Int. J. Aquat. Biol. (2020) 8(5): 317-320
ISSN: 2322-5270; P-ISSN: 2383-0956
Journal homepage: www.ij-aquaticbiology.com

Original Article

Current status and checklist of seagrass in Sri Lanka

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Abstract: This work provides the revised and updated checklist of the seagrass, Sri Lanka based on primary and secondary information. It is indeed to be an update the list of Seagrass species in Sri Lanka prepared by Abeywickrama and Arulgnanam (1991), which now been nearly three decades back. Further, several species names have been changed and there is concern that the nomenclature and distribution data are no longer accurate. Therefore, it is critical to identify the correct seagrasses species which are recorded in Sri Lanka in line with the updated global systematic records. More than forty (40) published pieces of literature, herbarium sheets in the National Herbarium and author's personal observations since 2011 were reviewed. Sri Lanka belongs to the Indo-Pacific bioregion and 14 species have been recorded so far representing seven genera. They are *Enhalus acoroides, Halophila beccarii*, *H. decipiens*, *H. ovalis*, *H. minor*, *H. ovata*, *H. stipulacea*, *Thalassia hemprichii*, *Cymodocea rotundata*, *C. serrulata*, *Halodule uninervis*, *H. pinifolia*, *Ruppia maritima*, and *Syringodium isoetifolium* with the estimated extend to be 37,137 ha. Lack of evidences to cross check the identification of *H. minor* (only recorded in Negombo Lagoon) and *H. ovata* are main drawback. The composition and distribution of seagrasses along the coastal zone of Sri Lanka is yet to be established covering the entire coastline, which mainly due to a 30-year long civil conflict. Therefore, island wide comprehensive and systematic research studies could be positively contributed to fulfil the data gaps in future.

Article history:
Received 19 June 2019
Accepted 12 September 2020
Available online 25 October 2020

Keywords:
Seagrass
Checklist
Sri Lanka
Distribution
Conservation

Introduction

Seagrasses are a unique group of flowering plants (angiosperms) which are dependent on light penetration for photosynthesis, and live in shallow oceanic and estuarine waters around the globe (Abeywickrama and Arulgnanam, 1991; Hemminga and Duarte, 2000; Orth et al., 2006; Miththapala, 2008). These species are evolved from a single lineage of monocotyledonous flowering plants between 70-100 million years ago, and have leaves, stems, rhizomes (horizontal underground runners) and roots (Hemminga and Duarte, 2000; Orth et al., 2006). They have developed unique ecological, physiological, and morphological adaptations to a completely submersed existence, including internal gas transport, epidermal chloroplasts, submarine pollination and marine dispersal (Orth et al., 2006).

Seagrasses are ecologically and economically important due to the services and functions they performed (Kenworthy et al., 2006; Cullen-Unsworth et al., 2013). Short et al. (2011) estimated that the value of ecosystem services of seagrasses is annually USD 34,000 per hectare. It provides habitat, shelter and food for numerous organisms, including shrimps, sea urchins, claims, various fish species and endangered species like turtles and dugongs (Fortes, 2012; Saenger et al., 2013). Seagrass meadows provide one of the most productive stores of carbon in our oceans and support global food security through their role as nurseries and foraging grounds for fishes (Unsworth et al., 2016). Globally, seagrasses are estimated to store 19.9 Pg in organic carbon and providing valuable nursery habitat to over one fifth of the world's largest 25 fisheries (Fourqurean et al., 2012; UNEP, 2020). In addition, it played as important roles in nutrient recycling, sediment

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DOI: https://doi.org/10.22034/ijab.v8i5.619

Table 1. Summarized information (species and respective place of species examine) from Revised Handbook to the Flora of Ceylon-Volume IX and XIV.

Species	Place of Specimens Examined and year	Volume	Reference
Enhalus acoroides	Opposite Jaffna, Feb 1890; Jaffna Lagoon, 24 Oct 1973; Puttalam Lagoon, 23 Mar 1926; Karativu Island, off Kalpitiya, May 1883; Dutch Bay, Karaitivu, 10 July 1932	IX	Philcox (1995)
Halophila beccarii	Muthur, S of Trincomalee, 19 May 1932; Batticaloa lake c. 20 km S of Batticaloa, June 1885, also May and Aug 1885	IX	
Halophila decipiens	Chilaw, in 6 fathoms of water, Apr 1881	IX	
Halophila ovalis	Jaffna, 3 Feb 1890; Thondaimanar Lagoon, Jaffna Peninsula, 8 July 1971; near Jaffna, 23 June 1973; along Chempiyanpattu cause way, sea level, 8 July 1971; Pearl Banks, off Arippu, 1860—1861; Mannar Flats, Feb 1890; S of Mulaitivu, sea level, 7 July 1971; Mulaitivu, 6 July 1971; Foul Point; Trincomalee, Sep/Dec 1853, ;Puttalam Lagoon, 1 Oct 1926; Kalpitiya, l870; s.n; in brackish water, May 1885; Negombo, 9 Apr 1931; Blue Lagoon, Negombo, 4 July 1978.	IX	
Thalassia hemprichii	Jaffna Lagoon, 24 Oct 1973; off Dholy Island, Feb 1890; Karainagar, 14 Oct 1970; Puttalam Lagoon, 23 Mar 1826; Weligama Bay, 26 July 1882; Dondra Head, 24 Feb 1881.	IX	
Cymodocea serrulata	Karaitivu, Dutch Bay; Pallugaturai; Trincomalee, Galle.	XIV	Wadhwa (2000a)
Halodule uninervis	Tampalakam Bay, Trincomalee; Negombo; Weligama Bay; Galle.	XIV	
Syringodium isoetifolium	Pallugaturai; Galle; Bentota; Weligama; Batticaloa; Puttalam; Mannar.	XIV	
Ruppia maritima	Thondamanar Lagoon, Feb 1889; Hambantota, Salt Pans, July 1879.	XIV	Wadhwa (2000b)

stabilization and reduction of wave impact (Blandon and Ermgassen, 2014). Seagrasses are also known as one of the most productive marine ecosystems following mangroves and coral reefs (Nadiarti et al., 2012).

The seagrasses are currently divided into six families viz. Zosteraceae, Hydrocharitaceae, Posidoniacea, Cymodoceaceae, Ruppiaceae and Zannichelliaceae (Short et al., 2011). Among the six families, there are 72 species representing twelve genera. On the extinction risk assessment of the world's seagrass species, three species are categorized as Endangered, seven as Vulnerable, five as Near Threatened, forty-eight as Least Concern and nine as Data Deficient (Short et al., 2011). According to Rasheed and Unsworth (2011), nearly 10% of all coastal sea beds are covered with seagrass and they exhibit low taxonomic diversity (Orth et al., 2006). Seagrass are widespread throughout tropical and temperate regions across six global bioregions (Short et al., 2007). The seagrasses are existed in 159 countries on six continents, covering over 300,000 km^2, making them one of the most widespread coastal habitats on Earth (UNEP, 2020). The tropical Indo-Pacific represents one of the high diverse seagrass bioregions in the world accounting for around 35% of total species, however this region also accounts for around 24% data scarcity, particularly for population special distribution data (Short et al., 2007).

Historical background in Sri Lankan seagrass: Scientific investigations of seagrasses in Sri Lanka dates back to18th century and herbarium sheet of *Thalassia hemprichii* from the Puttalam Lagoon was placed in the National Herbarium Sri Lanka in 23rd March 1826. Information on species examined in Sri Lanka and its mandatory information such as key, characteristic, distribution was compiled by a revised handbook of the flora of Ceylon, volume IX and XIV (Philcox, 1995; Wadhwa, 2000a, b) (Table1). 165 years after the initial herbarium sheet collection, a comprehensive study was carried out in 1991 by the UNESCO Man and Biosphere National Committee of Sri Lanka and reported fifteen species of seagrass, providing illustrated taxonomic keys (Abeywickrama and Arulgnanam, 1991). After 1991, studies mainly focused on the species composition, abundance, distribution, nutrient dynamics and productivity of the limited locations, including Negombo Estuary,

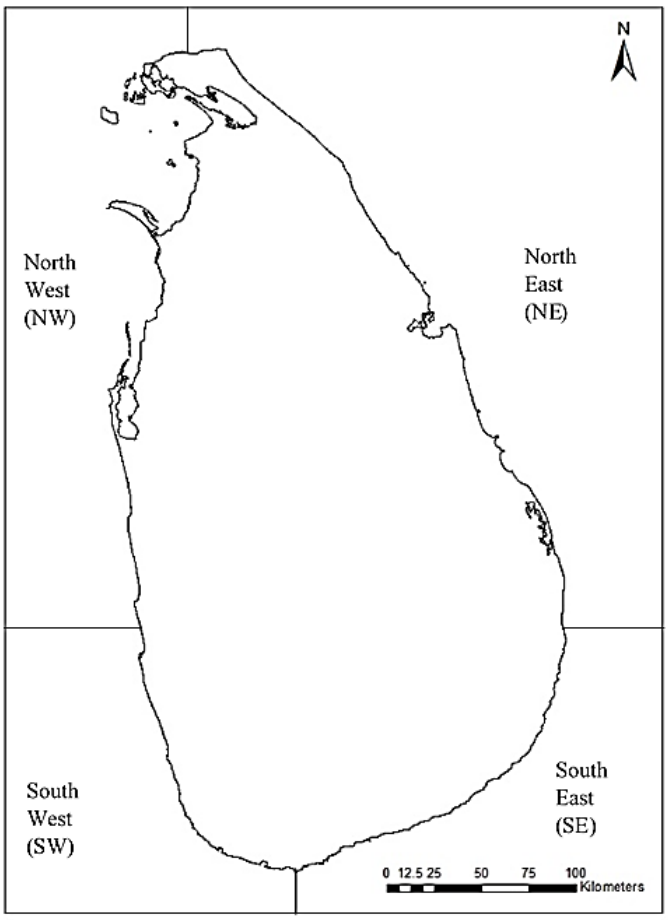

Figure 1. Seagrass recorded region in Sri Lanka.

Puttalam Lagoon and few other coastal areas. Even though, studies of seagrasses along the North, North-West and North-East coastal areas (where extensive seagrass meadows are available) are scarce due to 30-year civil conflict of the region (Udagedara et al., 2017). Present paper focused to update the list of seagrasses in Sri Lanka with compiling all the reliable information in line with the species included in Short et al. (2011).

Methods

Data were compiled from available published literature from the early18th century. Published data were critically reviewed based on the herbarium sheets, current taxonomic and nomenclatural key references. In addition, authors individual records were incorporated since 2011. The locality of each species was arranged according to the four major different regions as South West (SW), North West (NW), North East (NE) and South East (SE) in reference to the original recorded locality (Fig. 1). IUCN Red List Category of each species were extracted through extinction risk assessment of the world's seagrass species (Short et al., 2011) and national conservation status were obtained from MOE (2012). Threats of the seagrasses were identified through published literature and personal observations.

Results and Discussions

Checklist of Sri Lankan seagrass: The present checklist is based on published literature (books, abstracts, dissertations, manuscripts, notes, reports), deposited seagrass herbarium sheets in National Herbarium of Sri Lanka and the author's personal observations since 2011. A new checklist of the seagrasses of Sri Lanka is given in Table 2. It is intended to be an updated version of the checklist prepared by Abeywickrama and Arulgnanam (1991), which is out-of-date. In Sri Lanka, several literatures related to seagrasses found to be reported, the species which are currently not considered as a true seagrass. Further, many published records listed inconsistence numbers of seagrasses species in Sri Lanka, that mislead the actual number present at the country. Also, the same plant is identified differently by different workers in Sri Lanka. Therefore, these publications have erroneous species identifications and list many more seagrass species.

Among the 15 species reported by Abeywickrama and Arulgnanam (1991), *Najas graminea, N. marina* and *Photomogeton pectinatus* are not true seagrasses and also not included in the list of Short et al. (2011). Therefore, according to the updated record, fifteen true seagrass species belongs to seven genera were identified throughout the island as; *Enhalus acoroides, Halophila beccarii, H. decipiens, H. ovalis, H. ovata, H. major, H. minor H. stipulacea*, *Thalassia hemprichii, Cymodocea rotundata, C. serrulata, Halodule uninervis, H. pinifolia, Ruppia maritima,* and *Syringodium isoetifolium*. In addition, *Halophila stipulacea* was also new addition reported by Ocean Resources Conservation Association (ORCA) during their seagrass survey under the Dugong Seagrass

Table 2. Checklist of Seagrasses in Sri Lanka.

Family: Hydrocharitaceae

Species	NCS 2012	GCS 201	Population trend (Global)	Recorded Region in Sri Lanka	Reference
Halophila decipiens	NT	LC	Increasing	NE, NW, SE	1,3, 4,6,8,9,12,13,14,15,18
Halophila ovalis	LC	LC	Stable	SW, NW, NE, SE	1,3,4,5,6,7,8,9,10,12,13,14,15,18, 22,23, 24, 25
Halophila beccarii	EN	VU	Decreasing	NE, NW, SE	1,4,18, 22,23, 24
Halophila ovata		LC	Stable	NW	4
Halophila minor		LC	Unknown	NW	7, 23, 24
Halophila stipulacea		LC	Increasing	NW	20
Thalassia hemprichii	NT	LC	Stable	NW, SW, NE, SE	1,3,6,7,8,9,12,13,14,11,15,18,19, 24
Enhalus acoroides	NT	LC	Decreasing	NW, NE, SE	1,3,4,6,8,9,10,12,13,14,15,18

Family: Cymodoceaceae

Species	NCS	GCS	Population trend (Global)	Recorded Region in Sri Lanka	Reference
Cymodocea rotundata	NT	LC	Stable	NW, NE, SW	3,4,6,8,9,10,11,12,13,15,18, 21
Cymodocea serrulata		LC	Stable	NW, NE	2,3,4,6,8,9,10,13,14,15,18, 21
Halodule uninervis	NT	LC	Stable	NW, NE, SE, SW	2,3,4,6,8,9,10,11,12,13,14,15,18
Halodule pinifolia		LC	Decreasing	NE, SW	4,5,710,11,18, 24
Syringodium soetifolium	NT	LC	Stable	NW, NE, SW	2,4,6,8,9,10,11,13,14,15,18, 21, 26

Family: Ruppiaceae

Species	NCS	GCS	Population trend (Global)	Recorded Region in Sri Lanka	Reference
Ruppia maritima	LC	LC	Stable	NE, SE, SW	7,10,18,23, 24, 25,

GCS: Global Conservation Status; **NCS**: National Conservation Status, **EN**: Endangered; **NT**: Near Threatened; **LC**: Least Concerned; **(1)**: Philcox (1995); **(2).** Wadhwa (2000a); **(3)**. Jayasuriya (1991); **(4).** Abeywickrama and Arulgnanam (1991); **(5)**. Pinto and Punchihewa (1996); **(6)**. Johnson and Johnstone (1995); **(7)**. Amarasinghe et al. (2003); **(8)**. Dahanayaka (2009); **(9)**. Dahanayaka et al 2010; **(10)**. NARA (2010); **(11)**. Bandara et al. (2011); **(12)**. Kumara and Udagedara (2012); **(13)**. Udagedara and Kumara (2013); **(14)**. Udagedara and Kumara (2014); **(15)**. Ranatunga and Pethiyagoda (2015); **(17)**. Silva et al. (2013); **(18)**. Personal Observation-U.S.C. Udagedara; **(19)**. Mathiventhan and Jayasingam (2004); **(20)**. Dugong and Seagrass Conservation Project (2019); **(21)**. ISEANP 2014; **(22)**. Udagedara et al 2017; **(23)**. Samarakoon and van Zon (1991); **(24).** De Silva and Amarasinghe (2007); **(25)**. Samarasekara (1996); **(26)**: Wadhwa (2000b).

Conservation Project at North-Western coastal area of Sri Lanka (Dugong and Seagrass Conservation Project, 2019). Further, *Ha. major* was reported for the first time in Sri Lanka using genetic identification with morphological examinations by Liu et al. (2020). Among them, *H. beccarii* categorized as "Endangered" according to the National Red List 2012 and 'Vulnerable' according to the extinction risk assessment of the world's seagrass species in 2011. Out of 15 species, only nine species were evaluated for National Red List 2012 and six species identified as a "Near Threatened", whereas two species considered as "Least Concerned" (MOE, 2012). There are no endemic species to Sri Lanka may be due to propagules distribute by ocean currents through the region (Abeywickrama and Arulgnanam, 1991). *Halophila beccarii* is considered as rare species and has only been recorded in few localities in Sri Lanka as Batticaloa Lagoon, Muthur south of Trincomalee, Negombo Estuary and Valaichchenai Lagoon (Udagedara et al., 2017). *Ruppia maritima* is recorded in estuarine and lagoon habitats. All the species have been recorded in both marine and estuarine waters, excluding *H. stipulacea* which was found off shore habitats in the North Western Part of the Sri Lanka and considered as a global invasive species according to GISD (2015). *Halophila ovata* was recorded in few localities without any reliable evidences for the cross check of its identification. The list of species recorded in Sri Lanka and its respective citations are included in Table 2.

Distribution and Extent in Sri Lanka: Seagrasses exhibited a distinct variation in terms of abundance and species composition across Sri Lanka due to the

diversity of coastal morphology, hydrodynamic conditions and variation of the environmental parameters. The species are inhabit sallow marine and estuarine waters especially in the Gulf of Mannar, lagoons including Jaffna, Puttalam, Chilaw, Batticaloa, Mawella, Koggala, Rekawa, Valaichchenai, Mullaitivu and Negombo Estuary, Bays including Weligama, Trincomalee, and some shallow coastal areas with less wave currents (Baldwin et al., 1991; Abeywickrama and Arulgnanam, 1991; Udagedara et al., 2017, personal unpublished data). Extensive seagrass meadows have been recorded in the Northwestern side of Sri Lanka extending from Dutch bay in Kalpitiya to the western end of the Jaffna peninsula, and from Mannar to Northwest across the Palk Bay and to Rameswaram Island on the Indian coast (MoMD&E, 2019). SLCZCRMP (2018) included an extent of seagrasses in Sri Lanka was about 37,137 ha and which contributed district wise 2,054 ha from Mullaitivu, 21,225 ha in Jaffna, 509 ha from Kilinochchi, and 13,349 ha in Mannar. Data on the distribution of seagrasses along the coasts of Northwest, Northern, Northeast to Southeast is limited due to a three-decade civil conflict, and no reliable records are available (Udagedara et al., 2017). Thus, composition and distribution of seagrasses along the coastal zone of Sri Lanka is yet to be established covering the entire coastline and it is difficult to get a clear picture of seagrass distribution in Sri Lanka at the present scenario.

Threats: In spite of this recognition, habitat loss has not been as much a focus of marine science and conservation as in terrestrial environments. Past literature has highlighted that this habitat is under direct threat from anthropogenic influences and resulting rapid degradation of habitat and ultimately decline of Seagrass (Short and Wyllie-echeverria, 1996; Short et al., 2001; Orth et al., 2006, Eklöf, 2008; Udagedara and Kumara, 2013; Unsworth et al., 2015). Short et al. (2011) emphasized that 20% of seagrass population reduced distribution throughout the Indo-Pacific bioregion, except for remote islands and areas of low development. According to Waycott (2009), new threats are causing an acceleration of annual seagrass loss from less than 1% per year before 1940 to 7% per year since 1990. With an estimated loss of 110 km^2 per year since 1980 (Cullen-Unsworth and Unsworth, 2013; Serrano et al., 2016) and a loss of 29% of the seagrasses that were believed to have existed at the beginning of the twentieth century (Unsworth and Cullen-Unsworth, 2013); it is clear that seagrasses are still the 'ugly duckling' of the conservation world and greater recognition of their high value of environment health is needed. Further, existing 20th century global sea surface temperature increases of 0.6±0.2°C has already resulted in significant ecological changes across an expanse of different ecosystems and ecological hierarchies including seagrass ecosystems (Rasheed and Unsworth, 2011).

In Sri Lanka, decline rates of the seagrass ecosystems in the northern, eastern and western parts of Negombo Estuary to be around 96% between 1997 and 2004. In addition, around 20% of the total seagrass cover in Negombo Estuary has been lost owing to micro-algal proliferation on seagrass beds as a result of nutrient loading (Joseph, 2011b). These habitats are threatened due to destructive fishing practices (drag nets and push nets) and digging for polychaetes (e.g. Negombo Estuary), siltation and eutrophication (Pernetta, 1993). Digging for polychaete worms as brood stock feed for shrimp hatcheries and the use of push nets to catch fish for ornamental industry have caused severe damage to seagrass beds in Chilaw Lagoon (Joseph, 2011a).

Moreover, Seagrass are further affected by pollution (solid waste, chemical contaminants trough river water discharge, oil contamination in shallow waters), unplanned coastal development (port, harbor, anchorage developments and unplanned activities of the land lead to high turbidity of rivers and ultimately deposit in coastal habitats), boat anchoring, propeller damage, storm surges, discharge of coastal aquaculture and releasement of concentrated salt water from salterns. In addition, large scale commercial trawling heavily impacts the seagrasses in the Gulf of Manner and Palk Bay area (Udagedara and

Kumara, 2013). Anthropogenic activities have a great potential to impact the diversity and the ecology of seagrass communities and ultimately leading to impact on livelihood options of associated fishers.

Limitation of seagrass research in Sri Lanka: Most of the seagrass research in Sri Lanka are short term basis and limited to fewer locations with diversity and distribution information. Authors were found that a lack of field guides and checklists for fauna and flora including seagrass and associated fauna of the island may be major drawback to limit the research interest. In addition, the published literatures were limited with the basic research findings and scattered source of information. On the North, North-West and North-East coasts of Sri Lanka, where seagrass meadows are extensive, studies on seagrasses are scarce, however degradation of seagrass meadows are evident due to destructive fishing activities (MoMD&E 2019). Further, seagrasses are underwater meadows that cannot be accessed by a scientist without sound diving and snorkeling skills. The underwater mapping and surveying techniques are cumbersome, hence difficult to perform by a layman scientist. In addition, absence of seagrass research manuals, central database, handbooks and photographic guidebooks for seagrasses in Sri Lanka are identified as other drawbacks of the country. To avoid confusion between the species, a molecular study is needed to confirm the species at inter and intra species levels, especially for genus *Halodule* and *Halophila*.

Conservation and recommendations: Many studies have identified that the Indo-Pacific area as the center of seagrass biodiversity, but it is fragmented into many legally responsible authorities, and therefore a consistent approach is difficult especially countries like Sri Lanka. Therefore, multiple overlapping strategies are essential to secure a future of seagrass habitats, and an effective mechanism should be developed for long-term monitoring of seagrass meadows in Sri Lanka. The importance of seagrass meadows as fishing grounds to improve commercial fishery should be assessed for their conservation. The establishment of a well-elaborated temporal database would provide a common platform for all seagrass scientists to exchange their views and a national seagrass monitoring network should be established to develop proper strategic science-based conservation plans (Udagedara and Dahanayaka, 2017). In many locations, seagrass habitats remain largely unmapped, so incorporation into marine conservation initiatives is difficult when managers and policy makers are unaware of the full spatial extent of the resource. Therefore, systematic research should be promoted to document the current distribution and habitat status with the baseline information, including distribution, ecology and various anthropogenic impacts in respect to various time horizon (short term and long term) (Udagedara and Kumara, 2013). Moreover, extensive studies on ecology, genetic analysis, mapping, restoration techniques and climate change impacts are essential for conservation and sustainable utilization. Increasing awareness of people on seagrass in the coastal area is important for the sustainable utilization. Promotion of sustainable activities such as ecotourism, nature-based education, scientific study and maintaining as nursery and breeding ground for commercial fishery are recognized for providing further social and economic values to this ecosystem. Well-planned and targeted programs should be carried out focusing on local communities to make them aware of the dependence of their livelihood on seagrass ecosystems. Long-term monitoring programmes should be implemented through the collaboration of the funding agencies and NGOs; which should lead and conducted by local communities in a manner appropriate to the local culture. This will provide an important role in empowering people to connect (or re-connect) with their natural resources, enhancing social capital.

Globally, 26% of the recorded seagrass meadows fall within marine protected areas (MPAs) compared with 40 percent of coral reefs and 43 percent of mangroves. Only 17 percent of seagrasses in the Tropical Indo-Pacific bioregion occurring within MPAs (UNEP, 2020). Under the Dugong and Seagrass Conservation project, Sri Lanka has identified an additional area which could be declared as a MPAs to support the conservation of dugongs and

their feeding habitats in the Gulf of Mannar and Palk Bay. Moreover, seagrass restoration and rehabilitation can be done through advanced cutting-edge seagrass nursery techniques and other advance methodologies which were already practiced in developed countries. This is an option for restoring seagrass habitat where the underlying environmental issues that first led to seagrass decline have been resolved, but Sri Lanka has not started this mechanism yet.

In addition, multiple overlapping strategies could be adopted to secure a future seagrass conservation, and this was highlighted by Cullen-Unsworth and Unsworth (2016). UNEP (2020) suggested further directives such as development of policy expert group for seagrasses, national action plans for seagrass ecosystems and increasing national, bilateral and multilateral funding for comprehensive actions required to conserve and sustainable management of seagrass ecosystems. Furthermore, identify the value of protecting seagrasses for the post-2020 global biodiversity framework, Sustainable Development Goals (SDGs), Nationally Determined Contributions (NDCs), the 2030 Agenda for Sustainable Development and other international policy targets are important to save seagrass beds of the country. Finally, adhere the additional recommended actions proposed by UNEP (2020) could be utilized as an effective seagrass conservation strategy for Sri Lanka.

Conclusion

Fifteen true seagrass species belongs to nine genera were identified. *Halophila ovata* was recorded on limited locality. Further, genus of *Halophila* and *Halodule* contribute the wide array of morphological differences, therefore actual species list might be change through a compressive genetic study (Liu et al., 2020). Seagrass species *T. ciliatum* record from Jaffna (Digamadulla et al., 2016), however, there was no any proof of its identity. In addition, *Zostrera* species reported in south western region of the Sri Lanka by Silva et al. (2013) and verification study should be conduct for the confirmation. Various publications presented huge inconsistencies in the extent of seagrasses in Sri Lanka as Gunatilleke et al. (2017) reported 23,819 ha, 37,137 ha in SLCZCRMP (2018) and 293,400 ha (2,934 km^{-2}) by Vanderklift et al. (2019). Therefore, comprehensive review of seagrasses in Sri Lanka along with extensive mapping could be recommended to fulfill existence gaps.

Moreover, during the IUCN Red list of threatened species workshop at the international seagrass biology workshop in Singapore 2018, experts identified several gaps in our understanding of seagrass species and in particular, how seagrasses are distributed around coastal waters of Sri Lanka. The seagrass specialist group identified *H. beccarii* as an elevated risk of extinction, which was, previously listed as vulnerable, and known to occur in Sri Lanka. The studies of seagrasses, generally, along the Sri Lankan coastal waters are sparse and scattered, maybe because of the lack of focused research programs and has created many gaps in our knowledge. In addition, we observed seagrass species being decline over past decade due to anthropogenic impacts and climate change. Therefore, proposed conservation strategies and recommendations and research proprieties listed in MoMD&E (2019) are indeed to stream line for the development of seagrass conservation action plan in Sri Lanka in line with the global arena.

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