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Vegetative Propagation in *Dictyopteris latiuscula* (Dictyotaceae, Phaeophyta)*

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Abstract Results of the present writer's observations on vegetative propagation occurred in *Dictyopteris latiuscula* (Okamura) Okamura (Dictyotaceae, Phaeophyta) in nature are presented in this report.

Vegetative propagation in *Dictyopteris latiuscula* occurred both from the blade and from the adventitious rhizoid. Juvenile gemmae were cylindrical to subcylindrical and then became a little compressed and underwent apical growth. Thereafter they became the flattened and spatulate by replacing the apical cell to the marginal meristem, and the gemmae further developed into the typical dichotomously branched thallus with a prominent midrib and many proximal secondary rhizoids. Vegetative propagation of this species occurred in early September in the Oki Islands.

Key words: *Dictyopteris latiuscula*; Dictyotaceae; Phaeophyta; vegetative propagation.

Introduction

Vegetative propagation has not been reported for *Dictyopteris latiuscula* since it was described. This species is growing commonly in deep water in the Oki Islands, the Sea of Japan, and this time the present writer could detect the vegetative propagation of it occurred in nature.

Materials and Methods

Abundant material specimens of *Dictyopteris latiuscula* were collected for this study with a steel dredge designed by the present writer at 8 m depth off Tsudo, the Oki Islands on September 7, 1995. All of the material plants were transported to the laboratory from the collection site in seawater buckets by boat in *ca.* 30 minutes, and immediately examined. Sections were made by hand for the anatomical observations.

Observations

Dictyopteris latiuscula (Okamura) Okamura 1907: 59, pl. 14, figs. 1-4 as *Haliseris latuscula;* 1932 : 75.

Vegetative propagation of this species occurred in early September prior to decomposition of the old thallus.

Vegetative propagation occurred both from the midrib of the old blade (Figs. 1, 2) and from adventitious rhizoids (Figs. 3-8) which arose from wounded portions of the old blade. The initial cell of gemmae was usually dome-shaped (Figs. 4, 5) and *ca.* 45 μm in diameter, but the one formed terminally on the adventitious rhizoid was spherical to subspherical (Fig. 3). The gemma was uniserial, cylindrical to subcylindrical and underwent apical growth at juvenile stage of development (Figs. 6, 7). It continued apical growth even after becoming multiserial and compressed. Thereafter gemmae became flattened and spatulate by replacing the apical cell to the marginal meristem occupying almost semicircular distal edge (Figs. 8-10).

Gemmae were still monostromatic at the spatulate stage (Figs. 9-11), then they developed into several-cell-layered tyipcal band-shaped foliose blade with a percurrent midrib (Figs. 12, 15). Then

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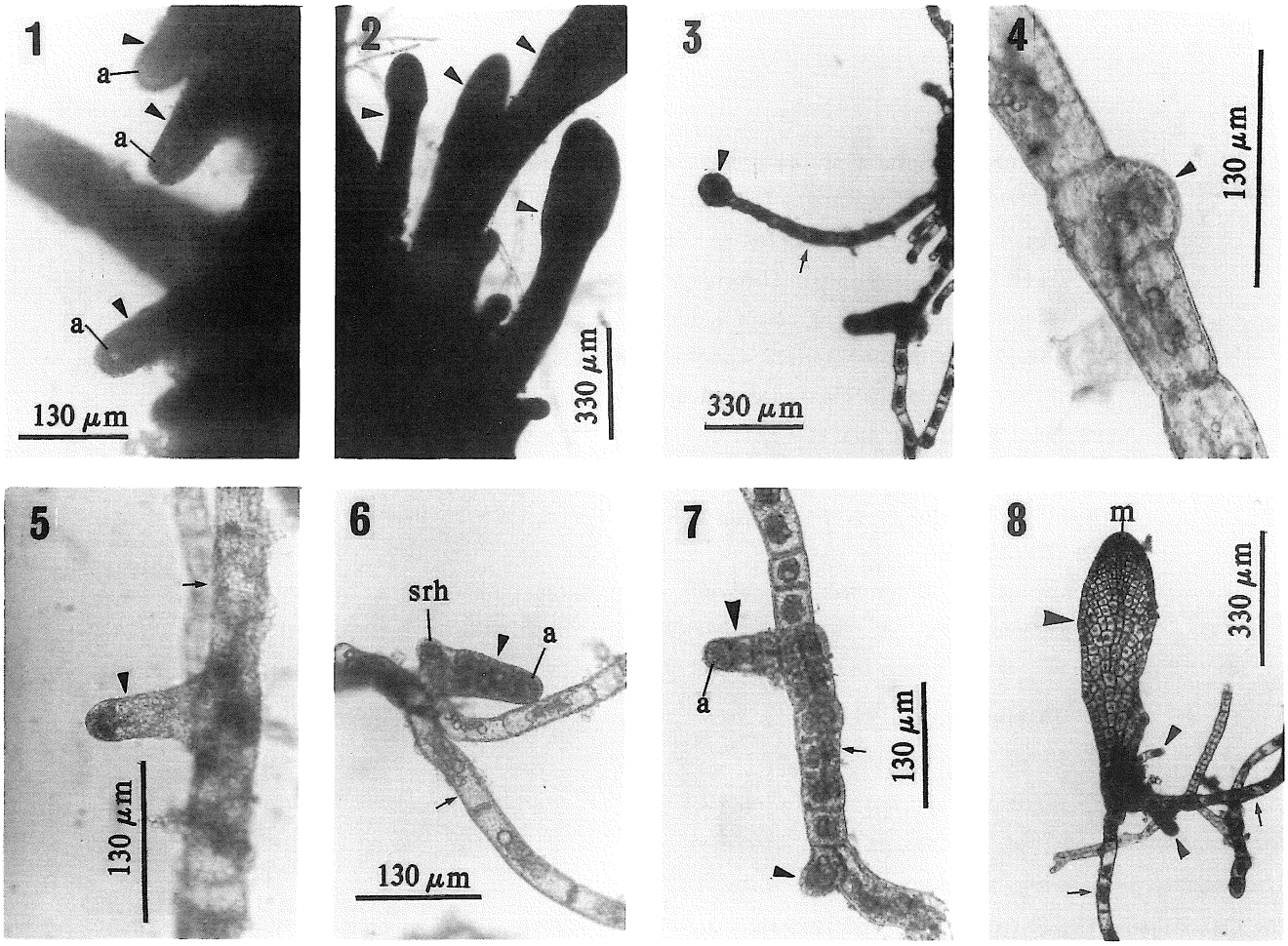


Figs. 1−8. *Dictyopteris latiuscula* (Okamura) Okamura.

Fig. 1. Three juvenile cylindrical gemmae (arrowheads) with an apical cell (a) and arising from the midrib of the old blade.

Fig. 2. Four developing spatulate gemmae (arrowheads) with marginal meristem and arising from the midrib of the old blade.

Fig. 3. A spherical gemma initial (arrowhead) arising terminally from the adventitious rhizoid (arrow).

Fig. 4. An adventitious rhizoidal cell cutting late-rally off an initial cell of gemma (arrowhead).

Fig. 5. An initial cell ofgemma (arrowhead) arising laterally from the adventitious rhizoid (arrow).

Fig. 6. A cylindrical juvenile gemma (arrowhead) arising laterally from theadventitious rhizoid (arrow), with an apical cell (a) and a proximal youngsecondary rhizoid (srh).

Fig. 7. A gemma initial (small arrowhead) and a cylindrical juvenile gemma (large arrowhead) with anapical cell (a), arising laterally from the adventitious rhizoid (arrow).

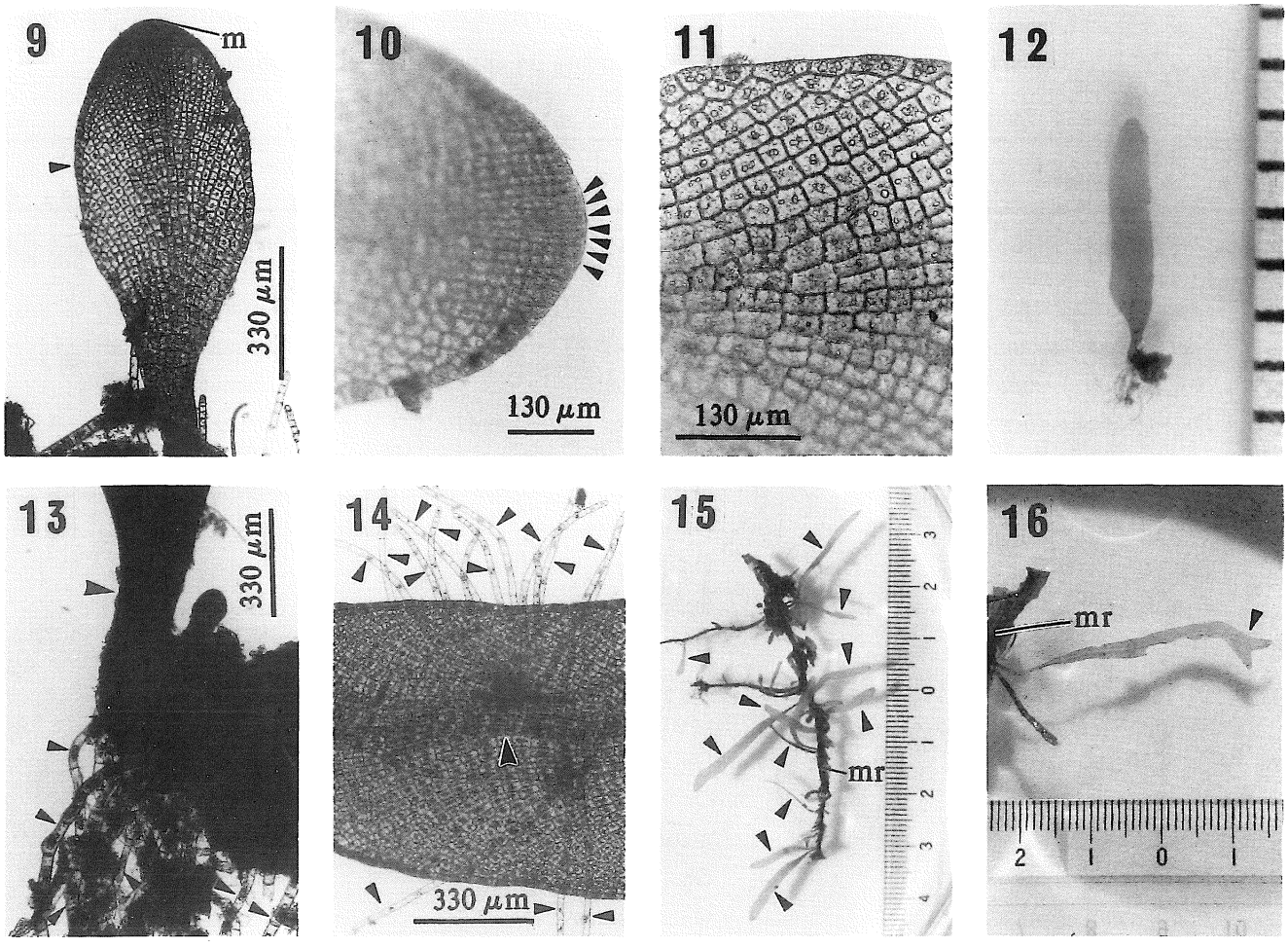
Fig. 8. A developing spa-tulate gemma (large arrô-whead) with marginal meristem (m) and proximal young secondary rhizoids (small arrowhheads), aris-ing laterally from the ad-ventitious rhizoid (arrows)..

they typically dichotomously branched (Fig. 16) and the midrib became prominent. The developing gemmae produced many trichoblasts in tufts (Fig. 14) from the surface and many secondary rhizoids proximally (Figs. 12, 13).

Discussion

Dictyopteris latiuscula (Okamura) Okamura is unique among dictyotaceous species in the production of gemmae both from the blade and from adventitious rhizoids (Table 1).

Namely, those six species produce gemmae solely from rhizoids, such as *Padina arborescens* Holmes (Kajimura 1996), *Stypopodium zonale* (Lamouroux)



Figs .9−16 *Dictyopteris latiuscula* (Okamura) Okamura.

Fig. 9. A developing spatulate monostromatic gemma (arrowhead) with marginal meristem (m) and arising from the adv-entitious rhizoid.

Fig. 10. Distal part of the gemma in Fig. 9, showing some meristematic cells (arrowheads).

Fig. 11. Middle part of the gemma in Fig. 9, showing cell arrangement in surface view.

Fig. 12. Further developed gemma formed from the midrib of the old blade.

Fig. 13. Basal part of the gemma in Fig. 12, showing a stipe (large arrowhead) and some secondary rhizoids (small arrowhea-ds).

Fig. 14. Middle part of the gemma in Fig. 12, showing a midrib (large arrowhead) and many trichoblasts (small arrowheads)arising from its surface in tufts.

Fig. 15. Some further developed gemmae (arrowheads) arising from the midrib (mr) of the old decomposing blade.

Fig. 16. A further developed gemma arising from the midrib (mr) of the old blade and with a terminal dichotomy (arrowhead).

Papenfuss (Kajimura 1995b), *Dictyopteris prolifera* (Okamura) Okamura (Kajimura 1994), *Padina* crassa Yamada (Kajimura 1993), *Zonaria flabellata* (Okamura) Papenfuss (Kajimura 1992) and *Dictyopteris divaricata* (Okamura) Okamura (Tokida *et al.* 1953).

Vegetative propagation occurs solely from the blade in those five species such as *Dictyopteris undulata* Holmes (Kajimura 1995b), *Dictyota linearis* (C. Agardh) Greville (Kajimura 1994), *Dilophus okamurae* Dawson (Kajimura 1992), *Pachydictyon coriaceum* (Holmes) Okamura (Kumagae 1977) and *Dictyota dichotoma* (Hudson) Lamouroux (Hoyt 1907).

Those two species produce gemmae both from the blade and from the rhizoid, such as *Distromium decumbens* (Okamura) Levring (Kajimura 1986) and *Zonaria diesingiana* J. Agardh (Kumagae 1977).

Those two other species produce gemmae solely

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

Species	Position	Reference
Dictyopteris latiuscula	On blades and adventitious rhizoids	Present study
Padina arborescens	On rhizoids	Kajimura 1996
Dictyopteris undulata	On blades	Kajimura 1995b
Stypopodium zonale	On rhizoids	Kajimura 1995b
Spatoglossum pacificum	On blades and rhizoids of sporelings	Kumagae 1972; Kajimura 1995a
Padina japonica	On rhizomes	Kajimura 1994
Dictyopteris prolifera	On rhizoids	Kajimura 1994
Dictyota linearis	On blades	Kajimura 1994
Padina crassa	On rhizoids	Kajimura 1993
Dilophus okamurae	On blades	Kajimura 1992
Zonaria flabellata	On rhizoids	Kajimura 1992
Distromium decumbens	On blades and rhizoids	Kajimura 1986
Pachydictyon coriaceum	On blades	Kumagae 1977
Zonaria diesingiana	On blades and rhizoids	Kumagae 1977
Dictyopteris divaricata	On rhizoids	Tokida, *et al.* 1953
Dictyota dichotoma	On blades	Hoyt 1907
Padina pavonica	On rhizomes	Reinke 1878

from the rhizome, such as *Padina japonica* Yamada (Kajimura 1994) and *Padina pavonica* (Linnaeus) Thivy (Reinke 1878).

Only in *Spatoglossum pacificum* Yendo (Kumagae 1972; Kajimura 1995a) gemmae are uniquely produced both from the blade of sporelings and from the secondary rhizoid of sporelings.

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