Vegetative Propagation in *Padina arborescens* (Dictyotaceae, Phaeophyta) from the Oki Islands*

by
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Abstract

Results of the present writer's observations on vegetative propagation in *Padina arborescens* HOLMES (Dictyotaceae, Phaeophyta) is presented in this report.

Vegetative propagation in this species occurred solely from the primary rhizoid. The initial cell usually developed by apical growth to the uniserial cylindrical juvenile gemma. It further developed to subcylindrical to compressed and lanceolate stage still by apical growth. Thereafter gemmae became broader and flattened by replacing an apical cell to the marginal meristem which circinately inrolled towards the ventral side, then the gemma further developed into the typical fan-shaped.

Key Index Words: Dictyotaceae—Padina arborescens—*Phaeophyta*—*the Oki Islands*—*vegetative propagation.*

I. Introduction

Vegetative propagation has not been reported for *Padina arborescens* since it was described by HOLMES in 1895. This species is very common in the Oki Islands, and this time the present writer could detect the vegetative propagation occurred in it in nature.

II. Materials and Methods

Many material specimens of *Padina arborescens* were collected by the present writer from the Oki Islands for the present study: at 1 m depth, at Sasuka, on July 22, 1994; at 1 m depth, at Sasuka, Takeishi and Tsutsuka Bay, on August 8, 1995; at 1 m depth, at Sasuka, on August 9, 11, 1995.

All of the material specimens were kept in seawater tank and examined just after the collection.

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III. Observations

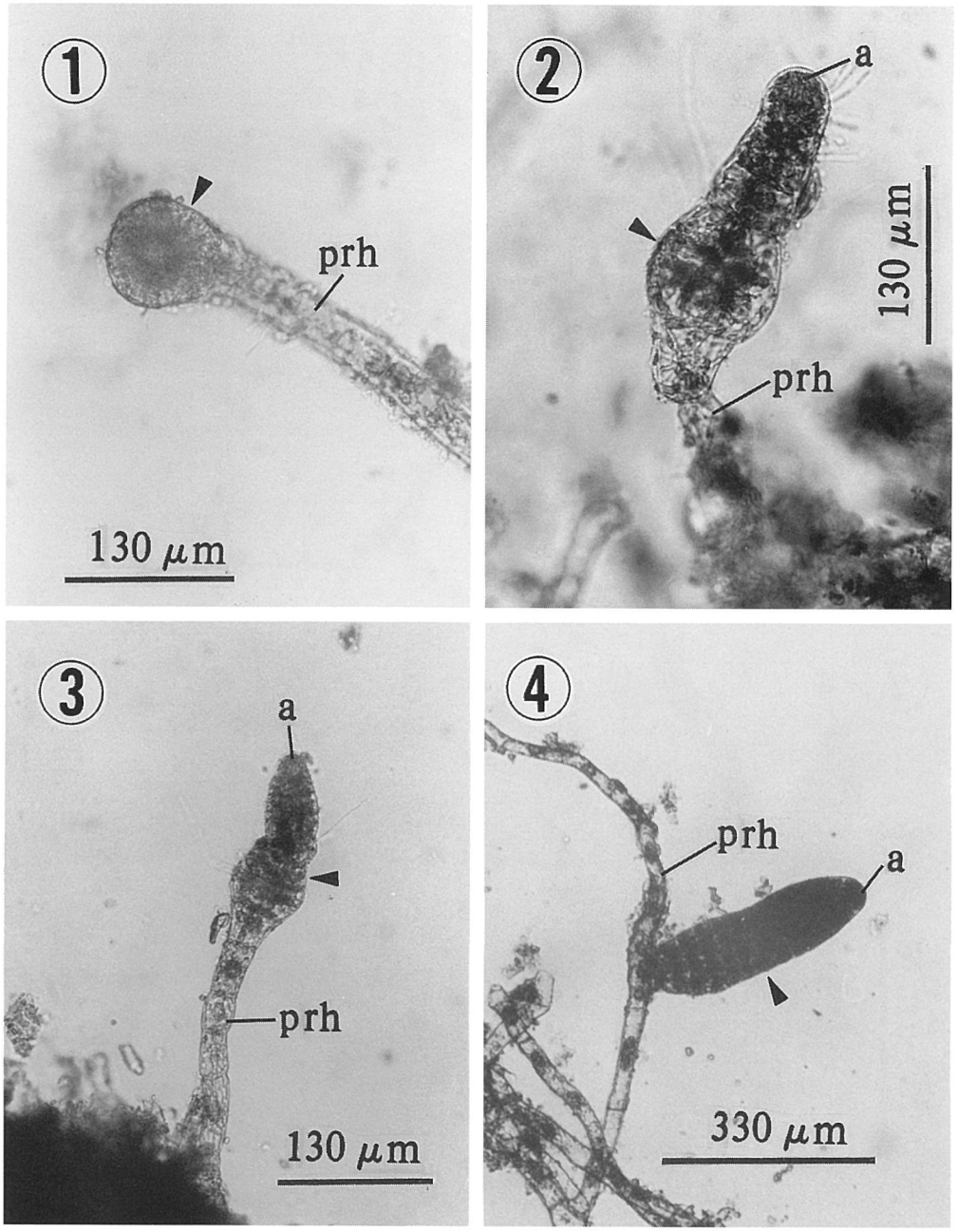
Padina arborescens HOLMES 1895: 251, pl. 12, fig. 1.

Vegetative propagation of this species occurred in July to August in the Oki Islands prior to decomposition of the old thallus.

Vegetative propagation occurred solely from the primary rhizoid. Gemmae were formed terminally or laterally on the primary rhizoid. The initial cell of gemmae (Fig. 1) was dome-shaped to subspherical and 60-90 μm in diameter. The initial cell developed by apical growth to the uniserial cylindrical to subcylindrical juvenile gemma (Fig. 2). It further developed to subcylindrical to compressed and more or less lanceolate stage still by apical growth (Figs. 3−8), and produced secondary rhizoids proximally (Figs. 5, 10). The developing gemmae also produced many trichoblasts in tufts on the surface (Fig. 9). Thereafter gemmae became broader and flattened by replacing the apical cell to the marginal meristem (Fig. 11) occupying distal edge. The meristematic cells elongated perpendicularly to the distal margin of the gemma and divided repeatedly periclinally and anticlinally, consequently the gemma rapidly increased in total size as well as its cell number. The meristematic region then circinately inrolled towards the ventral side (Figs. 13−16). The young monostromatic (Fig. 12) spatulate gemmae gradually became several-cell-layered in thickness and typical fan-shaped.

IV. Discussion

Padina arborescens is related to those five species of Dictyotaceae in the occurrence of vegetative propagation solely from the rhizoid, such as *Dictyopteris divaricata* (OKAMURA) OKAMURA, *Dictyopteris prolifera* (OKAMURA) OKAMURA, *Padina crassa* YAMADA, *Stypopodium zonale* (LAMOUROUX) PAPENFUSS and *Zonaria flabellata* (OKAMURA) PAPENFUSS (Table 1). *Padina arborescens,* however, is distinct from those five species whose vegetative propagation occurs solely from the blade, such as *Dictyota dichotoma* (HUDSON) LAMOUROUX, *Dictyota linearis* (C. AGARDH) GREVILLE, *Dictyopteris undulata* HOLMES, *Dilophus okamurae* DAWSON and *Pachydictyon coriaceum* (HOLMES) OKAMURA (Table 1). *Padina arborescens* is also distinct not only from *Padina pavonica* (LINNAEUS) THIVY and *Padina japonica* YAMADA whose vegetative propagation occurs solely from the rhizome, but also from *Distromium decumbens* (OKAMURA) LEVRING and *Zonaria diesingiana* J. AGARDH whose vegetative propagation occurs from both of the blade and the rhizoid (Table 1). *Padina arborescens* is specifically distinct from *Spatoglossum pacificum* YENDO whose vegetative propagation occurs solely from the sporeling (Table 1).



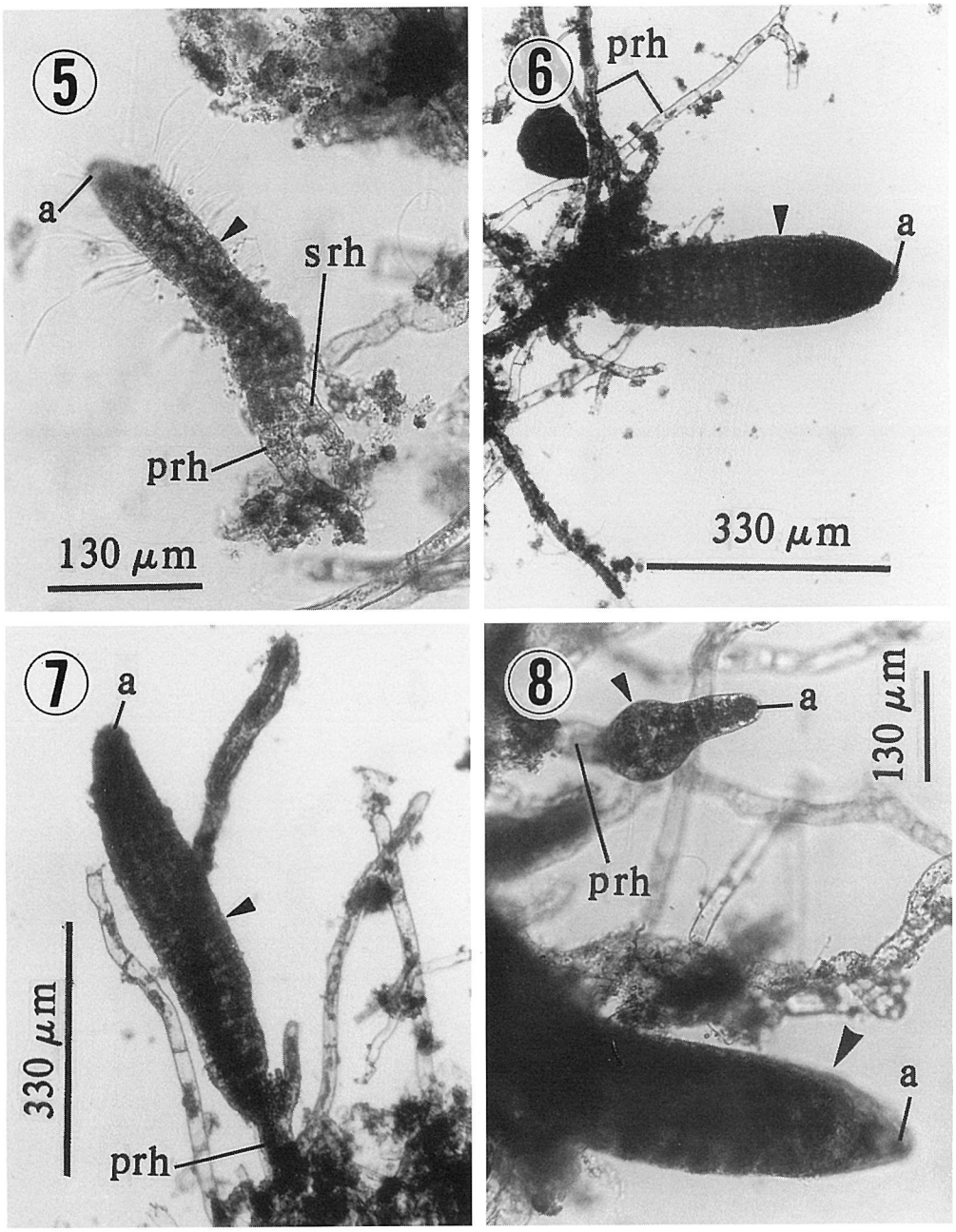
Figs. 1−4. *Padina arborescens* HOLMES.

Fig. 1. An initial cell of gemma (arrowhead) arising terminally from the primary rhizoid (prh).

Fig. 2. A uniserial juvenile gemma (arrowhead) with an apical cell (a) and arising terminally from the primary rhizoid (prh).

Fig. 3. A subcylindrical juvenile gemma (arrowhead) with an apical cell (a) and arising terminally from the primary rhizoid (prh).

Fig. 4. A compressed young gemma (arrowhead) with an apical cell (a) and arising laterally from the primary rhizoid (prh).



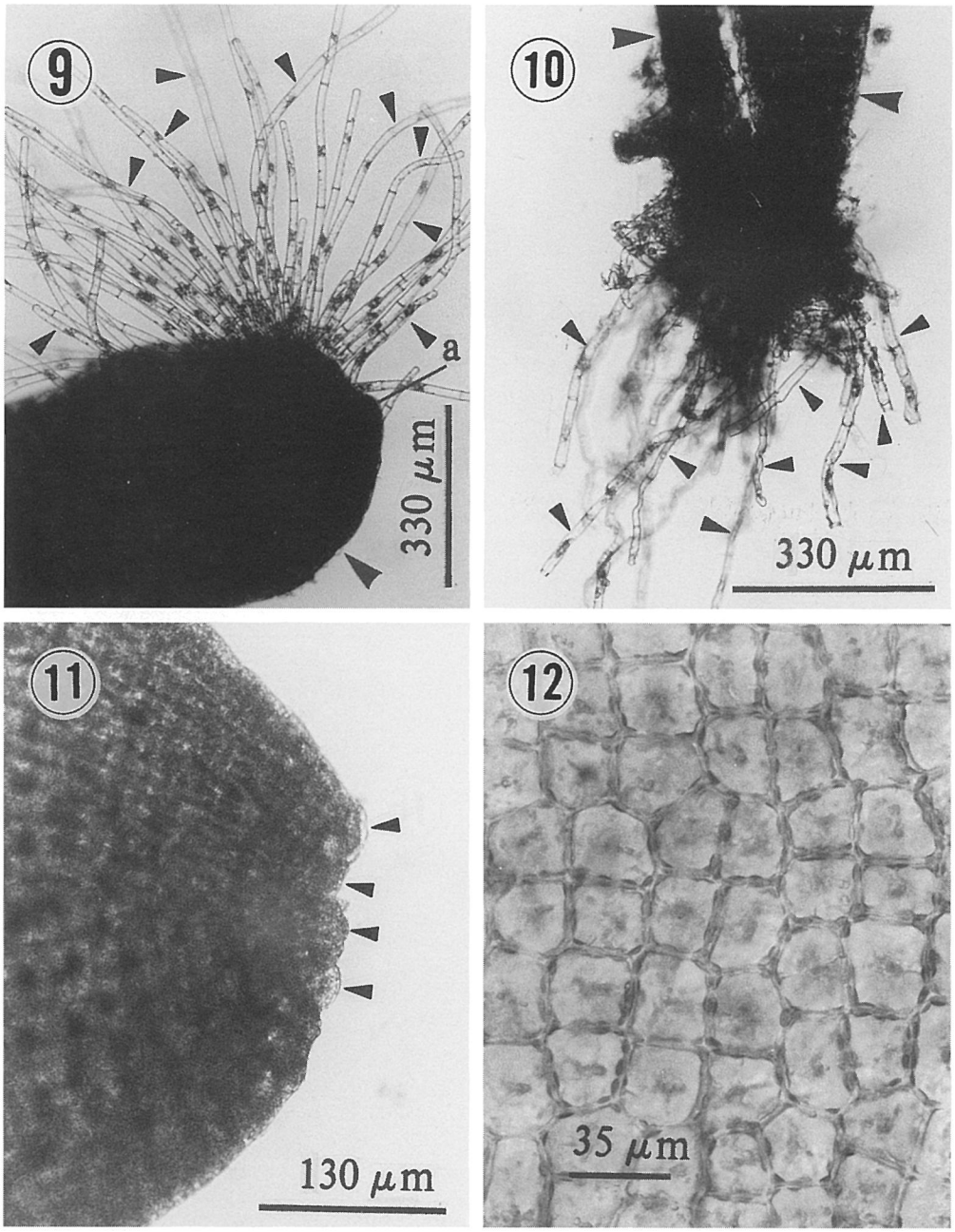
Figs. 5−8. *Padina arborescens* HOLMES.

Fig. 5. A slightly compressed young gemma (arrowhead) with an apical cell (a) and a secondary rhizoid (srh), and arising terminally from the primary rhizoid (prh).

Fig. 6. A compressed further developed gemma (arrowhead) with an apical cell (a).

Fig. 7. A compressed young gemma (arrowhead) with an apical cell (a) and arising terminally from the primary rhizoid (prh).

Fig. 8. A compressed further developed gemma (large arrowhead) and a uniserial juvenile gemma (small arrowhead) with an apical cell (a) each.



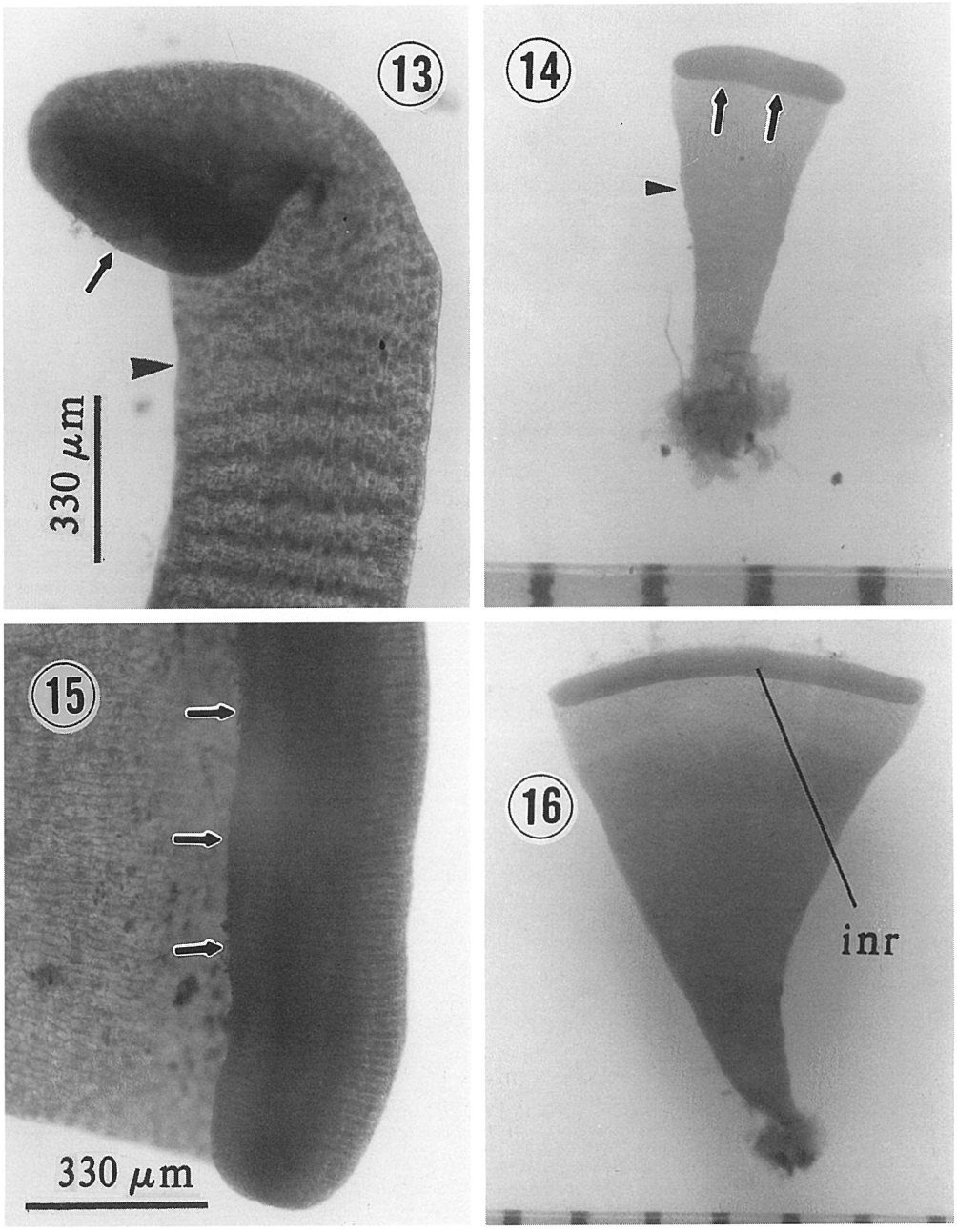
Figs. 9–12. *Padina arborescens* HOLMES.

Fig. 9. Upper part of a compressed young gemma (large arrowhead) with an apical cell (a), showing a tuft of trichoblasts (small arrowheads) arising from the surface.

Fig. 10. Proximal part of the gemma in Fig. 9, showing some secondary rhizoids (arrowheads).

Fig. 11. Distal part of a flattened developing gemma, showing four meristematic cells (arrowheads).

Fig. 12. Enlarged middle part of the monostromatic gemma in Fig. 11, showing the cells in surface view.



Figs. 13–16. *Padina arborescens* HOLMES.

Fig. 13. Upper part of a developing gemma (arrowhead), showing marginal meristem circinately inrolled towards the ventral side (arrow).

Fig. 14. Spatulate developing gemma (arrowhead), showing marginal meristem circinately inrolled towards the ventral side (arrows).

Fig. 15. Enlarged distal part of the gemma in Fig. 14, showing part of the marginal meristem circinately inrolled towards the ventral side (arrows).

Fig. 16. Developing fan-shaped gemma with the extending marginal meristem circinately inrolled towards the ventral side (inr).

Table 1. Comparison of dictyotaceous species on the position of vegetative propagation.

Species	Position	Reference
Padina arborescens HOLMES	On rhizoids	Present study
Dictyopteris undulata HOLMES	On blades	KAJIMURA, 1995 (b)
Stypopodium zonale (LAMOUROUX) PAPENFUSS	On rhizoids	KAJIMURA, 1995 (b)
Spatoglossum pacificum YENDO	On blades and rhizoids of sporelings	KUMAGAE, 1972; KAJIMURA, 1995 (a)
Padina japonica YAMADA	On rhizomes	KAJIMURA, 1994
Dictyopteris prolifera (OKAMURA) OKAMURA	On rhizoids	KAJIMURA, 1994
Dictyota linearis (C. AGARDH) GREVILLE	On blades	KAJIMURA, 1994
Padina crassa YAMADA	On rhizoids	KAJIMURA, 1993
Dilophus okamurae DAWSON	On blades	KAJIMURA, 1992
Zonaria flabellata (OKAMURA) PAPENFUSS	On rhizoids	KAJIMURA, 1992
Distromium decumbens (OKAMURA) LEVRING	On blades and rhizoids	KAJIMURA, 1986
Pachydictyon coriaceum (HOLMES) OKAMURA	On blades	KUMAGAE, 1977
Zonaria diesingiana J. AGARDH	On blades and rhizoids	KUMAGAE, 1977
Dictyopteris divaricata (OKAMURA) OKAMURA	On rhizoids	TOKIDA, *et al.*, 1953
Dictyota dichotoma (HUDSON) LAMOUROUX	On blades	HOYT, 1907
Padina pavonica (LINNAEUS) THIVY	On rhizomes	REINKE, 1878

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