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MITOSIS IN THE SPORANGIUM OF *LAMINARIA YEZOENSIS* MIYABE

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Laminaria yezoensis Miyabe is known from Hokkaido (Miyabe, 1902, 1957; Kanda, 1938), the Kurile Islands (Miyabe, 1902, 1957; Miyabe & Nagai, 1933; Yamada, 1935; Kawabata, 1936; Nagai, 1940), and Kamchatka (Arwidsson, 1932). In Japanese waters it grows along the coasts of Kushiro and Nemuro Provinces in Hokkaido. It has never been treated cytologically to date, so I attempted to study the mitosis in the zoosporangium of this kelp with the single mature specimen which I was fortunate to collect on the 2nd of December, 1954, from among the seaweeds cast ashore at Daikoku-jima, an islet off Tokotan, Akkeshi-machi, Kushiro Province.

The mature portion of the blade was fixed in the same way as described in my former report (Yabu, 1964) with a mixture of Tahara's fluid and 40% formalin mixed in 1:2 ratio with a satisfactory result.

The zoosporangial sori are formed on both surfaces of the blade. The sporangium is usually developed from the meristoderm in just the same way as described in *Arthrothamnus bifidus* (Yabu & Tokida, 1963). However, I happened to observe in the present species again such an abnormal structure of the zoosporangial sori as I discovered and described in my preceding paper (Yabu, 1965) on *Laminaria angustata* var. *longissima* Miyabe.

The resting nucleus in a young sporangium usually contains one nucleolus, rarely two (Figs. 4 & 5). Figs. 6 & 7 show the synapsis and the spireme stage respectively. In late diakinesis the nucleolus disappears and in metaphase the nuclear membrane becomes obscure. The maximum number of chromosomes counted in the polar view of the metaphase was about 30 (Figs. 9 & 10). In the side view of the metaphase, a minute centrosome-like body is rarely seen at each pole of the spindle (Fig. 11). After the first nuclear division is finished, four successive divisions follow, and eventually 32 daughter nuclei are formed in a sporangium (Fig. 16). Finally small portions of the cytoplasm, each containing one daughter nucleus and one chromatophore, become bordered by a cytoplasmic membrane to produce 32 zoospores in each sporangium.

Summary

In *Laminaria yezoensis* Miyabe it has been established that the haploid chromosome number is about 30 and that 32 zoospores are formed in each sporangium. The abnormal structure of the zoosporangial sori that I first discovered in *Laminaria angustata* var. *longissima* Miyabe is observed again in the present species.

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Explanation of Plates

PLATE I

Laminaria yezoensis Miyabe

Fig. 1. Habit of the single mature specimen that was collected in 1954 and used for the present study. The mature portion of the blade fixed for making preparations was cut in a rectangle from the lower portion of the segment next to the left ($\times 1/7$)



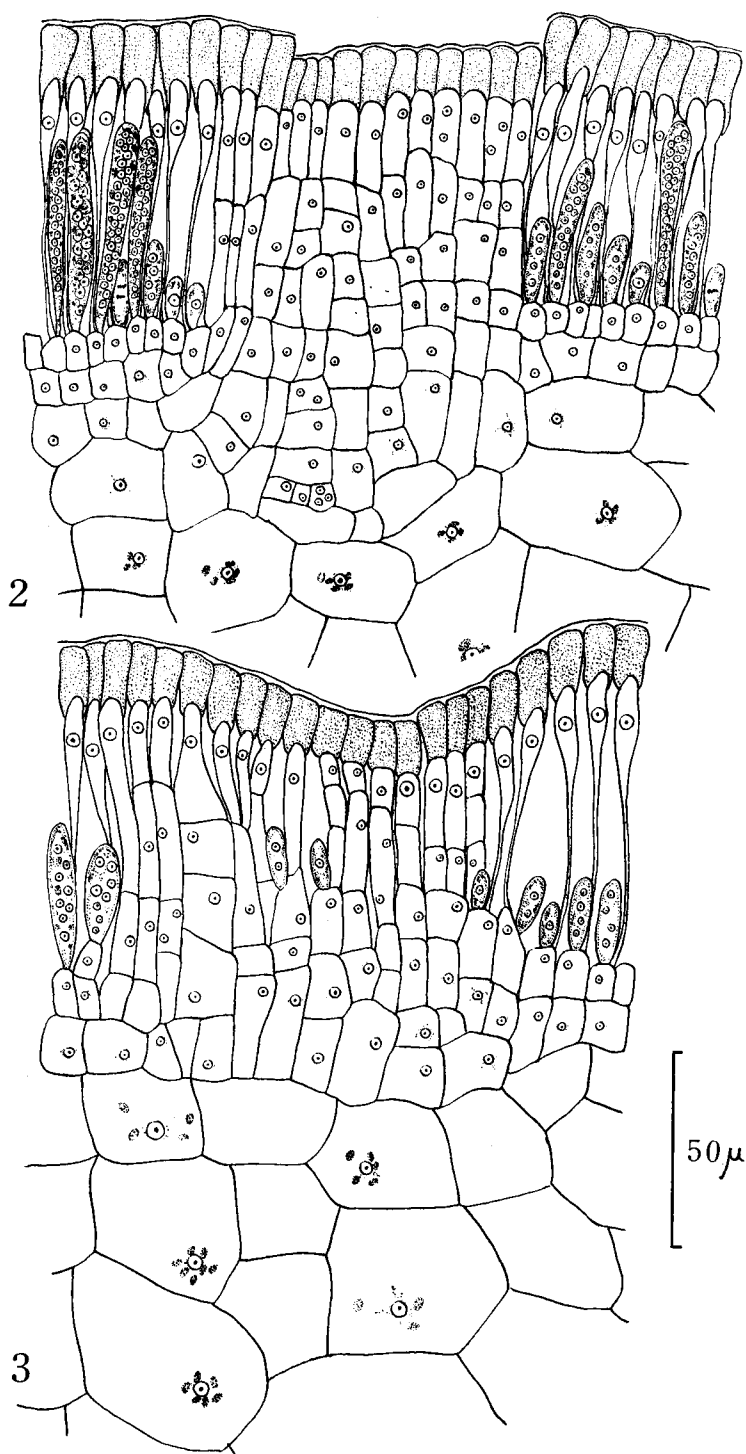
H. Yabu: Mitosis in the sporangium of *Laminaria yezoensis*

PLATE II

Laminaria yezoensis Miyabe

Fig. 2. Section through sporangial sorus on the blade showing multicellular paraphyses developed in the sorus from the abnormal activity of the meristoderm

Fig. 3. Section through sporangial sorus on the blade showing abnormal paraphyses and sporangia



H. Yabu: Mitosis in the sporangium of *Laminaria yezoensis*

PLATE III

Laminaria yezoensis Miyabe

Drawings and photomicrographs in Pls. III-IV show the nuclear divisions and development of zoosporangia

Figs. 4 & 5. Resting stage

Fig. 6. Synapsis

Fig. 7. Spireme

Fig. 8. Diakinesis

Figs. 9-11. Metaphase

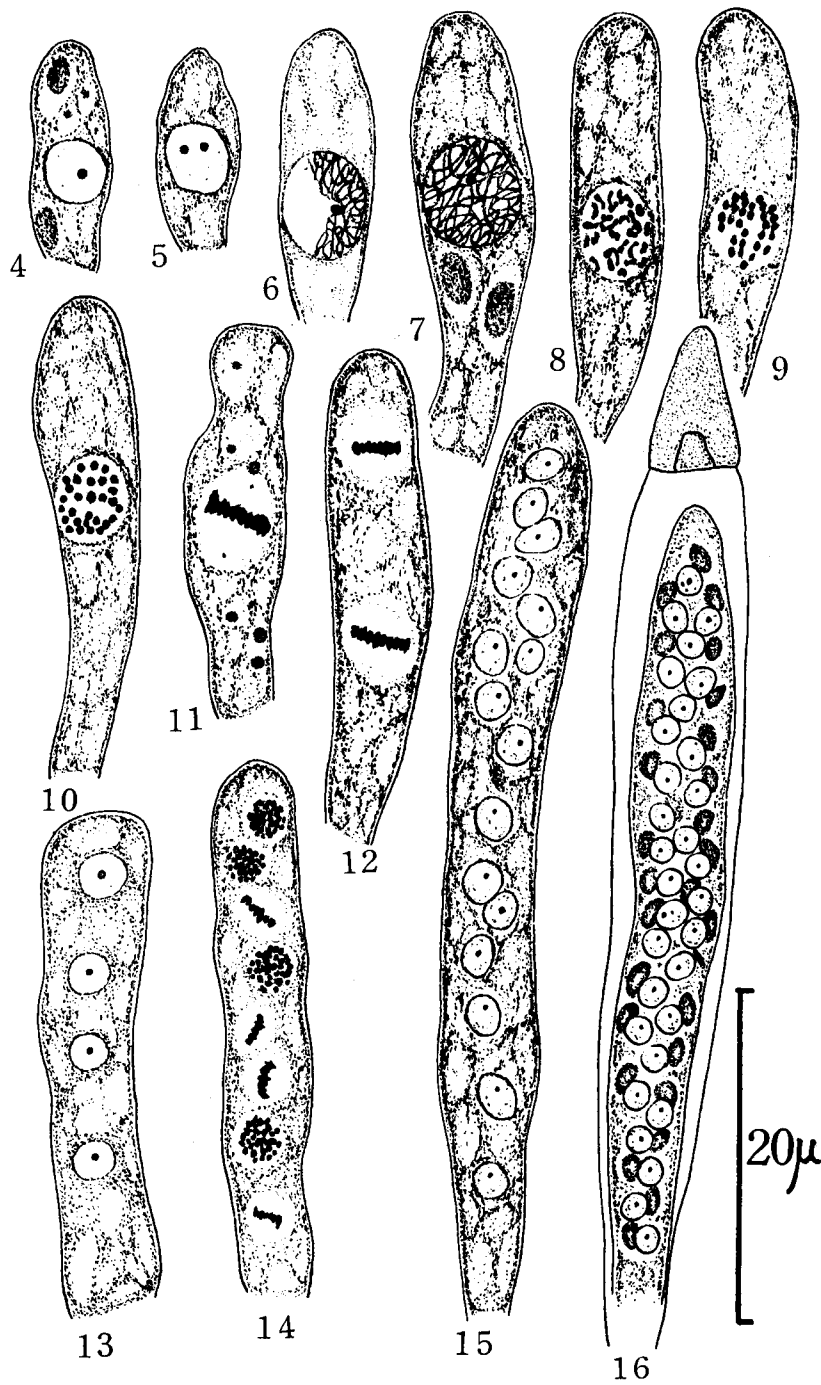
Fig. 12. Metaphase of the second division

Fig. 13. Four-nucleus stage

Fig. 14. Metaphase of the fourth division

Fig. 15. Sixteen-nucleus stage

Fig. 16. Thirty-two-nucleus stage



H. Yabu: Mitosis in the sporangium of *Laminaria yezoensis*

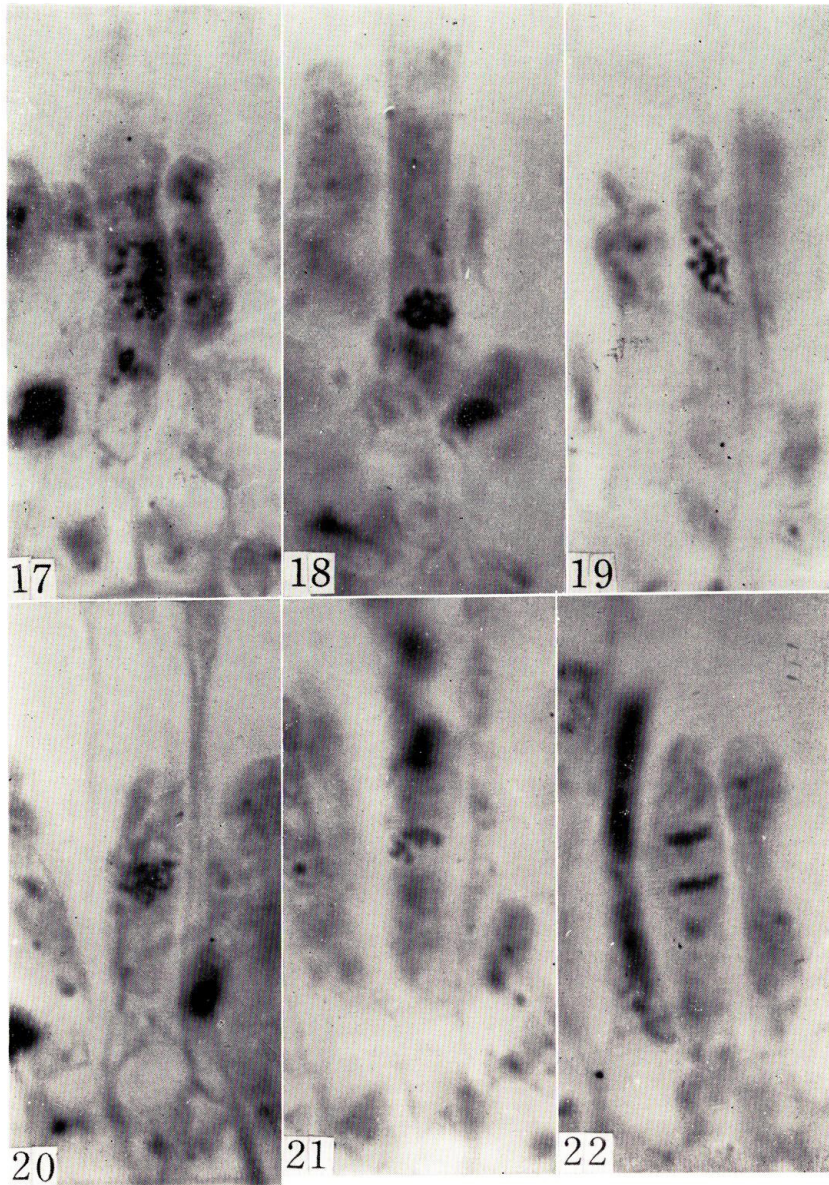
PLATE IV

Laminaria yezoensis Miyabe

Figs. 17-21. Metaphase

Fig. 22. Anaphase

(Figs. 17-22, $\times 1470$)



H. Yabu: Mitosis in the sporangium of *Laminaria yezoensis*