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OBSERVATION ON CHROMOSOMES IN SOME
SPECIES OF *PORPHYRA* III

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The present paper reveals the chromosome number and the length of the chromosomes in four species of leafy thalli of *Porphyra* collected in Hokkaido, viz., *P. katadai*, *P. kinositai*, *P. onoi* and *P. tasa*. Out of these four species examined here, *P. kinositai* and *P. tasa* have never been treated cytologically up to date. The materials were fixed at night with acetic alcohol (1:3) solution and they were stained with Wittmann's aceto-iron-haematoxylin-chloral hydrate solution.

I am greatly indebted to Dr. E. Fukuhara of the Hokkaido Fisheries Research Laboratory for his kind support in the collection of the materials and in the determination of the specific names. I am also grateful to Mr. T. Kaneko of the Wakkanai Fisheries Experimental Station and Mr. I. Kosaka of the Marine Biological Station of Sapporo Medical College for sending me the fixed materials.

Results

In every species, the dividing nuclei were found to be abundant in the nearly matured male portion and not so many in somatic cells or in female portion. Similarly to the results of observation in my preceding studies on *Porphyra* (Yabu, 1969, 1970, 1971), the materials treated here show a difference in their chromosome

Table 1. Chromosome number examined in four species of leafy thalli of *Porphyra* and length of chromosome in prophase nucleus

Species (collecting place and date)	Chromosome number	Chromosome length	
		long	short
<i>P. katadai</i> (Yoichi, February 24, 1971)	spermatium formation 5	1	4
	carpospore formation 10		
<i>P. kinositai</i> (Utasutsu, February 24, 1971)	somatic division 3	1	2
	spermatium formation 3	1	2
	carpospore formation 6	2	4
<i>P. onoi</i> (Oshoro, April 27, 1969)	somatic division 3	1	2
	spermatium formation 3	1	2
	carpospore formation 6	2	4
<i>P. tasa</i> (Washidomari in Rishiri, May 15, 1971)	spermatium formation 3	1	2

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length usually in the prophase nucleus. Table 1 contains a summary of the results of this study.

Porphyra katadai was recently reported as a new species by Miura (1968) on the basis of its morphological and ecological characters. The chromosome counts of this species were already given by Kito (1966) to be $n=4$ and $2n=8$ in the thalli collected at the estuary of Nagata River in Shimonoseki City, Yamaguchi Prefecture. In my materials, the chromosome number was $n=5$ and $2n=10$, and one chromosome out of five at prophase in the spermatium forming cells appeared to be a little longer than the other four. The present species is quite similar to the chromosome number and to the karyotype in having one long and four short chromosomes at prophase in the spermatium forming cells of the species of *Porphyra* cited in my former report (Yabu, 1970) as *P. sp. no. 2* from Uwano, Noto Peninsula in Ishikawa Prefecture.

P. kinositai was reported at first as a variety of *P. yezoensis* by Tanaka (1952) and was recently described as a new species by Fukuhara (1968). The chromosome number of this species was $n=3$ and $2n=6$.

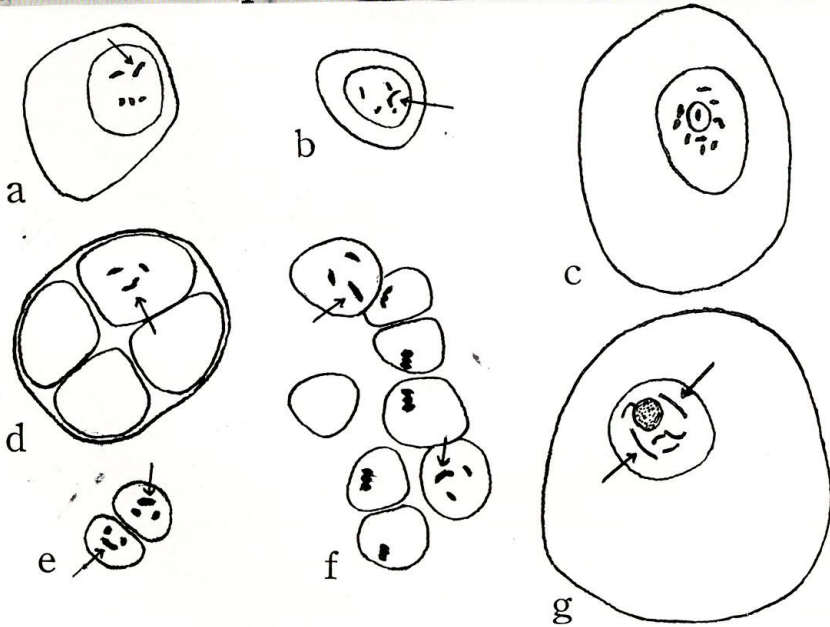
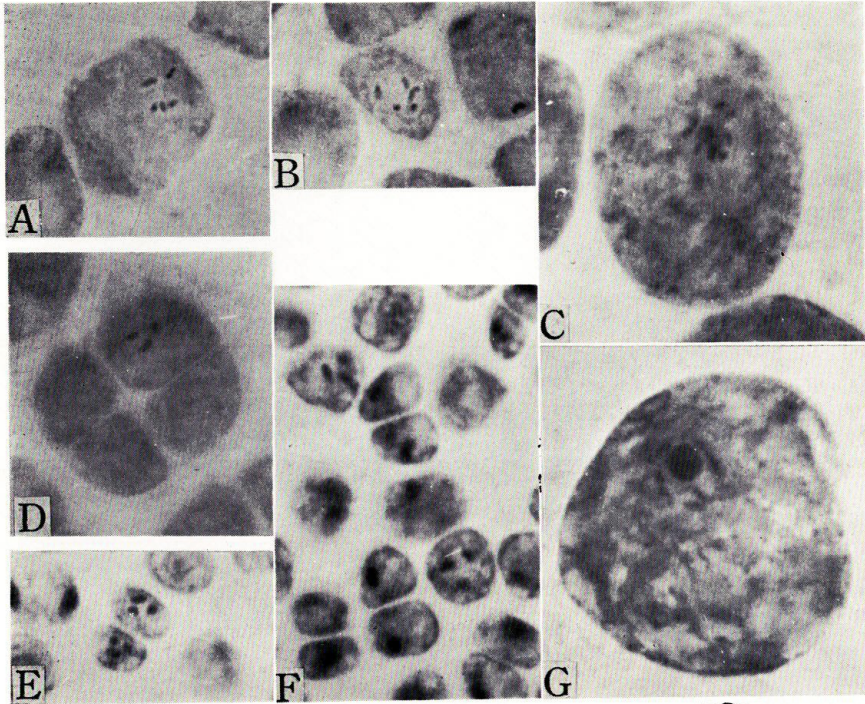
P. onoi was once treated cytologically by Yabu and Tokida (1963) who found 3 chromosomes in the vegetative cells and spermatium forming cells of the leafy thalli. In this study, the same chromosome number of 3 was also observed in those cells, and moreover, it was ascertained that the dividing nuclei in every cell stage leading to the carpospore formation displayed 6 chromosomes.

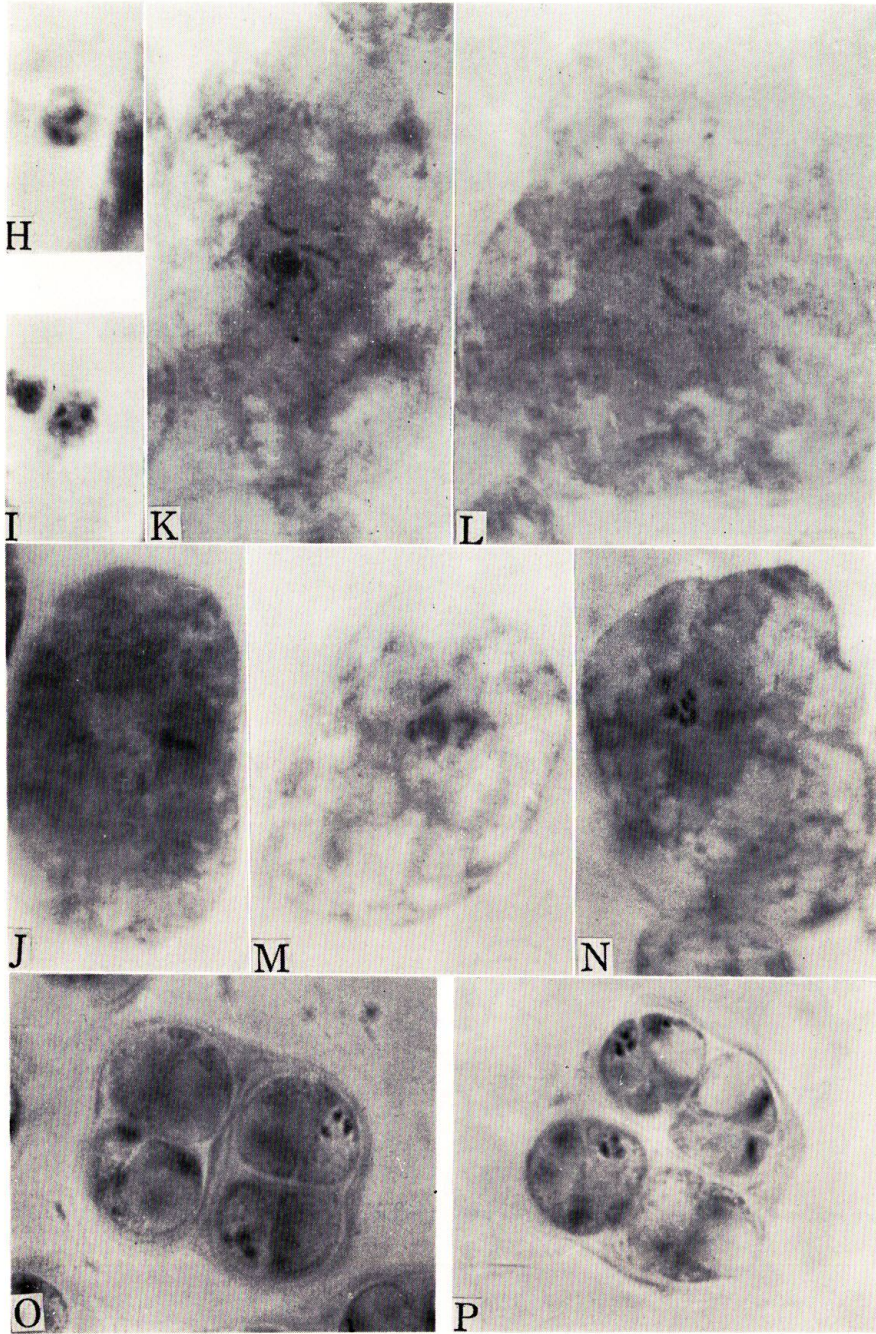
The dividing nuclei of *P. tasa* were encountered only in male portions in which the chromosomes were found to be 3 in number.

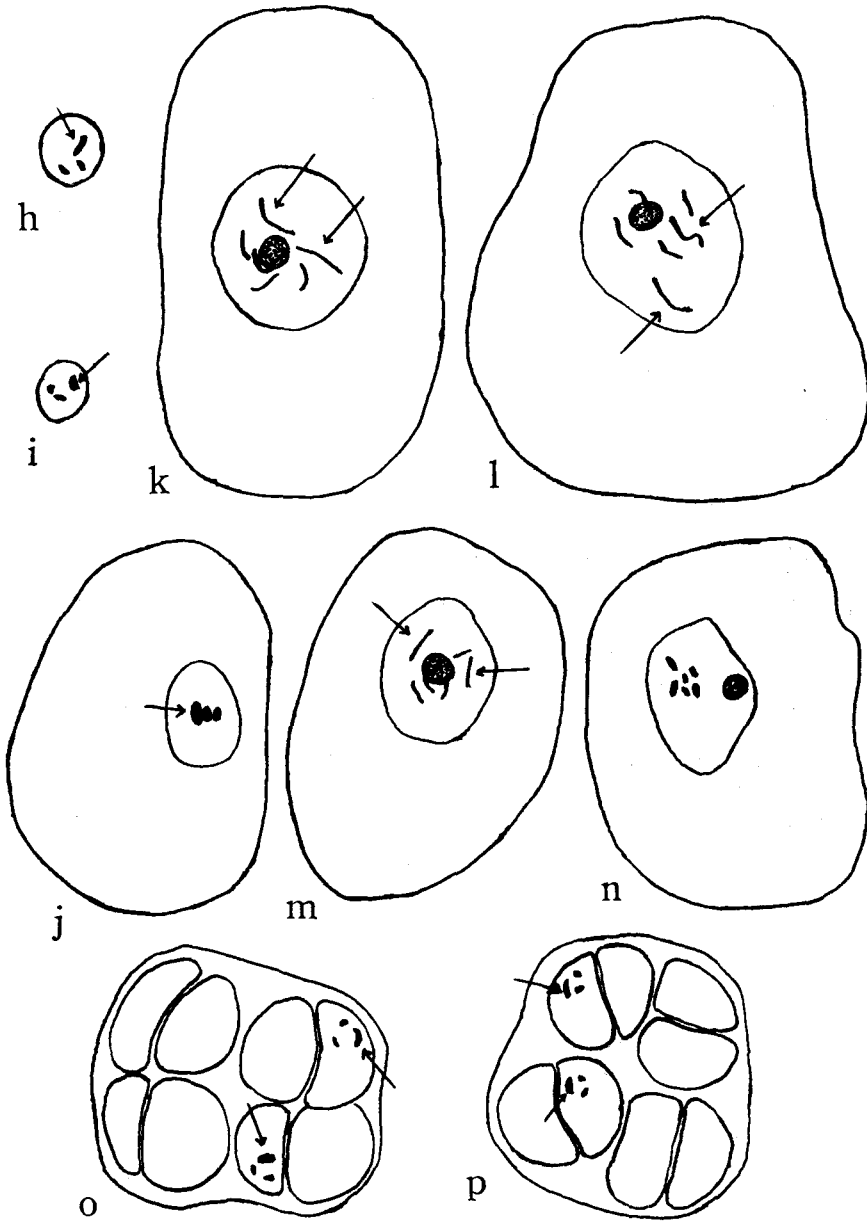
In the spermatium forming cells of *P. kinositai*, *P. onoi* and *P. tasa*, the long chromosome which appeared in the prophase nucleus could be distinguished from the others far more easily than in those of *P. katadai*, and it was usually distinguishable even at metaphase, as can be seen in Figs. A-F, H-I and O-P. These three

Explanation of Figures: Fig. A-C. *Porphyra katadai*. —Fig. A-B. Chromosomes at early metaphase in spermatium forming cells. —Fig. C. Chromosomes at late prophase in the first division leading to carpospore formation. —Fig. D-G. *Porphyra kinositai*. —Fig. D. Chromosomes at early metaphase in the third division leading to spermatium formation. —Fig. E. Chromosomes at early metaphase in spermatium forming cells. —Fig. F. Various stages of nuclear divisions in spermatium forming cells. —Fig. G. Chromosomes at prophase in the first division leading to carpospore formation. —Fig. H-N. *Porphyra onoi*. —Fig. H-I. Chromosomes at early metaphase in spermatium forming cells. —Fig. J. A side view of metaphase in somatic division. —Fig. K-N. Chromosomes at prophase in the first division leading to carpospore formation. —Fig. O-P. *Porphyra tasa*. Chromosomes at early metaphase in spermatium forming cells. —Fig. a-p. Corresponding drawings of photomicrographs of A-P, respectively. The chromosome pointed by an arrow in Fig. a was easily observed to be curved and to be long under the microscope although it could not be distinguishable in length from one which lies in the left side of the figure. (The long chromosome is pointed by an arrow.)

(Magnification: All $\times 1,450$)







species not only have the same chromosome number of three in haploid like above, but also have the same karyotype of one long and two short chromosomes in haploid.

Summary

The chromosome number and the length of the chromosomes at prophase are shown in four species of *Porphyra* of Hokkaido, viz., *P. katadai*, *P. kinositai*, *P. onoi* and *P. tasa*. The chromosome count of *P. katadai* in the present materials was $n=5$ and $2n=10$ which differs from the previous report of $n=4$ and $2n=8$. The chromosome numbers of *P. kinositai* ($n=3$, $2n=6$) and *P. tasa* ($n=3$) were recorded for the first time.

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