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**NEW DATA ON THE LOCATIONS OF SEAGRASS SPECIES
IN THE INDIAN OCEAN**

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NEW DATA ON THE LOCATIONS OF SEAGRASS SPECIES IN THE INDIAN OCEAN

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ABSTRACT

Localities and depths are described for seven seagrasses (*Syringodium isoetifolium*, *Halodule uninervis*, *Cymodocea rotundata*, *Thalassodendron ciliatum*, *Halophila decipiens*, *Halophila stipulacea* and *Enhalus acoroides*) collected in the Indian Ocean during four expeditions. These data are compared with those reported from the literature. Maps showing the formerly unknown localities are given.

INTRODUCTION

The number of seagrasses growing in the Indian Ocean varies from 17 to 24 species (Phillips, Menez, 1988; Short, Coles, 2001; Mangroves and seagrasses of the Indian Ocean, CD, SIDCA). The numerical discord is due to different taxonomic approaches used in species identification, to the uncertainty in defining the geographical limits of the Indian Ocean, and to the habitat characteristics of a specific area. In this paper, we accept the boundaries of the Indian Ocean as they are defined in the electronic catalogue “Mangroves and seagrasses of the Indian Ocean”, CD, SIDCA, i.e., the eastern coast of Africa, the coast of the Red Sea, to India, Malaysia, and northeastern Australia. Most of the relevant publications give evidence that seagrasses occupy vast areas in every part of the ocean. However, data on the ecology and the depth of occurrence are few (den Hartog, 1970, World Seagrass Atlas, 2003). This paper is an endeavor to fill in the gap in the knowledge about the localities and the borders of occurrence of the seagrasses prevailing in the Indian Ocean.

Seven seagrasses, *Syringodium isoetifolium*, *Halodule uninervis*, *C. rotundata*, *Thalassodendron ciliatum*, *Halophila decipiens*, *H. stipulacea* and *Enhalus acoroides* were collected in different parts of the Indian Ocean during four research cruises and are reported in this study.

MATERIALS AND METHODS

Four research cruises were made: 1) to the Red Sea in 1966, R/V Academician Kovalevsky; 2) to the Seychelles Archipelago in 1981; 3) to the Mascarena subwater mountain range in 1984, R/V Academician Vernadsky; and 4) to the Seychelles Islands

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in 1989, R/V Academician Nesmeyanov. The most comprehensive floristic study was conducted in 1989 during the joint (Institute of Biology of the Sea, Vladivostok, IBSS and Smithsonian Institute of Natural History, USA) research cruise on board the R/V Academician Nesmeyanov. The resulting data comprise the detailed description of the algal flora found at 12 large island groups of the Seychelles: the islands Mahe, Praslin, La Digue, Desroshes and Providence, and the atolls Cœtivy, African, Farquhar, Aldabra, St. Joseph, Cosmoledo and Astov (Kalugina-Gutnik, Perestenko, Titlyanova, 1992).

Seagrass specimens collected are deposited in the herbarium of the Institute of Biology of the Southern Seas (IBSS), National Academy of Sciences of Ukraine, Sevastopol.

The investigation of bottom vegetation growing in the Indian Ocean was conducted along transects using scuba equipment to collect algal and seagrass samples from the upper-to-the lower margins of growth.

The herbarium contains 593 samples of seagrass specimens from the Indian Ocean. Four hundred and twenty-two of the samples represent seven species described in this paper. Formerly unknown localities and depths of occurrence are given for most of the seagrasses. The species arrangement is in accord with the recent taxonomic guide (Kuo and den Hartog, 2001).

RESULTS AND DISCUSSION

Syringodium isoetifolium (Ascherson) Dandy

Location and sampling sites. Seychelles. Northwestern coast of the Desroshes, 12 m depth (Fig. 1), 6 February 1989, three plants, collected by Yu.Ya. Latypov; Aldabra atoll, mid-littoral zone, 29 January 1989, three plants collected by Yu.Ya. Latypov.



Figure 1. Herbarium specimen of *Syringodium isoetifolium* (Ascherson) Dandy, northeastern coast of Desroshes Island, Seychelles, 12 m depth.

S. isoetifolium is widely found in the tropical Indian Ocean (den Hartog, 1970; Bandeira and Gall, 2003). The following localities are new for this species: Desroshes Island, Cœtivy and Aldabra atolls of the Seychelles Archipelago (Kalugina-Gutnik, Perestenko, Titlyanova, 1992) (Fig. 2). Apparently, the 12 m depth near Desroshes Island closely approximates the lower limit of the occurrence of the species that was found near Cuba, i.e., 16.5 m (Duarte, 1991). den Hartog (1970) reported the depth of the species as 6 to 10 m in the Indian Ocean.

Halodule uninervis (Forsskal) Ascherson

Location and sampling sites. Felidy atoll, littoral zone, Maldives, 6 November 1981, one plant collected by A.A. Kalugina-Gutnik, Socotra Island, littoral, 11 November 1981, four plants collected by A.A. Kalugina-Gutnik; Seychelles, Cœtivy atoll, western coast, mid-littoral, 18 January 1989, 25 plants collected by N.I. Selin; Aldabra atoll, littoral,

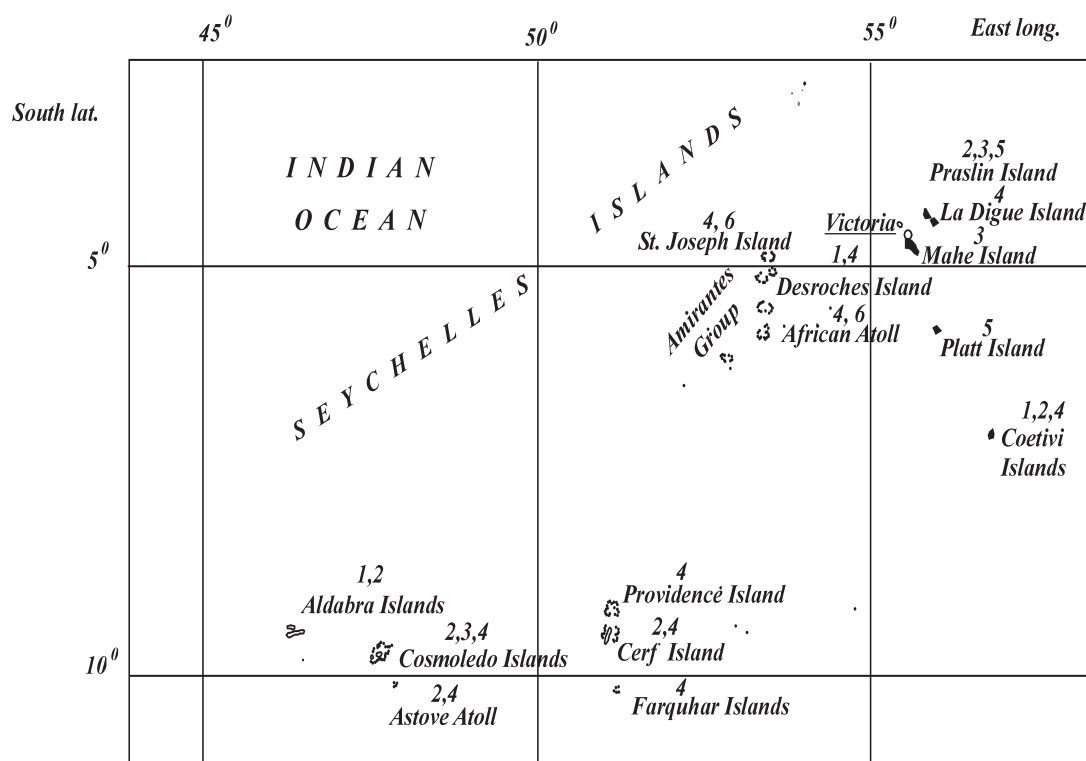


Figure 2. The new localities in the Seychelles for: 1 – *Syringodium isoetifolium*, 2 – *Halodule uninervis*, 3 – *Cymodocea rotundata*, 4 – *Thalasodendron ciliatum*, 5 – *Halophila decipiens*, 6 – *Halophila stipulacea*.

29 January 1989, two plants collected by A. A. Kalugina-Gutnik; Astov atoll, littoral, 10 March 1989, two plants collected by L.P. Perestenko; Praslin Island, mid-littoral, 11 February 1989, two plants collected by N.A. Milchakova; Cerf Island (adjacent to Mahé), mid-littoral, 17 February 1989, two plants collected by L.P. Perestenko.

H. uninervis is often found along the eastern coast of Africa and the Red Sea (den Hartog, 1970; Phillips and Menéz, 1988; Bandeira and Gell, 2003). Based on the herbarium specimens and published data (Kalugina-Gutnik et al., 1992), the area occupied by *H. uninervis* in the Indian Ocean has been extended to several localities not listed in earlier publications, i.e., Felidy atoll, the Maldiv Islands (Fig. 3), Socotra Island (Fig. 4), the Seychelles: Coëtivy, Aldabra, Astov atolls, Praslin, Cosmoledo and Cerf Islands (den Hartog, 1970; Phillips and Menéz, 1988; Bandeira and Gell, 2003, Mangroves and seagrasses of the Indian Ocean, CD, SIDCA) (Fig. 2).

***Cymodocea rotundata* Ehrenberg and Hemprich ex Ascherson**

Location and sampling sites. Felidy atoll, the northern shallow-water lagoon, Maldives, 0.5 m depth, 4 November 1981, five plants collected by A.A. Kalugina-Gutnik.

This species is widely known in the Indian Ocean (den Hartog, 1970; Lipkin et al. 2003; Bandeira and Gell, 2003). There are no data regarding the occurrence of

Cymodocea rotundata near the Seychelles and Maldives (den Hartog, 1979; Phillips and Menéz, 1988; Bandeira and Gell, 2003; Mangroves and seagrasses of the Indian Ocean, CD, SIDCA). The only exception is one paper (Kalugina-Gutnik et al., 1992), in which this species is described for some islands of the Seychelles Archipelago. Among the new localities where *C. rotundata* was found in the Indian Ocean are the islands of the Seychelles Archipelago named here (Fig. 2) and the atoll Felidy in the Maldives (Fig. 3).

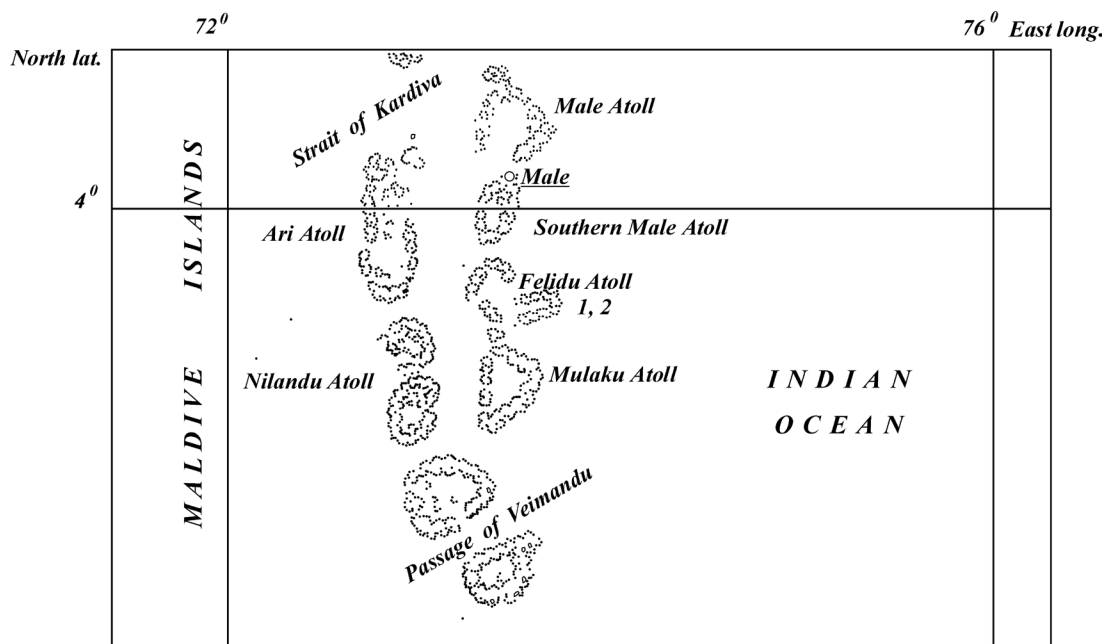


Figure 3. The new localities in the vicinity of the Maldives for: 1 - *Halodule uninervis*, 2 - *Cymodocea rotundata*.

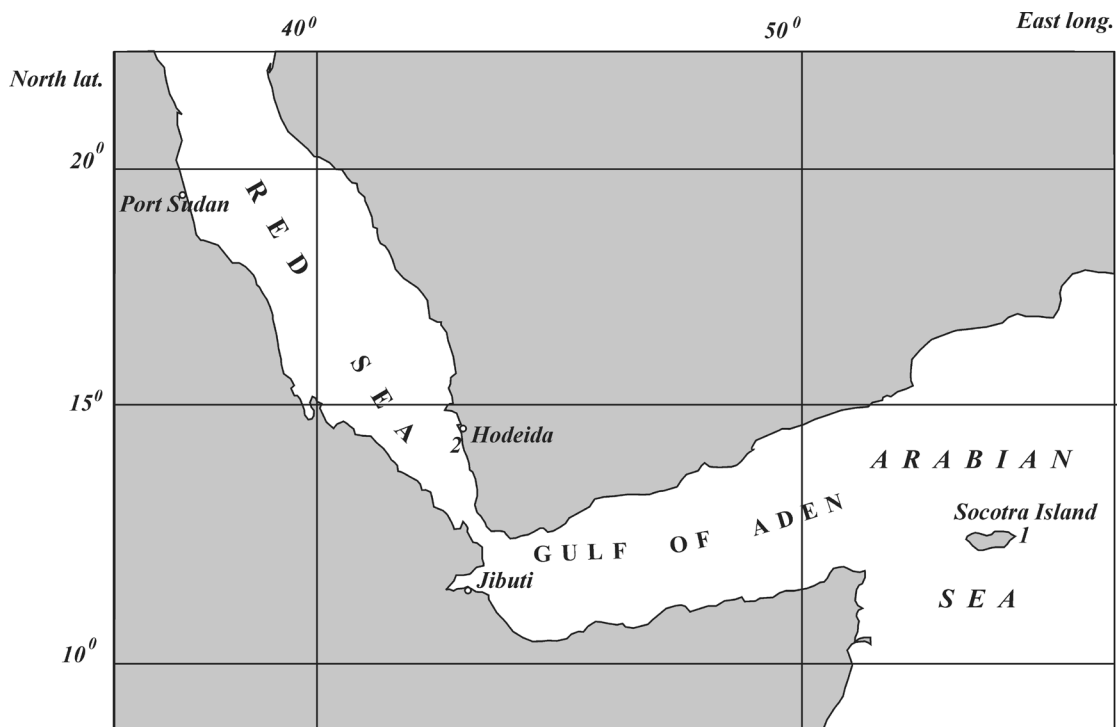


Figure 4. The new localities in the Red Sea and near Socotra for: 1 - *Halodule uninervis*, 2 - *Halophila decipiens*.

***Thalassodendron ciliatum* (Forsskal) den Hartog**

Location and sampling sites. Saya de Malha Bank, Mascarene subwater ridge, 20 m depth, 25 July 1981, four plants; 50 m depth, 4 August 1981, nine plants (Fig. 5), collected by E.Z. Gabrielian.



Figure 5. Herbarium specimen of *Thalassodendron ciliatum* (Forsskal) den Hartog, Saya de Malha Bank, Mascarene subwater ridge, 50 m depth.

Seychelles. Cœtivy atoll, eastern coast, 3 March 1984, 50 m depth, eight plants, collected by Yu. M. Latypov; Cœtivy atoll, western coast, 14 January 1989, 20 m depth, one plant, collected by N. I. Selin; Desroshes Island, northwestern coast, littoral zone, 6 February 1989, 14 plants, collected by E.V. Titlyanov; Astov atoll, 1.5 m depth, to March 1989, one plant, collected by N. I. Selin; La Digue Island, north-western extremity near Praslin Island, lower littoral zone, 26 February 1989, four plants, collected by N. I. Selin; Farquhar atoll, 3 m depth, 23 January 1989, four plants, collected by N. I. Selin; Providence Island, 1.5 m depth, 5 March 1989, four plants, collected by N. I. Selin.

Th. ciliatum has a discontinuous distribution. This species is common in the Red Sea and in the eastern and western Indian Ocean (den Hartog, 1970) at Mascarene subwater ridge (Kalugina-Gutnik et al., 1992). In the northeastern part of Cœtivy atoll, *Th. ciliatum* grows at a depth of 17 to 25 m. Total community biomass, including *Halimeda* spp., constitutes 1,640 – 2,319 g m⁻² (wet weight) with 10% coverage over the bottom. *Th. ciliatum* grows most extensively at African Bank, South Island. At depths from 10 to 31 m, biomass varies from 440 to 2,240

g m⁻² wet weight with the coverage estimated from 50 to 90 %, with an almost complete absence of associated seaweeds.

Though generally common for the Seychelles, *Th. ciliatum* has only recently been found at the Desroshes, La Digue, Providence, Cerf Islands and Astov, African, Cœtivy, Farquhar, St. Joseph, Cosmoledo atolls (Kalugina-Gutnik et al., 1992) (Fig. 2). The depth at which this species grows varies widely from the shallows to 33 m (Lipkin, 1977; Hulings, 1979; Pärnik et al., 1992; Lipkin et al., 2003; Titlyanova and Butorin, 1978). Based on herbarium records, the lower depth for this species is apparently 50 m (Cœtivy atoll and Saya de Malha Bank). We report that this depth constitutes a new lower depth record for *Th. ciliatum*.

***Halophila decipiens* Ostenfeld**

Location and sampling sites. Saya de Malha Bank, Mascarene subwater ridge, 20 m depth, one plant and 40 m depth, 19 March 1981, four plants, collected by E.Z. Gabrielian.

The Red Sea, the southern part of the Hodeida port, 0,5 depth, 3 September 1966, two plants, collected by A.A. Kalugina-Gutnik.

Grande Anse Bay, littoral zone, Praslin Island, Seychelles, 12 February 1989, one plant collected by N.A. Milchakova; Platt Island, 20 m depth (Titlyanova and Butorin, 1978).

This species is widely found in the Indian Ocean. There is little evidence regarding *H. decipiens* at the Seychelles, Mascarene subwater ridge and the southern Red Sea (den Hartog, 1970; Kalugina-Gutnik et al., 1992; Bandeira and Gell, 2003; Lipkin et al., 2003; Mangroves and seagrasses of the Indian Ocean, CD, SIDCA). According to our collections, the localities new for the species are the port of Hodeida, the Red Sea (Fig. 4), the coastal seawater of Praslin Island, Seychelles (Fig. 2) and Saya de Malha Bank (Fig. 6). According to Titlyanova and Butorin (1978), it is also found at Platt Island, Seychelles.

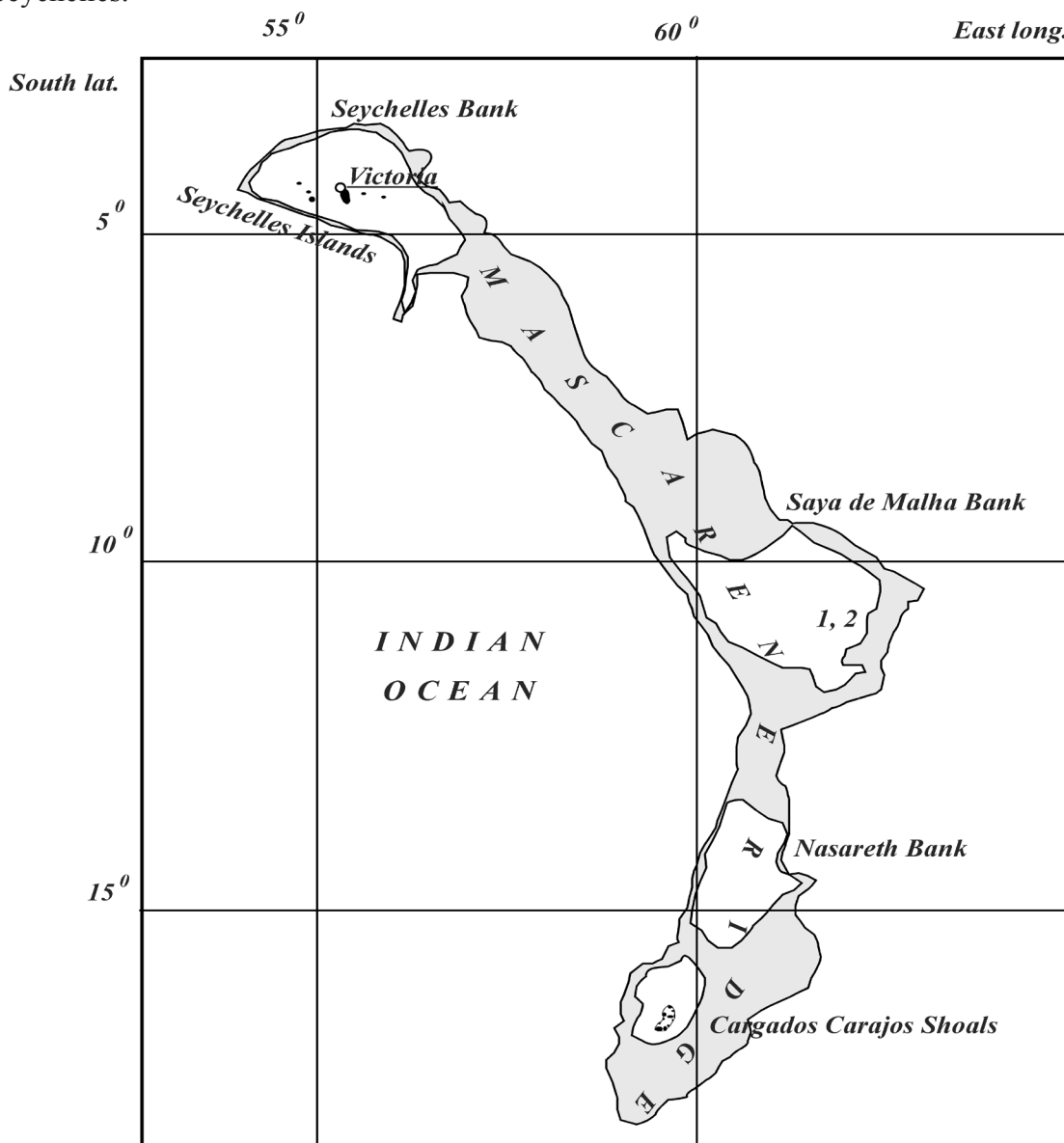


Figure 6. The new localities at the Mascarene ridge between the Seychelles and Mauritius Island for: 1 – *Halophila decipiens*, 2 – *Enhalus acoroides*.

***Halophila stipulacea* (Forsskal) Ascherson**

Location and sampling sites. Southeastern coast of St. Joseph atoll, Seychelles, 37 m depth, 3 March 1989, one plant (Fig. 7), collected by M. and D. Littler; African atoll, South Island, southeastern coast, 31 m depth, 28 February 1989, one plant, collected by N. I. Selin.

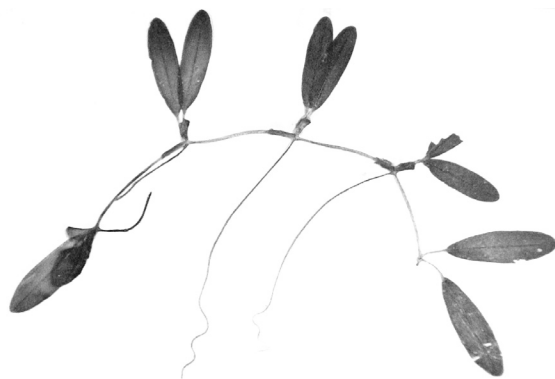


Figure 7. Herbarium specimen of *Halophila stipulacea* (Forsskal) Ascherson, southeastern coast of St. Joseph atoll, Seychelles, 37 m depth.

H. stipulacea is widely known in the Indian Ocean. The species has never been mentioned for the African and St. Joseph atolls in the Seychelles (Fig. 2) in the literature (Bandeira and Gell, 2003; Seagrasses of the Indian Ocean, CD, SIDCA) until recently and are places new for this species. There, at depths from 3 to 17 m, *H. stipulacea* grows together with solitary plants of *Th. ciliatum*, *Halimeda* spp. and other algae (Kalugina-Gutnik et al., 1992).

H. stipulacea grows at depths varying from 0 to 70 m, mostly from 0 to 18 m (den Hartog, 1970; Phillips and Menéz, 1988; Mangroves and seagrasses

of the Indian Ocean, CD, SIDCA). Duarte (1991) wrote that the lowest depth of *H. stipulacea* is 50 m. However, in the Gulf of Elat, the Red Sea, plants of *H. stipulacea* were found growing at 50 to 70 m deep (Lipkin, 1977; Hulings, 1979; Lipkin et al., 2003). The growth of this species at depths of 31 to 37 m along the Seychelles is new ecological data for *H. stipulacea* from the Indian Ocean (Kalugina-Gutnik et al. 1992).

***Enhalus acoroides* (L.) Royle**

Location and sampling sites. Saya de Malha Bank, Mascarene subwater ridge, 20 m depth, 25 July 1981, six plants (Fig. 8), collected by E. Z. Gabrielian.



Figure 8. Herbarium specimen of *Enhalus acoroides* (L.) Royle, Saya de Malha Bank, Mascarene subwater ridge, 20 m depth.

In the Indian Ocean, this species is sparsely found (den Hartog, 1970). About a century ago, *E. acoroides* was registered at Mahé and Praslin islands, Seychelles (den Hartog, 1970). More recent publications (Kalugina-Gutnik et al., 1992; Bandeira and Gell, 2003) gave little evidence. The species was reported for the Seychelles in “Mangroves and seagrasses of the Indian Ocean”, CD, SIDCA. Saya de Malha Bank and the Mascarene ridge are, apparently, new localities for this species (Fig. 2).

E. acoroides usually grows at depths from 0.5 to 6 m. The lower boundary for this species is 20 m (Saya de Malha Bank, Mascarene ridge). Little evidence is available about the ecology of this seagrass. It seems to be insufficiently studied (den Hartog, 1970).

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