

Hiroshi Yabu and Hajime Yasui: Chromosome number in four species of *Laminaria* (Phaeophyta)

Key Index Words: chromosome number—*Laminaria angustata*—*Laminaria japonica*—*Laminaria ochotensis*—*Laminaria religiosa*—Phaeophyta.

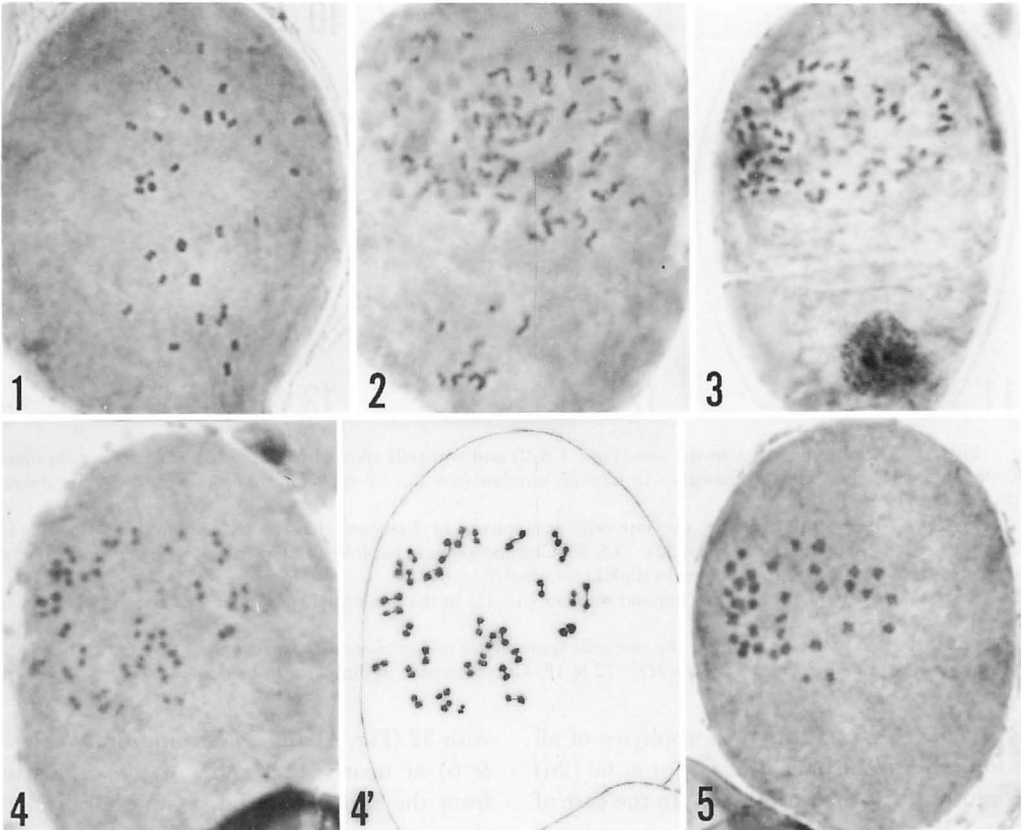
Hiroshi Yabu and Hajime Yasui, Faculty of Fisheries, Hokkaido University, Hakodate, Hokkaido, 041 Japan

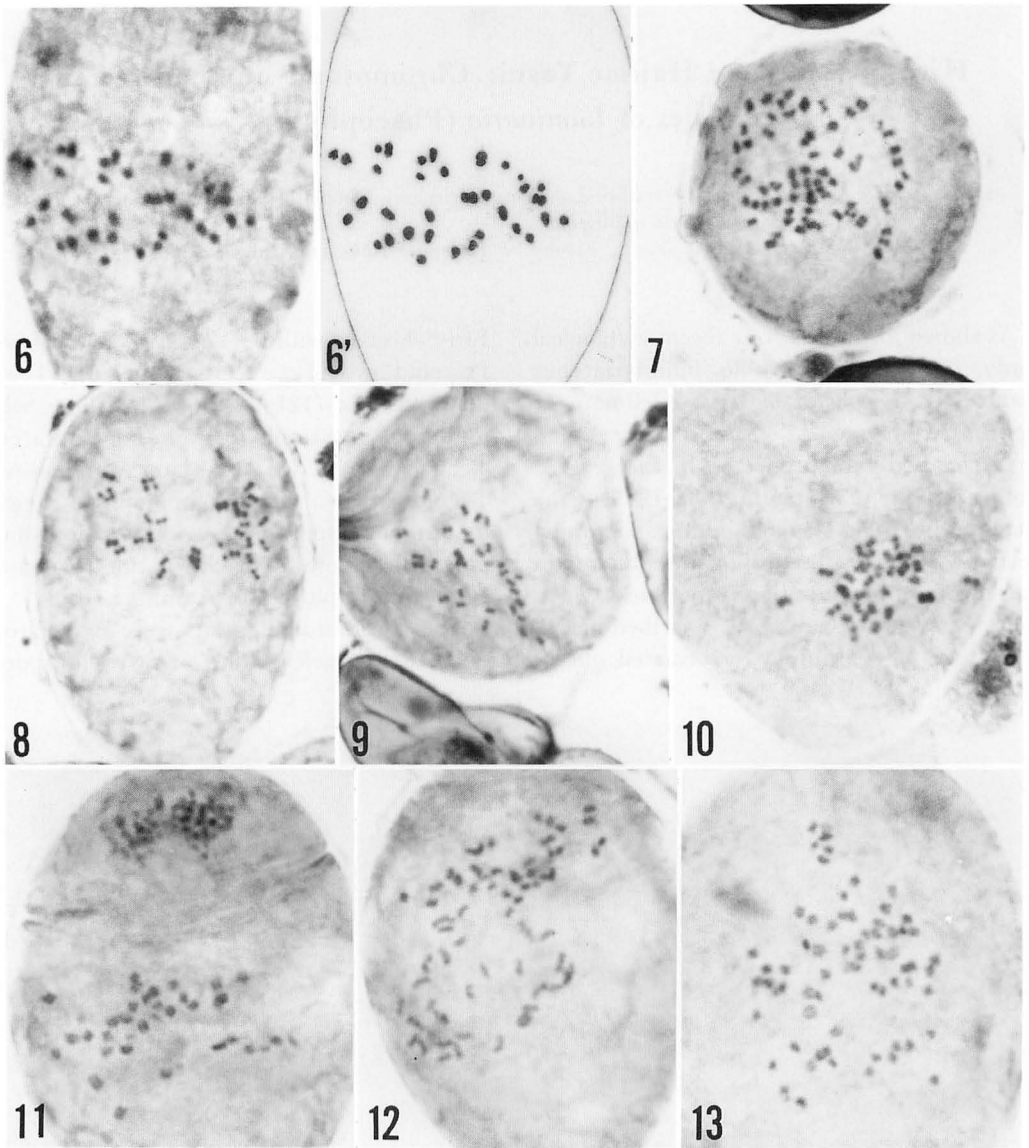
As shown in Table 1, our recent cytological study on the four edible laminariaceous plants, viz. *Laminaria angustata* Kjellman, *L. japonica* Areschoug, *L. ochotensis* MIYABE and *L. religiosa* Miyabe, collected in the seasons from autumn to winter in 1988-1989 at the localities in Hokkaido cited in the table, unexpectedly exhibited the results quite differed in the chromosome number from those which were recorded previously as described here.

Culture of zoospores were carried out in

Erd-Schreiber with 0.01% SLP (Squid Liver Protein Powder) extract (Yabu *et al.* 1984) under 3,000 lux (12L-12D). The slides with numerous gametophytes were put into acetic alcohol (1 : 3) at two weeks later from the start of culture when female gametophytes began to produce sporophytes. Aceto-iron-haematoxylin chloral hydrate solution (Wittman 1965) was employed for staining.

The chromosome counts were made from the dividing nuclei in one- or two-celled sporo-





Figs. 1-3. Chromosomes in the one-(Figs. 1 & 2) and two-cells sporophytes (Fig. 3) of *Laminaria angustata* Kjellman. $\times 1,600$. 1. Chromosomes in haploid number ($n=32$). 2 & 3. Chromosomes in diploid number ($2n=c. 60$).

Figs. 4-7. Chromosomes in the one-cells sporophytes of *Laminaria japonica* Areschoug. $\times 1,600$. 4. Chromosomes in haploid number ($n=32$). 5 & 6. Chromosomes in haploid number ($n=34$). 4' & 6'. Drawing of 4 & 6 respectively. 7. Chromosomes in diploid number ($2n=64$).

Figs. 8 & 9. Chromosomes in haploid number ($n=32$) in the one-celled sporophytes of *Laminaria ochotensis* Miyabe. $\times 1,600$.

Figs. 10-13. Chromosomes in the one-cells sporophytes of *Laminaria religiosa* Miyabe. $\times 1,600$. 10 & 11. Chromosomes in haploid number ($n=32$). 12 & 13. Chromosomes in diploid number ($2n=c. 60$).

phytes (Figs. 1-13). Such sporophytes of all the four species displayed 32 (n) or $c. 60$ ($2n$) chromosomes at the ratio 1 : 5. In the case of *L. japonica*, we met the partheno-sporophytes

with 32 (Fig. 4) and 34 chromosomes (Figs. 5 & 6) at nearly 1 : 1 ratio in the derivatives from the same material. Generally, all the chromosomes in each species show median

Table 1. Chromosome number in four species of *Laminaria* used for this study.

| Species | Locality | Chromosome number | Investigator |
|----------------------------|-----------|-----------------------|----------------------------|
| <i>Laminaria angustata</i> | Muroran | n=22 | Nishibayashi & Inoh (1956) |
| | Muroran | n=22 | Ohmori (1967) |
| | Shikabe | n=22 | Funano (1978) |
| | Mitsuishi | n=22 | Funano (1980) |
| | Usujiri | n=32, 2n=c. 60 | Present study |
| <i>L. japonica</i> | Muroran | n=22 | Abe (1939) |
| | Shikabe | n=22 | Funano (1978) |
| | Usujiri | n=22, 2n=44 | Yabu (1973) |
| | Usujiri | n=32 or 34*, 2n=c. 60 | Present study |
| <i>L. ochotensis</i> | Wakkanai | n=22 | Kaneko (1972) |
| | Kafuka | n=22 | Funano (1978) |
| | Wakkanai | n=32, 2n=c. 60 | Present study |
| <i>L. religiosa</i> | Oshoro | n=22 | Funano (1978) |
| | Oshoro | n=22 | Funano (1983) |
| | Oshoro | n=32, 2n=c. 60 | Present study |

* See text.

constriction.

As the results of our chromosome counts in the numerous sporophytes at this time, we came to a conclusion that the chromosome number of *Laminaria angustata*, *L. japonica*, *L. ochotensis* and *L. religiosa* is normally n=32, although they have been reported all as n=22 until now.

References

- Abe, K. 1939. Mitosen in Sporangium von *Laminaria japonica* Areschoug. Sci. Rep. Tohoku Imp. Univ. Biol. 14: 327-329.
- Funano, T. 1978. Crossing experiments between several species of *Laminaria* in Hokkaido. Jour. Hokkaido Fish. Exper. Sta. 35: 23-42. (in Japanese)
- Funano, T. 1980. Crossing experiments between several species of *Laminaria* in Hokkaido (2). Jour. Hokkaido Fish. Exper. Sta. 37: 181-207. (in Japanese)
- Funano, T. 1983. The ecology of *Laminaria religiosa* Miyabe. 1. The life history and the alternation of nuclear phases of *Laminaria religiosa* and the physiological ecology of the gametophytes and the embryonal sporophytes. Sci. Rep. Hokkaido Fish. Exper. Sta. 25: 61-109.
- Kaneko, T. 1972. Sporogenesis in *Laminaria japonica* var. *ochotensis* Okamura. Sci. Rep. Hokkaido Fish. Exper. Sta. 14: 45-53.
- Nishibayashi, T. and Inoh, S. 1956. Morphogenetical studies in Laminariales. I. The development of zoosporangia and the formation of zoospores in *Laminaria angustata* Kjellm. Biol. Jour. Okayama Univ. 2: 147-158.
- Ohmori, T. 1967. Morphogenetical studies on Laminariales. Biol. Jour. Okayama Univ. 13: 23-84.
- Yabu, H. 1973. Alternation of chromosomes in the life history of *Laminaria japonica* Areschoug. Bull. Fac. Fish. Hokkaido Univ. 23: 171-176.
- Yabu, H., Yasui, H. and Takamoto, M. 1984. *Undaria* gametophytes in culture with SLP (Squid Liver Protein Powder) extract. Bull. Fac. Fish. Hokkaido Univ. 35: 195-200.
- Wittman, W. 1965. Aceto-iron-haematoxylin-chloral hydrate for chromosome staining. Stain Tech. 40: 161-164.

藪 熙・安井 肇：コンブ科植物4種についての染色体数

ミツイシコンブ、マコンブ、リシリコンブ、ホソメコンブについての染色体数は今迄 n=22 とされている。しかし、今回、北海道産のこれらの種について1~2細胞期の幼芽胞体細胞内核分裂で調べた結果、何れの種も n=32 であると見做された。(041 函館市港町3-1-1 北海道大学水産学部)

