SHORT COMMUNICATIONS

OCCURRENCE OF THE SEAGRASS *HALODULE PINIFOLIA* (MIKI) dEN HARTOG IN THE INDIAN OCEAN

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In biogeographical studies one generally makes comparisons of groups of plants and animals of the tropical Indian Ocean–West Pacific area with those of the Caribbean–Gulf of Mexico area. The general conclusion from such comparisons is that the tropical Indian Ocean–West Pacific area shows a much larger diversity of taxa than the Caribbean–Gulf of Mexico area[1]. In itself this cannot be denied but the comparisons are not entirely fair, because of the much smaller area of the Caribbean–Gulf of Mexico, and because of the fact that flora and fauna of the tropical Indian Ocean–West Pacific are not at all homogeneously distributed over the whole area.

A total of 20 seagrass species has been recorded from the tropical Indian Ocean–West Pacific area (table 1). Three of them, however, are mainly distributed in the temperate zone, although their extension within the tropics may be considerable; e.g. the South African seagrass *Zostera capensis* even crosses the equator in Kenya[1]. Of the 17 species with a genuine tropical distribution 11 have so far been recorded from the Indian Ocean as well as from the Western Pacific. Only 7 of those appear to be rather evenly distributed throughout the whole area. The other 4 species have a more restricted distribution; future research may show that this is not so, but in that case they certainly remain among the rare species that do not play a dominant role. Six species have been found so far in only one of the oceans.

The attention paid to the seagrasses in the last decades has led to many records of species in areas from where they had not been known before. Recently, while studying the seagrass collection of the Institute of Oceanology, Academia Sinica in

Table 1 *Seagrasses of the tropical Indian Ocean–West Pacific area*

Species with temperate affinity:			
Zostera capensis Setchell	I		
Zostera capricorni Aschers.	P		
Zostera japonica Aschers. & Graebn.	P		
Species with tropical affinity:			
Cymodocea angustata Ostenf.	I		
Cymodocea rotundata Ehrenb. & Hempr. ex Aschers.	IP	*	Ind
Cymodocea serrulata (R. Br) Aschers. & Magnus	IP	*	Ind.
Halodule pinifolia (Miki) den Hartog	IP		Ind.
Halodule wrightii Aschers.	I		
Halodule uninervis (Forsk.) Aschers.	IP	*	Ind.
Syringodium isoetifolium (Aschers.) Dandy	IP	*	Ind.
Thalassodendron ciliatum (Forsk.) den Hartog	IP		
Enhalus acoroides (L.f) Royle	IP		Ind.
Thalassia hemprichii (Ehrenb.) Aschers in Peterm.	IP	*	Ind.
Halophila beccarii Aschers.	IP		Ind.
Halophila decipiens Ostenf.	IP	*	Ind.
Halophila ovalis (R. Br) Hook. f.	IP	*	Ind.
Halophila ovata Gaud.	IP		Ind.
Halophila spinulosa (R. Br.) Aschers.	P		
Halophila stipulacea (Forsk.) Aschers	I		Ind.
Halophila tricostata Greenway	P		

I: Indian Ocean; IP: Indian Ocean–West Pacific; P: West Pacific; *: widely distributed throughout the area, Ind.: recorded for India.

Qingdao, we discovered two specimens of *Halodule pinifolia* (Miki) den Hartog, collected in Mandapam, India. The label data are:

(i) Mandapam (Palk Bay), 18-VI-1951, F. Thivy, as "*Cymodocea australis*";
(ii) Mandapam, Gulf of Mannar, July 1955, F. Thivy.

This is the first record of this species for India, and also for the Indian Ocean. This brings the number of seagrass species of India up to 12[2–5] (table 1).

Other species in the collection of the Institute of Oceanology, Qingdao, originating from the same area and collected by the same investigator are: *Cymodocea serrulata, C. rotundata, Syringodium isoetifolium* and *Halophila ovalis.*

Halodule pinifolia is a small seagrass with linear leaves; the leaf-blades are 5–20 cm long by 0.06–0.12 cm wide. The leaf-tips are obtuse with more or less irregular serratures; lateral teeth are faintly developed or totally absent. It is easily distinguished

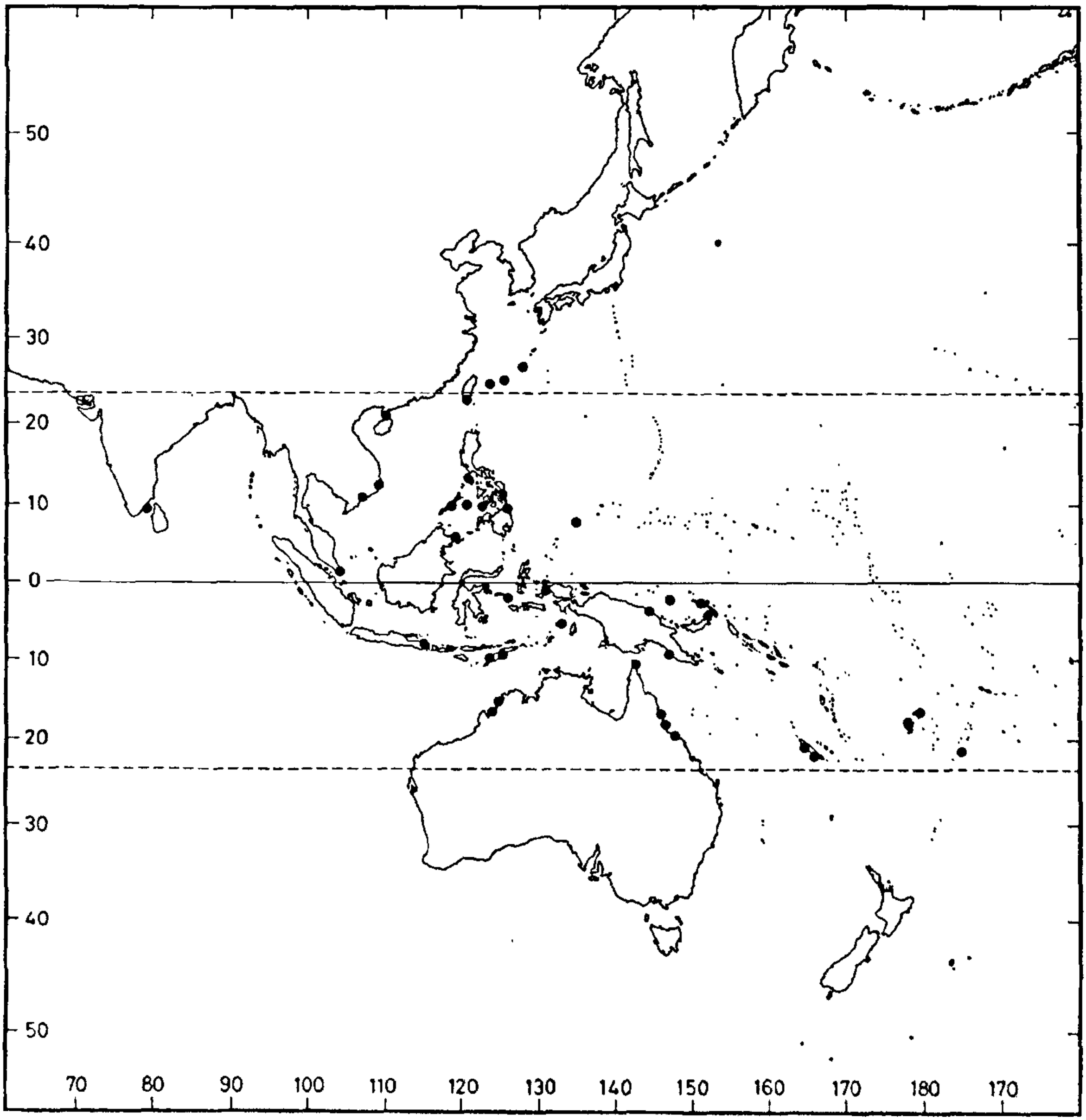

Figure 1. Geographical distribution of *Halodule pinifolia* (Miki) den Hartog.

from *H. uninervis*, in which the leaf-blades are generally wider (0.025–0.35 cm) and the leaf-tips always have two linear lateral teeth and a broad, obtuse median tooth. Flowers and fruits of the two species have been studied too infrequently to be of use in the species delineation. The labels did not indicate the environment where *H. pinifolia* was found in India. General experience, however, has shown that the species is not bound to any particular habitat. In fact, it has been found in all kinds of disturbed places and in sites apparently unsuitable for other seagrasses. In such places it may be dominant, with few or no companion species[1].

A distribution map of the species has been published earlier by den Hartog in the series *Pacific Plant Areas*[6]. This map was based on material seen by the author[1,7] and on other reliable observations[8,9]. However, since the publication of this map, new records of the species became known from Palau[10], the Philippines[11], New Guinea and the Bismarck Archipelago[12] and north-west Australia[13]. Therefore a new, updated map of the area of distribution of *H. pinifolia* has been prepared (figure 1).

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OCCURRENCE OF MULTINUCLEATE CAMBIAL INITIALS IN SOME TROPICAL TREES

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STUDIES on the cambial cytology are few in tropical trees[1–5]. The present paper describes the nuclear behaviour in the cambial initials in four deciduous and two evergreen trees: *Albizzia lebbeck* Benth., *Dalbergia sissoo* Roxb., *Tectona grandis* L.f., *Terminalia crenulata* Roth (deciduous); *Mangifera indica* L. and *Morinda tinctoria* Roxb. (evergreen). The vascular cambium is semi-storied in *Dalbergia* and non-storied in others. In *Albizzia*, *Dalbergia* and *Terminalia* the vascular cambium showed two peak periods of activity intermittent with two periods of dormancy[6,7], the maximum number of nuclei being recorded during the active period.

On the onset of mitosis the nucleus enlarged considerably and chromosomal organization was evident even when the nuclear membrane was still intact (figure 1). The fusiform initials showed 2–10 nuclei, the maximum in *Terminalia*. During peak activity and differentiation of derivative elements, all the population of fusiform and ray initials had polynucleate condition. When the cambium approached dormancy in two periods within a year in *Albizzia*, *Dalbergia* and *Terminalia* and only one period of dormancy in *Tectona*, *Mangifera* and *Morinda* showed uninucleate condition; however, about 10–15% of fusiform initials in *Terminalia* and *Albizzia* retained the multinucleate condition for some time during dormancy.

The nuclei of fusiform initials were not often alike with respect to their structure, size, shape, location and stainability (figures 2 and 3). Like fusiform initials, ray cell initials also showed variation in nuclear number from 2 to 5, the maximum being recorded in *Terminalia*. Unlike fusiform initials, all the nuclei were spherical or oval throughout the seasons in all the ray cell initials and their degeneration towards dormancy was proceeded by a change in their shape like nuclei of fusiform initials.

Bailey[8] contended that appearance of multinucleate condition was due to the superimposed cells which lie close to the same focal plane. However, multinucleate condition of fusiform initials in a single focal plane has ruled out Bailey's observations. The presence of multinucleate fusiform