Equatorial Guinea		X	X	X	X	X

Gabon		X	X	X	X	X
Sao Tome and Principe		X	X	X	X	X
Congo		X	X	X	X	X
Democratic Republic of Congo		X	X	X	X	X
Angola		X	X	X	X	X
East coast of Africa						
Egypt	X	X	X			X
Sudan	X	X	X	X		X
Eritrea	X	X	X	X		X
Djibouti	X	X	X	X		X
Somalia	X	X	X	X		X
Kenya	X	X				X
Seychelles	X	X		X		X
Tanzania	X	X				X
Mozambique	X	X		X		X
Comoros	X	X	X	X		X
Madagascar	X	X				X
Mauritius	X	X		X		X
France (Réunion)	X	X		X		X
South Africa	X			X		

Five of the priority syngnathid species occur along the east coast of Africa across 15 range states. Of these, eight had national lists of threatened species, but none had assessed syngnathids (Table 5). We were unable to find information for four range states in this region.

Specifically, South Africa is home to two of the most globally threated syngnathids – the CR pipefish *Syngnathus watermeyeri* and the EN seahorse *H. capensis*, both endemic to the country – but neither have been assessed at the national level. Both species are endemic to South Africa; therefore, global assessments could functionally serve as national assessments.

Asia

The Asian continent contains the greatest number of identified priority syngnathids with a total of 11 species across 19 range states, including eight seahorses and three pipefishes (Table 6). All eight seahorses and one pipefish (*Microphis insularis*) are considered globally VU, *Microphis pleurostictus* is globally EN and *Microphis deocata* is globally NT.

Overall, 84% of all syngnathid range states in Asia have a process for national conservation assessments but fewer than half had assessed syngnathids (n=8 of 19; Table 6). Indonesia was the only range state in Asia identified in our gap analysis to lack a process for national assessments that we are aware of. Brunei, Myanmar, and Russia were the only countries for which we could not obtain any information.

Range states with syngnathid assessments had appraised anywhere from 20 to 100% of species found in their waters. Cambodia and China have assessed all species found in their waters (Table 6). Other range

states with good coverage included South Korea (n=3 out of 5 species assessed), Viet Nam (n=4 out 7 species), Thailand (n=3 out of 6 species), and Japan (n= 2 out of 5 species) each with over 40% of all *Hippocampus* species assessed. Many range states, however, have assessed only a small number of *Hippocampus* species in their country. None of the three priority pipefish species were assessed in any of their range states in Asia.

Table 6. Gap analysis of priority syngnathid species in Asia. Green = range State has a process for national conservation assessments; green with text = range State has completed a national assessment for the priority syngnathid species; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; yellow = range State has no national threatened species list; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**								**Other Syngnathids**		
Range States	*H. barbouri*	*H. comes*	*H. histrix*	*H. kelloggi*	*H. kuda*	*H. mohnikei*	*H. spinosissimus*	*H. trimacultaus*	*Microphis pleurostictus*	*Microphis insularis*	*Microphis deocata*
South Asia											
Pakistan	X	X	X			X	X	X	X	X	X
India	X	X							X		
Bangladesh	X	X							X	X	
Myanmar	X	X	X	X		X			X	X	X
Sri Lanka	X	X	X	X		X	VU		X	X	X
Southeast Asia											
Viet Nam	X		VU		EN	EN		EN	X	X	X
Thailand	X		X	VU	VU		VU		X	X	X
Philippines										X	X
Cambodia	X	VU	X	VU	VU	DD	VU	VU	X	X	X
Malaysia									X	X	X
Brunei	X	X	X	X	X	X	X		X	X	X
Indonesia									X	X	X
Singapore	X		X	X	VU				X	X	X
East Asia	X	X	X	X	X	X	X	X	X	X	X
Russia	X	X	X	X	X	X	X		X	X	X
China	X	X	VU	VU	VU	VU	VU	VU	X	X	X
Japan	X	X			DD	VU	X		X	X	X
South Korea	X	X	VU		VU		X	VU	X	X	X
Taiwan	X	X	X						X	X	X
Hong Kong	X	X	X				X		X	X	X

Asia, with the highest known number of globally threatened (CR, EN, or VU) or Near Threatened syngnathid species, was found to have the most national assessments of any region. In total, eight of the 11 priority syngnathids had been assessed by a least one range state, though most species had been assessed by just a fraction of the range states in which they occur (Table 6). For example, *H. comes* occurs in the waters of seven range states but has only been assessed by Cambodia. The Philippines have drafted a national assessment for *H. comes,* but it is still under review (pers. comm. Chai Apale). Similarly, *H. histrix* and *H. kelloggi* – found in 9 and 14 range states respectively – have been assessed by three range states each. *Hippocampus kuda* had the greatest number of assessments, seven, but is found across 16 range states in Asia.

Four species had no national assessments at all. All three pipefish species found in the Asia region that had been assessed as threatened globally are endemic to one or two range states. However, none had national level assessments in the range states where they occur. *Microphis pleurostictus* (EN) is endemic to the Lake Bato region in the Philippines, *Microphis insularis* (VU) is endemic to the Andaman Islands in India, and *Microphis deocata* (NT) is endemic to both India and Bangladesh. Likewise, we could not find national assessments for any species, syngnathid or otherwise, in any of the three range states where *H. barbouri* is known to occur (Philippines, Malaysia and Indonesia).

All seahorse species assessed nationally in Asia had a global conservation status of VU. For the most part, the national assessments mirrored the global assessments for four out of the seven species assessed. Notable exceptions included *H. kuda* which is considered EN in Viet Nam and DD in Japan, *H. mohnikei* which is EN in Viet Nam and DD in Cambodia, and *H. trimaculatus* which is EN in Viet Nam.

Middle East

Three priority *Hippocampus* species were identified in the Middle East. However, both *H. kelloggi* and *H. spinosissimus* are documented as being found in only one country in the region Oman and Syria, respectively. For example, *H. kelloggi* is an extant resident in Oman and likely occurs in other Middle Eastern countries, but its presence is regarded as uncertain. *H. kuda* is distributed across all twelve of the Middle Eastern range states (Table 7).

Table 7. Gap analysis of priority syngnathid species in the Middle East. Green = range State has a process for national conservation assessments; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**		
Range States	*H. kelloggi*	*H. kuda*	*H. spinosissimus*
Turkey	X		X
Iran	X		X
Syria	X		
Cyprus	X		X
Lebanon	X		X
Israel	X		X
Saudi Arabia	X		X
Kuwait	X		X
Bahrain	X		X
Qatar	X		X
United Arab Emirates	X		X
Oman			X

Information on national conservation assessments for the Middle East was generally lacking. Out of the twelve range states in the region, information was found for only two range states, Cyprus and Israel, but neither had completed national assessments for syngnathids that we are aware of (Table 4). Note that for the purposes of this report, we have lumped Cyprus within the Middle East as we identified no priority species within Europe but aware that there is some ambiguity surrounding its placement here.

North America

Three priority syngnathid species were identified in North America (*H. erectus*, *H. ingens* and *H. reidi*) with an additional three priority species found in the US state of Hawaii (*H. histrix*, *H. kuda* and *Cosmocampus balli* – a pipefish endemic to Hawaii). Five of the six species found in North America are globally considered VU by the IUCN Red List, and one species, *H. reidi*, is classified as NT (Table 8).

All three North American range states, Canada, the US, and Mexico, have a process for national conservation assessments, but none have assessed priority syngnathids (Table 8).

Table 8. Gap analysis of priority syngnathid species in North America. Green = range State has a process for national conservation assessments; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**					**Other Syngnathids**
Range States	*H. erectus*	*H. ingens*	*H. reidi*	*H. histrix*	*H. kuda*	*Cosmocampus balli*
Canada		X	X	X	X	X
United States (Hawaii)	X	X	X			
United States				X	X	X
Mexico				X	X	X

Caribbean

The islands and waters of the Caribbean are home to two priority seahorse species – *H. erectus* and *H. reidi* (Table 9). The globally NT *H. reidi* is found in all 26 Caribbean range states, whereas the globally VU *H. erectus* is found in 13 range states across the region.

Information on national conservation assessments was hard to come by for the Caribbean region. No information was found for 17 of the region's 25 range states (Table 9). Seven Caribbean range states had a process for national threatened species assessments, but only two had assessed priority syngnathids (Table 4). Bermuda assessed both *H. erectus* and *H. reidi* as VU, and the Dominican Republic assessed *H. erectus* as VU. Globally, *H. erectus* is considered VU by the IUCN Red List which matches the national status for both Bermuda and the Dominican Republic. However, *H. reidi* was assessed as VU in Bermuda but is considered NT, globally. Information found for the Bahamas and Jamaica suggest they do not have national-level conservation assessments for any species, although the latter has listed *H. reidi* as a protected species (see Section 6).

Table 9. Gap analysis of priority syngnathid species in the Caribbean. Green = range State has a process for national conservation assessments; green with text = range State has completed a national assessment for the priority syngnathid species; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; yellow = range State has no national threatened species list; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**	
Range States	*H. erectus*	*H. reidi*
Bermuda (UK)	VU	VU
Bahamas		
Cuba		
Turks and Caicos (UK)		
Haiti		
Dominican Republic	VU	X
Cayman Islands (UK)		
Jamaica		

Puerto Rico (USA)		
British Virgin Islands (UK)		X
Anguilla (UK)		X
US Virgin Islands		
Saint Kitts and Nevis		X
Antigua and Barbuda		X
Montserrat (UK)		X
Guadeloupe (France)		X
Dominica		X
Martinique (France)		X
St. Lucia		
St. Vincent and the Grenadines		X
Barbados		
Grenada		
Aruba (Netherlands)		X
Curaçao (Netherlands)		X
Caribbean Netherlands		X
Trinidad and Tobago		

Central America

Central America is home to the same three threated syngnathids found in the Caribbean (Table 10). *Hippocampus erectus* and *H. ingens* are both considered globally VU and are found to occur in four and three out of seven of the region's range states, respectively, while the globally NT *H. reidi* is known from three of seven range states.

Four of the seven Central American syngnathid range states have a process for national-level conservation assessments, but just two – Belize and Honduras – had completed national assessments for two priority species (Table 11). *Hippocampus erectus* and *H. reidi* were both assessed by Belize as DD and by Honduras as Important for Eco-tourism (a special set of non-IUCN Red List categories and criteria were used to assess species in Honduras). We were unable to obtain any information for the remaining three range states – El Salvador, Costa Rica, and Panama. By species, *H. ingens* was lacking a national assessment in all six of the Central American range states where it is known to occur.

Table 10. Gap analysis of priority syngnathid species in Central America. Green = range State has a process for national conservation assessments; green with text = range State has completed a national assessment for the priority syngnathid species; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**		
Range States	*H. erectus*	*H. ingens*	*H. reidi*
Belize	DD	X	DD
Guatemala			X
Honduras	Importance for Eco-tourism		Importance for Eco-tourism
El Salvador	X		X
Nicaragua			
Costa Rica			
Panama			

South America

South America is home to four priority syngnathid species: *H. erectus*, *H. ingens, H. patagonicus and H. reidi*. The first three species are globally VU while *H. reidi* is assessed as globally NT (Table 11).

Table 11. Gap analysis of priority syngnathid species in South America. Green = range State has a process for national conservation assessments; green with text = range State has completed a national assessment for the priority syngnathid species; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**			
Range States	*H. erectus*	*H. ingens*	*H. patagonicus*	*H. reidi*
Colombia	VU	VU	X	VU
Venezuela	VU	X	X	VU
Guyana		X	X	X
Surinam		X	X	
French Guiana		X	X	
Ecuador	X		X	X
Peru	X		X	X
Brazil	VU	X	VU	VU
Uruguay	X	X		X
Argentina	X	X		X

Six of ten syngnathid range states had national conservation assessments, but only half had assessed priority species, including Columbia, Venezuela, and Brazil (Table 11). Argentina, which has a process for national conservation assessments, had not appeared to have formally assessed *H. patagonicus* though it had declared the species as a National Monument in the Municipality of General Pueyredón in Buenos Aires Province and the Municipality of San Antonio Oeste in Rio Negro Province. Based on Argentinean

legislation, the declaration of National Monument is the maximum conservation category that a species can have. Both declarations also change the status of seahorses from "fish" to "natural fauna." No information was found for four South American range states - Guyana, Suriname, French Guiana, and Ecuador.

Columbia, Venezuela, and Brazil completed assessments for all *Hippocampus* species found in their waters, and all species were deemed nationally VU, which apart from *H. reidi* reflected the species global conservation status (Table 11). *Hippocampus reidi*, globally considered NT, was assessed as VU in all South American range states. *Hippocampus reidi* had the most national assessments, with a status in three of the five range states where they are known to occur, while H. *erectus* was assigned a status in three out of six range states. *Hippocampus ingens* and *H. patagonicus* had one assessment completed in in Columbia and Brazil, respectively.

Oceania

Of Oceania's 13 range states with priority syngnathids, only Australia was found to have a process for national conservation assessments (Table 12). No information on national assessments was found for the remaining 12 range states in the Oceania region which are home to six priority syngnathid species. Although Australia has national conservation assessments, only the globally EN *H. whitei* has been assessed as Endangered (Table 12).

Table 12. Gap analysis of priority syngnathid species in Oceania. Green = range State has a process for national conservation assessments; green with text = range State has completed a national assessment for the priority syngnathid species; green = range State has completed a national assessment for the priority syngnathid species; grey = range state had not completed national assessments for the priority syngnathid species; white = we were unable to obtain any information; X = not a range State for the species. IUCN Red List Categories, which are also frequently used nationally, are abbreviated as follows: CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient.

	***Hippocampus* species**					
Range States	*H. histrix*	*H. kelloggi*	*H. kuda*	*H. spinosissimus*	*H. trimaculatus*	*H. whitei*
Republic of Palau		X	X	X	X	X
Federated States of Micronesia		X		X	X	X
Guam (USA)		X	X	X	X	X
Papua New Guinea				X		X
Solomon Islands	X	X		X	X	
Australia						EN
Samoa		X	X	X	X	X
American Samoa	X	X		X	X	X
Vanuatu	X		X	X	X	X
New Caledonia (France)				X	X	X
French Polynesia (France)		X		X		X
Fiji	X	X		X	X	X
Tonga		X		X	X	X

Sub-National Assessments

Five range states with national assessments for syngnathids – Australia, Brazil, Japan, Portugal, and the United States of America – have also completed local, provincial or state level assessments.

Australia completed a national assessment for the globally EN *H. whitei* in addition to state assessments in New South Wales where the species is listed as Endangered.

Within Brazil, two *Hippocampus* species were assessed at the sub-national level in five coastal states using the IUCN Red List of Categories and Criteria (Table 13). In general, the localized assessments reflected the national conservation status for both species with two notable exceptions. *Hippocampus reidi,* globally NT and nationally VU, was assessed as VU in four out of the five Brazilian states for which assessments were completed and classified as "threatened by overexploitation" in São Paulo. This latter classification is a specific category assigned to marine fishes with evident reduction of biomass or reproductive potential or declines in catches or reduction in area of occurrence, thus requiring management and monitoring (Tacyana Oliveira, pers.comm.). *Hippocampus erectus,* globally and nationally VU, was also classified as VU in three out of five Brazilian states but was DD in Paraná and "threatened by overexploitation" in São Paulo. Although not yet officially published, *H. patagonicus* is expected to be included in Brazil's updated list, and its conservation status will be assessed for the state of Espírito Santo (Table 13).

Table 13. Conservation status of Brazilian seahorse species at the global, national and state level. NT = Near Threatened, VU = Vulnerable, DD = Data Deficient, AS = *Ameaçada de sobrexplotação* (threatened by overexploitation). Year in brackets is year species was assessed. (Oliviera 2020).

***Hippocampus* species**	**Global status**	**National status**	**State level status**				
	IUCN Red List (2017)	Brazilian Red List (2014)	Espírito Santo (2005)*	Rio de Janeiro (2000)	São Paulo (2009)	Paraná (2004)	Santa Catarina (2011)
H. reidi	NT	VU	VU	VU	AS	VU	VU
H. erectus	VU	VU	VU	VU	AS	DD	VU
H. patagonicus	VU	VU	-	-	-	-	-

*A revision of the list in Espírito Santo has been finished and is expected to be officially published in 2020; *H. patagonicus* to be included in the updated list.

In the USA, five pipefish species have been assessed by NatureServe at the state level. Only one of them, *Syngnathus scovelli*, was assessed both at the national and state level. *Syngnathus scovelli,* considered nationally Secure, was assigned a conservation status of Secure to Apparently Secure across four states (Table 14). NatureServe considered only two syngnathids to be of conservation concern – *Syngnathus fuscus* had subnational statuses of Vulnerable to Secure and Vulnerable among two states, and *S. pelagicus* was assessed as Vulnerable to Secure in one state.

Portugal has separate assessments for its mainland and Azores populations of *H. hippocampus* and *H. guttulatus* (both globally DD and nationally assessed as Undetermined on the mainland and Rare in the Azores).

Table 14. Conservation status of syngnathid species in the United States at the global, national and state level. Information on the year in which assessments were made is not available at the National and State level on Nature Serve. (Nature Serve, 2021)

Species	**Global status**	**National status**	**State level status**						
	IUCN Red List	NatureServe	Alabama	Florida	Louisiana	Massachusetts	Mississippi	New York	Texas
Syngnathus floridae	LC	Unranked		Unranked	Apparently Secure				
Syngnathus fuscus	LC	Unranked		Vulnerable to Secure		Secure		Vulnerable	
Syngnathus louisiane	DD	Unranked		Apparently Secure					
Synganthus pelagicus	LC	Unranked			Vulnerable to Secure				
Syngnathus scovellli	LC	Secure	Apparently Secure	Unranked	Apparently Secure	-	Secure	-	Apparently Secure

Japan, in addition to completing national assessments for nine pipefish, has also conducted local conservation assessments of fish (mainly freshwater) in prefectures (similar to states or provinces). Japan assessed ten species of its syngnathids (about 20% of the country's total) across a subset of prefectures, totalling 14 assessments (Table 15). Japan assessed one of the species/prefecture combinations as CR, one as EN, four as VU, three as NT, and five as DD. Two seahorses were assessed at the subnational level: *H. kuda* was DD in two prefectures and *H. mohnikei* was assessed as VU in one prefecture. Only two species of pipefish were assessed both nationally and within prefectures of Japan (Table 15). The national and prefecture assessments match except in one case: the national assessment for *Hippichthys heptagonus* of EN was reflected in one prefecture, but it was assessed as DD in the other (Table 15). Japan used IUCN Categories and Criteria for their national assessments, but the method of evaluation for their sub-national assessments remains unknown.

Table 15. Conservation status of syngnathid species in Japan at the global, national and prefecture level. CR= Critically Endangered, EN= Endangered, VU = Vulnerable, NT = Near Threatened, LC= Least Concern, DD = Data deficient). (Sogabe 2020).

Species	**Global status**	**National status**	**Prefecture level status**							
	IUCN Red List	Japan Red Book	Izu Island	Fukuoka	Kagoshima	Kochi	Miyazaki	Nagasaki	Okinawa	Shimani
Hippocampus kuda	VU		DD		DD					
H. mohnikei	VU									VU
Hippichthys heptagonus	LC	EN			DD				EN	
H. penicillus	LC			DD						
H. spicifer	LC							VU		
Microphis brachyurus	LC							NT		
M. jagorii	DD	CR							CR	
M. leiaspis	LC							DD		
Syngnathus schlegeli	LC					NT	VU			VU
Urocampus nanus	DD					NT				

Syngnathid specific regulations/legislation

It was difficult to extract information on syngnathid-specific regulation/legislation, especially when searching online. Many government websites performed poorly (e.g. broken links, outdated information) and/or were solely in national languages.

We found syngnathid specific regulations in almost half of all the 64 range states where we obtained information for this report (n=31) (Table 16). We further determined that 14 range states did not have any nationwide syngnathid-specific regulation that we were able to find (Argentina, Bangladesh, Belize, Canada, Ecuador, France, Greece, Iran, Honduras, Kenya, Mozambique, Nicaragua, Taiwan, and Tanzania), though Argentina does protect *H. patagonicus* as a National Monument in the Municipality of General Pueyrredón (Buenos Aires Province) and Municipality of San Antonio Oeste (Rio Negro

Province). No information on the presence or absence of syngnathid-specific regulation was obtained for the remaining 19 range states.

Table 16. Countries with syngnathid-specific legislation, regulation or other rules independent of their commitments under regional/global accords and agreements such as CITES, the Bern Convention or the Barcelona Convention.

Country	Legislation
Argentina	*Hippocampus patagonicus* declared a "National Monument" in the Municipality of General Pueyredón in Buenos Aires Province and the Municipality of San Antonio Oeste in Rio Negro Province. Based on Argentinean legislation the declaration of National Monument is the maximum conservation category that a species can have. Both declarations also change the status of seahorses from "fish" to "natural fauna" which "prohibits any act or omission that directly or indirectly involves abuse, harm, capture, or captivity of the species, except in the case of individuals collected for scientific purposes" (Ordinance 19692/2010).
Australia	Nationally, all species within the Family Syngnathidae (seahorse, pipefish, pipehorse, and seadragons) are included in the list of marine species under Part 13 of the Environment Protection and Biodiversity Act. As a result of this listing, it is an offence to "kill, injure, take, trade, keep or move a member of a listed Marine Species if it is in or on Commonwealth area." Export permits will only be granted where syngnathid species: (1) have been obtained from an approved aquaculture operation; (2) are a product of an approved captive breeding program; or (3) have been taken from the wild under an approved harvesting regime under the EPBC Act". (Environment Protection and Biodiversity Conservation Act, Part 13, 1999) https://www.legislation.gov.au/Details/C2005C00338 *Specific State Regulations* Victoria All species within the Family Syngnathidae are considered Protected Aquatic Biota (PAB) under section 69 of the Fisheries Act 1995. It is unlawful "to take, injure, damage, destroy, possess, keep, display for reward, release into Victorian water or sell protected aquatic biota without a valid permit for scientific purposes. Permits are required to breed syngnathids, and permit holders are required to collect syngnathids from different sites to minimize localized impacts on populations (Section 69, Fisheries Act 1995). https://vfa.vic.gov.au/operational-policy/legislation-and-regulation/protected-aquatic-and-priority-species/pab-permit-policy-statement South Australia Family Syngnathidae are protected species (Schedule five of the South Australian Fisheries Management (General) Regulations 2007). https://www.pir.sa.gov.au/__data/assets/pdf_file/0012/351030/Operational_interactions_with_Threatened,_Endangered_or_Protected_Species_in_South_Australian_Managed_Fisheries_201718.pdf https://www.legislation.sa.gov.au/LZ/C/R/FISHERIES%20MANAGEMENT%20(GENERAL)%20REGULATIONS%202007/2018.01.14/2007.289.AUTH.PDF New South Wales: "All species of the families 'Syngnathidae', 'Solenostomidae', and 'Pegasidae' were listed as "protected" under the NSW Fisheries Management Act 1994. It is an offence to have in your possession, collect, or harvest any species of seahorse, seadragon, pipefish, pipehorse, ghostpipefish, or seamoths in NSW without a permit" (No 38, Fisheries Management Act 1994). Complete protection for the Endangered *H. whitei* in New South Wales stating it is illegal to catch and keep, buy, sell, possess, or harm White's Seahorse. Significant penalties for causing damage to the habitat of a threatened species without approval through actions such as boat anchoring, dredging, construction, and maintenance Works (New South Wales Fisheries Management Act, 1994; New South Wales Department of Primary Industries, 2019).

	https://www.environment.gov.au/system/files/consultations/fd75b672-9b0e-45c5-8811-8292d8d51424/files/hippocampus-whitei.pdf https://www.dpi.nsw.gov.au/fishing/closures/identifying/marine-or-estuarine-species/syngnathiformes
Bermuda	*Hippocampus erectus* and *H. reidi* are listed under Level 1 of the Protected Species Act (2003). Offences include: (1) A person who, unless authorized under section 8 or 8A- wilfully damages, destroys, removes or obstructs the habitat or nest of any protected species; (2) Or wilfully damages, destroys or injures, disturbs, uproots, fells, or kills a Level 1 protected species; (3) or takes, imports, exports, sells, purchases, or transports a Level 1 protected species" (Protected Species Act, 2003; Department of Environment and Natural Resources Bermuda, 2016). https://www.gov.bm/sites/default/files/PSA-booklet-June.pdf
Brazil	"All seahorse species figure in the Brazilian National Red List as 'Vulnerable' (through decree 445, issued in 2014 by the Brazilian Ministry of Environment – MMA, 2014). After its final alterations (in March 2018), it is forbidden to capture, trade, transport, and keep seahorses, excepting for research or conservation measures (under specific authorisation), unless a specific action/recovery plan or specific fishery regulations for seahorses are published by the Brazilian government. The prohibition does not apply to captive-bred specimens, and there "have been no specific legislation on seahorse aquaculture protocols in Brazil so far" (Ministry of Environment (MMA) *Decree 445,* 2014).
Cambodia	Seahorses are classified as an Endangered Fisheries Resource by the Sub-decree No. 128 (2009). Under proclamation 571 MAFF (2010), The Ministry of Agriculture, Forestry and Fisheries prohibits catching, selling, buying, transporting collecting, processing, and stocking of these species from natural water unless a permit is obtained for scientific purposes. Accidental catches must be released immediately and fishers must not harm or kill them (Ministry of Agriculture, Forest and Fisheries, Sub-Decree No.128, 2009; Ministry of Agriculture, Forest and Fisheries, Proclamation 571, 2010).
China	All *Hippocampus* species are listed as the national, second class protected animals of China. These species could be captured only under licence from provincial governments. Exploitation and trade require permits. Imports and exports must be declared. (Ministry of Agriculture, 1999; Wildlife Protection Act; NPC, 2018) http://www.npc.gov.cn/npc/c12435/201811/f4d2b7a3024b41ee8ea0ce54ac117daa.shtml China's laws prohibit fishing of seahorses for all but special uses such as research, artificial breeding, teaching, exhibition, donation, monitoring pharmaceutical production, etc. (Chapter 2 Articles 8 & 9) under the Regulations of the People's Republic of China on Concession for Utilization of Aquatic Wild Animals. Artificial breeding of seahorses by research institutions for conservation purposes is encouraged and breeding seahorses for commercial purposes is allowed but subject to permit regulation. (Chapter 3, Article 15). It is forbidden to sell, buy, and use seahorses and their products. However, use of seahorses and their products are allowed for medical and health purposes but need to be approved with a permit. (Chapter 4, Article 22, 24, 26) (Ministry of Agriculture, 1999; revised in 2017). http://www.gd.gov.cn/zwgk/wjk/zcfgk/content/post_2523995.html
Columbia	The prohibition on Marine Ornamental Species which includes *H. erectus*, *H. ingens,* and *H. reidi* includes 1) The extraction of native marine ornamental species from the natural environment within national territory, except those that are the object of research and/or breeding; 2) The introduction to the country of parents, eggs, species, subspecies, races, or foreign varieties that have been declared or deemed invasive by the Ministry of Environment and Sustainable Development; or those potentially invasive; 3) The introduction to the country of parents, eggs, species, subspecies, races, or foreign varieties that have reported invasion in other countries, such as the IUCN invasive species database, among others. No export of Marine Ornamental species is allowed unless a breeding process and requirements have been approved. (Article 6, Prohibition on Marine Ornamental Species).
Croatia	*Hippocampus hippocampus* and *H. guttulatus* are included in the Regulation of Strictly Protected Species under the Law of Nature Protection. Fishing, catching or any kind of disturbance of these species, as well as trade in parts or derivatives or any kind of commercial activity is prohibited (Nature Protection Act OG 80/2013; Ministry of Environment and Nature Protection). http://extwprlegs1.fao.org/docs/pdf/cro143051.pdf

Guatemala	*Hippocampus* species within the Family Syngnathidae are included in the list of threatened species (National Council of Protected Areas, Resolution SC. No. 01/2009). https://conap.gob.gt/wp-content/uploads/2021/03/LEA-2009-Guatemala.pdf
Hong Kong	Permits are required for the export of CITES Appendix II listed species (e.g. dried seahorses) and import permits are required for Appendix II listed species from wild origins (e.g. live seahorses) (Government of Hong Kong, 2006).
India	All *Hippocampus* species included in Schedule 1 of India's Wildlife Protection Act of 1972: "Prohibited to acquire, receive, keep in his control, custody or possession, sell, offer for sale, or otherwise transfer to transport. Permits are required for export (Indian Ministry of Environment and Forests 1972; 2001).
Indonesia	Indonesia declared an export ban on wild seahorses in response the CITES Review of Significant trade: "ban on all harvest/export quota of all *Hippocampus* species since the beginning of 2009" (AC25 Doc. 9.5 Addendum – Review of Significant Trade, Species selected following CoP15). https://cites.org/sites/default/files/eng/com/ac/25/E25-09-05.pdf
Jamaica	*Hippocampus reidi* is a protected species. The National Environment and Planning Agency established guidelines for protected fish species which advises the public to "not use poison, explosives or unauthorized traps for fishing; not trap immature fish and; not dispose of waste in any national body of water containing live fish. The act also prohibits buying, selling or has in possession fish taken, killed or injured in contravention of the Act or Regulations" (The Wildlife Protection Act, 1945; Amended 1991).
Malaysia	Malaysia declared an export ban on wild seahorses in response the CITES Review of Significant trade (RST): "an administrative suspension of all seahorse exports" (AC25 Doc. 9.5 Addendum). In support of the RST for *H. barbouri*, *H. histrix,* and *H. trimaculatus*, Malaysia implemented zero quotas for wild specimens, and listed the three species as "nationally protected" (AC26 Doc. 12.3). https://cites.org/sites/default/files/eng/com/ac/25/E25-09-05.pdf https://cites.org/sites/default/files/eng/com/ac/26/E26-12-03.pdf
Malta	*Hippocampus hippocampus* and *H. guttulatus* are strictly protected and collection of species and destruction of their habitat is strictly prohibited. Permits are only granted to carry out studies on these species for the advancement of scientific knowledge to further protect the species (Flora, Fauna and Natural Habitats Protection Regulations, 2006). http://extwprlegs1.fao.org/docs/pdf/mlt68295.pdf
Mexico	All *Hippocampus* species in Mexico are subject to special protection. Intentional capture of wild seahorses and their trade is illegal. Recovery and conservation of species and their populations are promoted through this legislation (NORMA Official Mexicana NOM-059-SEMARNAT, 2010). https://dof.gob.mx/nota_detalle_popup.php?codigo=5173091
Monaco	Special measures are in place for species listed in Annex II of the Barcelona Protocol (1995) relating specifically to protected areas and biological diversity, including seahorses. It is prohibited to intentionally disturb, capture, import, detain, kill, trade, transport, exhibit for commercial purposes for seahorses, eggs, parts, or their derivatives. (Code of the Sea Article L.230-1, Article O.230-1) https://www.un.org/depts/los/LEGISLATIONANDTREATIES/PDFFILES/MCO_1998_Act.pdf
New Zealand	No fishing permit authorising the taking of fish, aquatic life, or seaweed of a stock or species listed under Schedule 4C (including *Hippocampus abdominalis*) shall be issued unless under a set of listed exceptions (Fisheries Act, 1996; Schedule 4C, 2004). It is unlawful to target seahorses in commercial fisheries, but they may be retained and sold to Licensed Fish Receivers as regulated incidental bycatch (Pollom 2017). https://www.legislation.govt.nz/act/public/1996/0088/latest/whole.html?search=sw_096be8ed81ae1f1c_seahorse_25_se&p=1#DLM396933
Panama	The capture and export of ornamental fishes is illegal (Autoridad Marítima de Panama (AMP), 2000). The extraction of coral reef fishes is regulated and includes, *Hippocampus ingens* (Ministry of Agriculture's decree 19.450).
Peru	According to a report completed by the Peruvian Sea Institute (IMARPE) *Hippocampus ingens* is considered "Endangered" and vulnerable to capture and exploitation. The extraction of *Hippocampus ingens* is prohibited in marine waters of the Peruvian jurisdiction until corresponding studies determine that the resource can be exploited without putting its survival at risk (Marine Resolution No. 306-2004-PRODUCE). Any persons who extract, disembark and/or

	transport, retain, transform, commercialize, or use seahorses will be sanctioned in accordance with the provisions of the General Fishing Law and its regulations. Despite the provisions seahorse extraction activities continue, mainly due to incidental fishing by artisanal fishers. Training actions for fishers, merchants, transporters on species declared closed, protected, minimum size restrictions are offered to generate change in behaviour to contribute to the sustainability of the use of hydrobiological resources. A "Responsible Fishing and Consumption" platform was created to present relevant information on protected species and management measures for species of commercial interest including seahorses. (https://pescayconsumoresponsable.produce.gob.pe/especies-protegidas.html ; https://www.minam.gob.pe/diversidadbiologica/wp-content/uploads/sites/21/2014/02/Afiche-de-Caballito-de-mar.compressed.pdf)
Philippines	Seahorse exploitation in the Philippines became illegal in 2004. The Republic Act (RA) 8550 Section 97 prohibits fishing or collecting of all CITES listed species. Under section 97 "it is unlawful to fish or take rare, threatened or endangered species as listed in CITES." This extends beyond national implementation of the CITES Appendix II listing for seahorses, which allows for trade to continue as long as it is sustainable, legal and monitored (The Republic Act (RA) 8550 Section 97). Revision of Philippines Fisheries Code in 2015, (RA10654) restored the potential for legal seahorse fisheries and trade if scientific assessments show activities to be sustainable. At the time of writing, fishing and trade were still illegal under this law (Philippines Fishery Code RA No. 10654: Section 102). https://www.officialgazette.gov.ph/2015/02/27/republic-act-no-10654/
Portugal	Seahorses are protected under Decree Law No. 92/2019 where the conservation of wild flora and fauna and their habitats and exploitation are regulated. The capture or slaughter, holding, sale, purchase for public display, transportation, destruction of habitat, disturbance, collection of seahorses is prohibited unless a license is obtained (Decree Law No. 92/2019; Decree Law No. 50/2006). https://data.dre.pt/application/conteudo/164258742
Singapore	Syngnathids (seahorses and pipefishes) are listed under the Endangered Species Act making it an offence under section 4(2) for anyone to possess or have in its control, sell, offer, or expose or advertise for sale, or display to public any specimens that were imported or introduced from the sea. (Endangered Species (Import and Export) Act, Chapter 92A, 2006, 2008; National Parks: Illegal Wildlife Trade, 2020). https://www.nparks.gov.sg/biodiversity/cites/illegal-wildlife-trade *Hippocampus* species are protected under the Wildlife Act that states: (1) A person must not intentionally kill, trap, take or keep any wildlife in any place unless the person has the Director General's written approval to do so; (2) A person must not offer for sale, sell or export any wildlife (whether alive or dead), or any part of a wildlife, unless the person has the Director General's written approval to do so; (3) A person must not import into Singapore any living wildlife unless the person has the Director General's written approval to do so; and (4) Permits are required for import, export, killing, taking, possessing, and offering for sale of wildlife. (Wildlife Act 2000, 2020). https://sso.agc.gov.sg/SL/ESIEA2006-N1?DocDate=20080401
Slovenia	All syngnathids are protected from exploitation and disturbance. It is illegal to hunt, prepare, trade, export, collect, disturb, or keep in captivity (Protection of Threatened Animal Species Act, 1993).
South Africa	In South Africa, all syngnathids are classified as Threatened or Protected Species (TOPS) and protected under the National Environmental Management: Biodiversity Act 10 of 2004. This means that all syngnathid species within South Africa cannot be collected, handled or disturbed in any way (The National Environmental Management Biodiversity Act, 2004). The National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) and the NEMA: Integrated Coastal Management Act no 36 of 2014, protect both *H. capensis* and *S. watermeyeri*

	from being collected, disturbed by either pollution, human interference or development (The National Environmental Management Biodiversity Act, 2004).
South Korea	*Hippocampus histrix*, *H. kuda*, *H. trimaculatus* are considered protected species under Decree No. 345 of the Ministry of Oceans and Fisheries – Violations for a person who has captured, collected or damaged marine protective organisms using explosives, nets, trap fishing gear, or use of poisonous materials or current to capture or damage marine protective organisms, those who have transplanted, processed, distributed, or store marine protected organisms or those who have obtained permission to capture or collect marine protected organisms by false or other illegal means (Conservation and Management of Marine Ecosystem Act, Decree No. 345, 2019A; Conservation and Management of Marine Ecosystems ACT, Act No.16516, 2019B).
Spain	*Hippocampus* species are included in the List of Wild Species in Special Protection Regime and in the Spanish Catalogue of Threatened Species. It is forbidden to intentionally kill, injure, annoy, or disturb. Species included in the catalogue require active management of populations, implementation of specific measures in conservation strategies and action plans in addition periodic evaluation of their conservation status (Royal Decree 139/2011). https://www.global-regulation.com/translation/spain/1438070/royal-decree-139-2011-4-february%252c-for-the-development-of-the-list-of-wild-species-in-regime-of-special-protection-and-the-spanish-catalogue-of-endan.html
Thailand	Thailand declared an export ban on wild seahorses in response the CITES Review of Significant trade: The Department of Fisheries issued "interim measure to cease the issuance of export permits for seahorses (*Hippocampus* spp.) .... shall come into force starting from 1 January 2016 onwards, until further notification." Export of live seahorses has been prohibited since 1988. (CITES SC67 Doc. 15 Annex 2 – Implementation of recommendations of the Animals and Plants Committees; CITES SC63 Doc. 14 – Review of Significant Trade). https://cites.org/sites/default/files/eng/com/sc/67/E-SC67-15.pdf https://cites.org/sites/default/files/eng/com/sc/63/E-SC63-14.pdf
United Kingdom	Both seahorse species found in UK waters – long snouted (*Hippocampus guttulatus*) and short snouted (*Hippocampus hippocampus*) – are listed under Schedule 5 of the Wildlife and Countryside Act 1981 as a Species of Principal Importance. This means that it is an offense to kill, injure, capture, possess or keep, damage, or destroy place of shelter, breeding or protection, disturb, transport or possess for sale or offer or expose for sale or advertise for sale or use prohibited method to take or kill (Wildlife and Countryside Act, 1981). https://www.gov.uk/government/publications/protected-marine-species/seahorses https://www.legislation.gov.uk/ukpga/1981/69/section/9
USA	No national legislation or management measures for seahorses, as they are not currently listed on the U.S Endangered Species Act. In State of Florida, "Marine Life" rule regulates tropical ornamental species, including seahorses, and extends to federal waters of the Exclusive Economic Zone adjacent to State of Florida waters. Measures include recreational and commercial bag limits, large areas of quality habitat are closed to commercial and recreational harvest and limited-entry fishery for commercial harvest (FWC rule 68B-42, Florida Administrative Code, 1991). https://myfwc.com/fishing/saltwater/recreational/marine-life/
Viet Nam	Seahorses species in Viet Nam are listed on government Decree no. 26/2019/NĐ-CP as protected marine species (requiring harvesting and trade domestically and internationally to be regulated with reporting and permitting system). In support of this law, Viet Nam has initiated regulations for seahorses catches in national waters, effective March 15, 2019 – including fishing seasons and minimum size limits (Decree no. 26/2019/NĐ-CP). https://www.customs.gov.vn/Lists/VanBanPhapLuat/ViewDetails.aspx?ID=11615

Regulations/legislation varied from bans on fishing and/or trade to protection of syngnathid habitats (Table 16). Almost all regulation was relevant only to wild syngnathids, with three range states regulating captive breeding (Australia, Cambodia and Slovenia). Of the 31 range states with regulations, (i) 13 prevented harming, injuring or disturbing individuals of the protected species; (ii) 23 restricted fishing, capturing or collecting; (iii) 17 prevented international trade (suspending exports and/or imports), and (iv) another five prevented damage to the habitats of protected syngnathids.

Regulations/legislation in most range states, where it existed, extended to all *Hippocampus* species found to occur within national waters, although some range states provided protection for all syngnathid (seahorses, pipefishes, as well as pipehorses and seadragons, where applicable) species in their waters such as in Australia, Slovenia and South Africa. Three countries protected only a subset of syngnathid species found in their waters: Argentina (*H. patagonicus),* Jamaica (*H. reidi),* and South Korea (*H. histrix*, *H. kuda* and *H. trimaculatus*). Where they do occur, regulations were often biased towards seahorses as was found with national conservation assessments.

The existence of syngnathid-specific national regulation was not always linked to presence of national conservation assessments for the same species. Sixteen range states without national assessments have nonetheless conferred syngnathid species with various levels of protection, as these examples indicate: (See Table 2 & 16 for more details).

- In Argentina, the Municipality of General Pueyrredón (Buenos Aires Province) and Municipality of San Antonio Oeste (Rio Negro Province) has declared *H. patagonicus* to be a National Monument, but we are not aware of a corresponding conservation assessment.
- The Philippines are in the process of drafting national conservation assessments for *Hippocampus* species but already have legislation in place to regulate syngnathid harvesting.
- Mexico has classified *H. erectus*, *H. ingens* and *H. reidi* as subject to special protection, but no formal conservation assessments have been completed.
- Peru considers *H. ingens* as Endangered and vulnerable to capture and exploitation, but the species was not formally assessed at the national level.
- South Africa is lacking national conservation assessments for the globally threatened *Syngnathus watermeyeri* and *H. capensis*, but all syngnathids are protected species in that country. Both species are endemic to South Africa, and although they lack national conservation assessments, global assessments may serve as national assessments.

On the other hand, four range states that had assessed seahorses as threatened or of conservation concern did not appear to protect the species through species-specific national regulation (Table 2).

Syngnathid-specific national regulation is often tied to their inclusion in regional or global agreements and Conventions. Conventions provide frameworks to be implemented by signatory governments (Parties) which are meant to enact national legislation to implement the framework in turn. All seahorses are included on Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES, a global agreement among 183 governments, regulates international trade of wild animals and plants to ensure trade does not threaten wild populations. Seahorses were listed on CITES Appendix II in 2002, which allows trade to continue as long as it is sustainable, legally sourced, and monitored. All seahorse range states are Parties to CITES and are therefore obliged to have domestic legislation to ensure that any exports meet CITES provisions for Appendix II; even Parties that have taken out reservations for *Hippocampus* must do this if they wish to trade with other CITES Parties. We found that five countries (Indonesia, Malaysia, Philippines, Thailand, and Viet Nam) reportedly have regulations in place that restrict international trade to a greater degree than what is specified for an Appendix II listing.

Both European seahorse species are covered by The Bern Convention, an international agreement on the conservation of European wildlife and natural habitats, that is committed to promoting national conservation policies, education, planning, and development and coordinating research (Convention on

the Conservation of European Wildlife and Natural Habitats 1979, Appendix II). Fourteen syngnathid range states are Parties to the Bern Convention, including Bulgaria, Croatia, Cyprus, Estonia, France, Germany, Greece, Italy, Malta, Monaco, Portugal, Slovenia, Spain, and the United Kingdom. The Convention offers strict protection to *H. hippocampus* and *H. guttulatus* under EU regulation N. 407/2009 in agreement with Appendix II of the Bern Convention, which restricts listed species from being disturbed, captured, killed, or traded. In addition, the pipefish *Syngnathus abaster* is protected under Appendix III of the Bern Convention. Appendix III indicates species in need of protection but that a "certain level of exploitation is possible if the population level permits" (Convention on the Conservation of European Wildlife and Natural Habitats 1979, Appendix III).

Similarly, *H. guttulatus* and *H. hippocampus* are included in the Barcelona Convention for the Protection of the Marine Environment and Coastal Region of the Mediterranean, which aims to protect the marine coastal environment of the Mediterranean by promoting regional and national plans to achieve sustainable development (Barcelona Convention 1976). Eleven range states from our survey – Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Malta, Monaco, Slovenia, and Spain – protect the two EU seahorses under EU regulation N. 407/2009 in agreement with Annex II of the Barcelona Convention. This requires the species to be managed and maintained in a "favourable state of conservation" ensuring "their maximum possible protection and recovery" (Barcelona Convention 1976; Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean 1999).

In some cases, national assessments have led to the creation of management or action plans that called for regulations/legislation to protect syngnathids but have yet to be promulgated. For example, the Brazilian government, in addition to the creating regulatory measures also completed, in 2011, a national proposal for a management plan for the sustainable use of Brazilian seahorse species. The proposal compiled information on life history, threats, and regulation of seahorse species in Brazil and suggested a series of conservation measures to support the sustainable use of seahorses. Measures included the establishment of no-take zones; programs to monitor and minimize effects of seahorse-incidental capture; programs for mapping, monitoring and restoring seahorse populations and habitats; community-based management programs, as well as a series of proposed measures for *H. erectus* and *H. reidi*. However, this proposal has not been fully implemented.

Monitoring

Of course, having rules and laws in place is not enough – they need to be implemented with good effect. To know if laws are helping syngnathids, countries need to monitor their wild seahorse populations. From surveying SPS SG group members as well as other syngnathid experts, we were able to deduce which range states and/or locations have monitoring programs in place. Very few countries were found to have government-led monitoring of syngnathids, but programs do exist in countries such as Thailand (CITES 2013) and the USA (state of Florida) (CITES 2020; AC Doc. 26 Annex) Instead, any extant monitoring is happening through non-governmental organizations or citizen science, as these examples show:

- In Argentina, the Municipality of San Antonio Oeste (Rio Negro Province) has initiated a quantitative study to monitor abundance and trends for populations of *H. patigonicus*. The study is about to enter its fourth year of surveys starting in 2018 (D. Luzzatto, pers. comm., 8 July 2021).
- In Australia, long-term monitoring within the Port Stephens estuary began in 2005 by SPS SG member David Harasti through various research projects on the biology, ecology, and conservation of *H. whitei* (Harasti 2021).

- In Cambodia, Marine Conservation Cambodia has been surveying seahorses in the Kep Archipelago since 2007. As well, Projects Abroad and subsequently Kuda Divers, in Koh Sdach, have been regularly surveying seahorses since 2014.
- Peau-Bleue Association, a citizen science program in France, established the Hippo-ATLAS project and have been monitoring seahorses since 2005.
- In Greece, a group of divers from the *Hippocampus* Marine Institute has been monitoring seahorses in Stratoni since 2007 in collaboration with SPS SG member Dr. Miguel Correia (Correia *et al.* 2020).
- In Kenya, seahorse sightings have been obtained since 2018 through citizen science composed of local communities and conservation officials and through ecological surveys done at a community conservation area in Shimoni (T. Mkare, pers. comm., 18 May 2020).
- In Mexico, researchers from the Autonomous University of Baja California Sur have independently monitored *H. ingens* populations in the state of Baja California Sur since 2014 (Sofía Gómez Aguilar, pers. comm., 8 May 2020).
- In Monaco, an initiative from The Prince Albert II of Monaco Foundation together with the Oceanographic Museum launched a research project in 2016 for *H. hippocampus* and *H. guttulatus* which involves surveying seahorse sights as well as a reintroduction and monitoring program with guidance from SPS SG member Dr. Patrick Louisy.
- In Mozambique, Parco, a community grassroots organization in Vilankulo, together with local dive operators and community members have surveyed seahorses in the Bazaruto Archipelago since 2019 with help from SPS SG member Dr. Louw Claassens.
- In the Philippines, the Zoological Society of London was monitoring seahorses in Bohol from 1996 until 2016.
- In Portugal, a seahorse census in the Ria Formosa was conducted in 2018 by SPS SG member Dr. Miguel Correia, funded and initiated by the Oceano Azul (Blue Ocean) Foundation.
- In Spain, Asociación Hippocampus have had a monitoring program for *H. guttulatus* in place in Mar Menor since 2007. (Asociación Hippocampus, 2018).

Discussion

Syngnathid fishes are poorly assessed and protected at the national level, despite the vital importance of such evaluation and action for their conservation. We have thus far discerned national conservation assessments in only one-fifth of the range states for syngnathid fishes, covering fewer than 20% of syngnathid species. Most such assessments focus on seahorses rather than pipefishes, pipehorses or seadragons. These few available conservation assessments for syngnathids raise a number of questions about the basis for the evaluation and the categorizations that emerged, with some similarities to and discrepancies from global assessments. The few and limited national level rules and regulations to protect syngnathid fishes often seemed to represent good intentions without being based on solid evidence and were commonly decided without national assessments. Moreover, there appears to be little to no monitoring of the effectiveness of such actions, whether measured by implementation metrics or (far better) by population responses. Our hope is that this paper will serve to prompt systematic national assessments of syngnathid fishes, the importance of which has been agreed in IUCN Resolution 095, and to catalyse effective national policy that will lead to better conservation status for syngnathid fishes.

We found a worrying dearth of national conservation assessments for syngnathids, with only 20% of range states known to have assessed any syngnathids at all. Even if we limit our evaluation to range states known to have national species assessments, only half had evaluated syngnathids. Such evaluations are concentrated, with just eight range states accounting for two-thirds of all national conservation

assessments for syngnathids. Given that syngnathids are amongst the most charismatic of marine fishes, and species for which conservation assessments might be least likely to arouse controversy, such poor coverage reflects badly on the level of attention given to the status of marine fishes. Indeed, many of the most appealing marine species in soft sediment habitat for divers in wildlife tourism industry include many members of the family Syngnathidae but have no conservation assessments, are poorly researched, and/or have little or no data to properly assess their extinction risk (De Brauwer and Burton 2018). In some range states, it may simply be that nobody has yet assessed the status of these fishes. In others, there may be active opposition to conservation assessments for syngnathids, as for other marine fishes. The first IUCN Red List assessments for marine fishes at a global scale occurred in 1996 and provoked considerable debate about whether marine fishes can be threatened with extinction -- debate that continues (Matsuda *et al.* 1997; Reynolds *et al.* 2005; Roberson *et al.* 2020). We also know that marine fishes continue to be regarded differently from other vertebrates in conservation assessments at the national level (Reynolds *et al.* 2005; Roberson *et al.* 2020). Only 61% of all known fish species have been assessed compared to 91% of mammals and 100% of birds (IUCN 2021). It is indicative that a number of marine fishes and invertebrates threatened with extinction are still targeted in fisheries (Roberson *et al.* 2020).

National assessments for syngnathids were concentrated on seahorses – with one-half of all assessments, even though seahorses only constitute about one-sixth of syngnathid species – and most resulted in designations of concern. For the seahorses that were assessed as threatened at a national level, many had already been deemed threatened by the global IUCN Red List (www.iucnredlist.org); indeed, it seems IUCN appraisals of concern may have propelled conservation assessments at the national level. Such echoing should automatically be the case only for endemics, although not necessarily so, as criteria vary and assessors may be different between domestic red lists and IUCN Red List. We would otherwise expect range states to differ in their assessments of a species if they were deciding independently from the global IUCN Red List. It also seems that many range states evaluated all their *Hippocampus* species as one group, without much distinction among species, with the same conservation designation as a result. The corollary is that evaluations of a few species varied greatly across range states, even as might be expected if they vary in their marine management and conservation measures.

Many of the seahorse species that had been assessed as DD at a global scale were evaluated by national red list processes to be threatened. The categorisation of Data Deficient (or similar language) for about 16% of national assessments is rather lower than for IUCN global assessments, where about 40% of seahorse species were judged to be Data Deficient. On the other hand, many syngnathid species considered Data Deficient in global IUCN Red List evaluations still lack the national assessments that could help build global understanding.

Patchy as the national assessments are for seahorses, the gaps and discrepancies are yet more obvious for pipefishes, pipehorses and seadragons: only one-sixth of species have been assessed and about 80% of those have been evaluated in only one range state. About one-third of species that had been assessed at the national level were considered to be threatened, whereas the same species had been evaluated as Least Concern or Data Deficient at the global level. There were also some notable differences in range state evaluations for the same species. Such discrepancies might be explained either (i) by differences among range states in the real status of their populations and/or (ii) by evaluation processes that differed at the global and national levels. Although 70% of range states reported using IUCN Red List global criteria and categories for national appraisals, the process of data gathering and analysis may still have differed at

global and national levels. No country has assessed more pipefishes than Japan, but even so, they have only completed assessments for about one-quarter of their pipefishes; given that seven of those nine species were judged to be threatened, it is very important that the rest be evaluated too.

Many more national – and subnational – assessments are needed, especially for the species known to be most threatened at a global level, with the current gaps seriously limiting conservation action. Most of the threatened seahorse species have been assessed by zero to three range states, even though they occurred in up to 50 range states. All five species of pipefishes known to be globally threatened are endemic but none had been assessed by their range states. This is worrying because, although IUCN global assessments for endemics also provide proxies for national assessments, they are often limited in their capacity to trigger the vital necessary responses in national engagement. Thus, in management and policy, national assessments are sorely needed. Such gaps are particularly notable in Africa which has 36 range states, two of the most threatened species globally (EN seahorse and CR pipefish in South Africa), at least eight threatened species in total, and no national assessments for syngnathids. Many other regions, including the Middle East and North America, also lack national assessments for syngnathids judged by the IUCN to be threatened. Only five range states have made subnational assessments, and none of them has comprehensive coverage by species or by country.

We particularly need to generate national assessments for the 93 Data Deficient syngnathid species. An IUCN Red List classification of DD does not imply no conservation concern but rather, that no or insufficient information is available. Therefore, a great number of species could be of conservation concern, and national assessments for these species should be made a priority. Apart from a few countries such as Japan and New Zealand, very few non-*Hippocampus* species have been assessed nationally to any significant extent. This may result partially from the general paucity of knowledge and population data for a large number of pipefish species who are generally under researched and little known, many of which are assessed globally as DD. Another possible explanation, however, is that range states that do have national red lists will often focus on the most imperiled species where there is a known threat. However, one would expect that the proportion of syngnathids identified as threatened in national red lists should decline if all species were covered.

A country's creation of syngnathid-specific national legislation was seldom based on national conservation assessments. The general expectation in conservation is that national assessments would be the basis for national legislation (Miller *et al.* 2007; Rodríguez 2008). Our study found a mismatch between national assessments and legislation where some countries were found to have enacted protective measures for all *Hippocampus* within their national waters without a national assessment process in place. It seemed as if good intentions had driven action without waiting for the valuable information an assessment can provide. That said, we did find instances in which national assessments have led to the creation of management or action plans that called for legislation to protect syngnathids. Specific policies for the protection of syngnathids at the national level were patchy and unpredictable with many gaps. In general, most rules forbid harming or disturbing the animals while others constrain fishing, suspend international trade, or protect habitats. The challenge for syngnathids, as for all wildlife, is meaningful legislation that is both implemented and enforced at the national level, as this is where the majority of conservation action occurs (Gärdenfors 2001; Gärdenfors *et al.* 2001; Rodríguez *et al.* 2000; Rodrigues *et al.* 2006). At the same time, there can certainly be merit in national conservation action while lengthy assessments are conducted.

All legislation has varying levels of implementation. Although all *Hippocampus* range states had obligations under CITES, others also had additional commitments under the Bern Convention and Barcelona Convention. Continuous monitoring, funding, and active engagement from policy and government are needed to implement the rules and laws that affect syngnathids. For example, determining the conservation status and the laws in place for seahorses nationally is highly relevant in the CITES framework – as most implementation and fisheries measure are primarily executed at the national level.

New knowledge gained from this study on the national assessments and legislation will support the implementation of IUCN World Conservation Congress Resolution 095 - Conservation of seahorses, pipefishes and seadragons. In particular, it "calls on all members, especially State and Government Agency Members, to by 2022, ensure that the status of all syngnathids is assessed and included in national/regional Red Lists as warranted." Knowledge gaps identified in this report will help guide our focus to those range states where national assessments are largely lacking and will improve the effectiveness of the resolution.

Although vital for good management, population monitoring turned out to be rare for syngnathid fishes and only executed patchily. Such tracking is hugely valuable in conservation, both to evaluate change and to understand how management and policy affect such change. For seahorses, monitoring and evaluation of at least a subset of wild populations is vital for the 182 countries to meet their obligations to CITES, yet no country does it systematically or on a widespread basis. Moreover, government plays little to no role in such monitoring, relying instead on non-governmental organizations, research units and community scientists.

If we are to succeed in conserving syngnathid populations, we need to have a clear understanding of priority species and conservation action, starting at the national level. Conservation assessments provide the baseline for the status of species and can help monitor change in population trends and threats to reduce the risk of extirpation and/or extinction (Rodrigues *et al.* 2006; Vié *et al.* 2008; Miqueleiz *et al.* 2019). IUCN Red List assessments are invaluable but are rather too broad brush to direct conservation action at a national scale, where most decisions are taken. National assessments will inform and guide targeted action by government, non-governmental organizations, research units, and community groups much more effectively. A priority should be to ensure that syngnathids are assessed in each country in which they are found and monitored thereafter. While management and policy can make broadly useful changes without waiting for the conservation assessment, they will generally benefit from such understanding in an adaptive management framework.

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Refer to Table 16 for legislation/regulation references.

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