Colophon, Preface, Introduction, Contents

Index to Chromosomes of Japanese Pteridophyta
(1910 - 1996)

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Cover Drawing: Gametic chromosomes in a sporocyte of *Ophioglossum petiolatum* (Ophioglossaceae) showing 510-520 bivalents, the largest chromosome number in Japanese flora examined so far (redrawn from Kurita and Nishida, Bot. Mag. Tokyo 78: 463, 1965).

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Preface

Cytological surveys of Japanese pteridophytes have continued since Yasui described the meiotic behavior of chromosomes in Japanese material of *Salvinia natans* in 1910. During the early half of this century, the chromosome numbers of several Japanese pteridophytes were reported. At that time chromosome numbers were determined using the paraffin sectioning technique, which made interpretation very difficult, although there were several correct reports, e.g., $2n$=22 in *Isoetes asiatica* (Takamine, 1921), n=52 and 104 in *Psilotum nudum* (Okabe, 1929), n=33 in *Isoetes japonica* (Yuasa, 1935), n=22 and $2n$=44 in *Osumunda banksiifolia*, *O. cinnamomea*, and *O. japonica*, and n=40 in *Onoclea orientalis* (Okuno, 1936). Accurate data increased abruptly worldwide since the landmark publication "Problems of Cytology and Evolution in the Pteridophyta" by Manton (1950). She introduced the squash technique that enabled spore mother cells to be flattened and the chromosomes to be counted with complete accuracy. Kurita (1960) was the first Japanese student to use Manton's technique and he determined the chromosome numbers of 24 fern taxa. After Kurita's pioneer work, Kurita (1961-), Hirabayashi (1963-), Mitui (1965-1989), Shimura (1975-), and Sahashi (1979-) determined the meiotic chromosome numbers of many Japanese pteridophytes. Meanwhile Tatuno (1963-1996) and his coworkers determined somatic chromosome numbers and karyotypes using an original technique different from Manton's method, and extensive karyomorphological comparisons were made by Kawakami (1969-) and Takei (1969-). Recently, Matsumoto (1975-), Nakato (1975-), Takamiya (1981-), and Lin (1990-), have determined both the meiotic and the somatic chromosome numbers of various pteridophytes using many individuals within a single taxon. As a result of their efforts, 179 references concerning the cytology of Japanese pteridophytes have been published and the chromosome numbers of 596 of 973 Japanese taxa (61%) have been determined.

Previously, Kurita (1967) and Mitui (1975, 1980, 1986) summarized and cataloged the chromosome numbers of Japanese pteridophytes. Their lists provided important information necessary for pteridological research. Summarized data after 1986 is unavailable, though, because of the sudden death of Dr. Kunio Mitui in 1988. Last year, "Flora of Japan Vol. I. Pteridophyta and Gymnospermae" was published (Iwatsuki *et al.*, 1995) containing comprehensive information of Japanese pteridophytes. From that work a serious need for a new index of chromosome numbers of Japanese pteridophytes, that is, a compilation of all the information on available chromosome counts according to the taxonomical treatments in the "Flora of Japan", became evident. In this index, I summarize the chromosome numbers, ploidy levels, reproductive modes, and localities of Japanese materials examined so far. I hope this index will be useful in promoting further pteridological research.

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Introduction

This index contains all available chromosome numbers and related information on all taxa, species, varieties, forms, hybrids, and unnamed hybrids, included in the "Flora of Japan" (Iwatsuki *et al.*, 1995). All chromosome counts published in standard references are cited here, while unpublished counts are excluded. The names of taxa whose chromosome numbers have been unpublished, though, are listed. Families, genera, and species are listed in alphabetical order under their accepted names following Iwatsuki *et al.* (1995). When chromosome numbers were reported for taxa not cited in Iwatsuki *et al.* (1995), the scientific names follow Iwatsuki (1992), Nakaike (1992), or original papers in which the new taxa were described.

Chromosome numbers cited as "$n=$ " represents the gametic chromosome number recorded at meiosis, "$2n=$ " the somatic chromosome number recorded at mitosis, "$n=$, $2n=$ " both n and $2n$ numbers recorded in a single plant, and "($2n=$)" represents the somatic chromosome number calculated from the meiotic configurations at metaphase I in irregular meiosis.

The basic chromosome number of a genus is determined as the lowest n number known in each genus (Manton and Vida, 1968), and the ploidy level of each taxon is calculated. The basic numbers for non-Japanese taxa are cited from Walker (1985). Out of 596 Japanese taxa whose chromosome numbers are known, 249 (42%) are polyploid, and 80 (13%) include two or three cytotypes within the same taxon (=intraspecific or intravarietal polyploids).

Reproductive modes used in this index are determined by cytological and/or spore evidence. The direct observations of prothallia cultivation of Japanese ferns were summarized in Momose (1967). If the n chromosome number is half the $2n$ number, the taxon reproduces sexually (abbreviated as "sex"). An apogamous taxon, "apo", has the n and $2n$ numbers the same. Plants displaying irregular meiosis, "irr", are sterile. However, the reproductive modes in most homosporous ferns were determined simply by observation of the number of spore mother cells (SMCs) or spores in a sporangium. Sexual homosporous ferns usually have 16 SMCs and 64 spores in a sporangium; apogamous homosporous ferns have eight SMCs and 32 spores (Walker, 1985). This simple method for determining reproductive mode is convenient, although several exceptions are known. For example, species of *Lindsaea*, *Sphenomeris*, and *Tapeinidum* (Lindsaeaceae) have eight SMCs and 32 spores in a sporangium even though they produce sexually (Lin *et al.*, 1993). In another example, apogamous ferns of the Braithwaite scheme (Walker, 1985) contain 16 SMCs and 32 spores in a sporangium. *Neocheiropteris subhastata* (Polypodiaceae) is the only example of such an apogamous fern in the Japanese flora (Takei, 1983a). Because the number of SMCs or spores in a sporangium is not constant in eusporangiate pteridophytes, both n and $2n$ chromosome numbers are needed to determine their reproductive modes. A total of 77 taxa of Japanese pteridophytes (13%) are apogamous.

The names of the sites where materials were collected are abridged. The number of individuals examined in each population is not cited in this index. When the study site was not given in the original reference, the locality was obtained by personal communication with the author whenever possible.

Contents