

NOTES ON THE CHROMOSOME CYTOLOGY OF
SOME RARE, THREATENED, OR ENDANGERED
PLANTS OF TAIWAN (I)¹

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(Received February 17, 1986; Accepted May 15, 1986)

Abstract

Chromosome cytology of 24 rare, threatened, or endangered species in 22 genera belonging to 17 vascular plant families are investigated. Chromosome counts include 9 first reports and 2 reports that differ from all previous studies. Comments are also made concerning the distribution, habitat, and status of wild populations of the plants studied.

Key words: Rare plants; threatened or endangered plants; chromosome number; karyotype; habitat; ecology.

Introduction

The cytological survey of the vascular flora of Taiwan was initiated by Liu *et al.* (1961) who, in their systematic study of Apiaceae, reported chromosome numbers for 23 species. Meanwhile, Chen & Hsu (1961, 1962) studied the meiotic behavior of Taiwan grasses; and Chuang *et al.* (1962) reported chromosome numbers in 98 species of vascular plants of miscellaneous families. Chao *et al.* (1963) and Feung (1965) studied the cytotaxonomy of *Disporum* and *Viscum* respectively, and Shimizu (1965) published a cytotaxonomic note on the *Adenophora* of Taiwan. Hsu, in a series of papers (1967, 1968, 1970, 1971, 1972, 1976), reported chromosome numbers of miscellaneous plant families. More recently, Kuo *et al.* (1972) analyzed the karyotype of 13 gymnosperm species; Chang & Hsu (1974) made a cytotaxonomical study of Taiwan Liliaceae; Wu & Huang (1975) studied the biosystematics of *Salvia*; Chen *et al.* (1977) made a karyotypic study of *Dyosma pleiantha*; and Peng & Hsu (1978) investigated the chromosome numbers

¹ Paper No. 312 of the Scientific Journal Series, Institute of Botany, Academia Sinica, Nankang, Taipei, Taiwan, Republic of China.

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of Asteraceae of Taiwan. Chen (1984) attempted an interspecific hybridization and karyotype analysis of two native *Lilium* species. Chromosomes of Pteridophytes were studied by Chen (1969), Tsai (1972, 1973), and Tsai & Hsieh (1975, 1977, 1978, 1983, 1985).

Despite the efforts of the many authors cited above, it is estimated that to date only approximately 20% of our rich flora has been studied cytologically. Furthermore, many of the published chromosome counts were determined from a single plant. Not a few of the counts are in conflict with those published elsewhere in the literature, and some are manifestly inaccurate either in scientific names used or in the analysis of chromosome number or behavior. It is, therefore, necessary to continue our work in the chromosome cytology of our native flora in order to clarify some of these reports and to provide, eventually, more accurate and comprehensive cytological data for systematic, evolutionary, and applied studies of the vascular plants of Taiwan.

This study represents the first of a series of reports from the senior author's laboratory on the chromosome cytology of the native flora of Taiwan. The present paper deals with 24 rare, threatened, or endangered species. In addition to providing cytological data, comments are made, where appropriate, concerning the distribution, habitat, and status of wild populations of the plants studied.

Materials and Methods

The chromosome studies were made either on pollen mother cells or on root-tips. Materials were obtained either directly from wild populations or from seeds or clonal transplants collected from the field and propagated in the experimental greenhouse of the Academia Sinica, Taipei. Voucher specimens are deposited in the herbarium of the Academia Sinica (HAST).

Flower buds were fixed in a 3:1 (V/V) mixture of 95% ethanol and glacial acetic acid, and were stored in the refrigerator at about 5°C. Prior to study, they were hydrolyzed in 1N HCl for up to 6 minutes, when necessary, and squashed in FLP orcein (Jackson, 1973). Somatic chromosome preparations were obtained from actively growing root-tips that were pretreated for 3-4 hours in 8-hydroxyquinoline, and fixed for at least 5 minutes. The root-tips were then hydrolyzed in 1N HCl for 5-10 minutes at 60°C and squashed in the FLP orcein. Cytological observations were made using a Nikon Biophot research microscope. Except for a few cases, chromosome configurations were documented either with camera lucida drawings or photomicrographs using Kodak Panatomic-X film.

Results and Discussions

Table 1 summarizes the data of our cytological studies in the rare, threatened,

Table 1. Chromosome numbers of rare, threatened, or endangered plant species in Taiwan

Taxon	Chromosome number	Figure	Voucher
ARALIACEAE			
* <i>Aralia taiwaniana</i> Liu et Lu ex Lu	2n=48		Hualien: Mukuashan, 7263.
ARISTOLOCHACEAE			
* <i>Aristolochia zollingeriana</i> Miq.	2n=12	1	Taitung: Lanyu, 6645.
ASTERACEAE			
* <i>Echinops grijisii</i> Hance	2n=32+2B	2	Hsinchu: Hsinchu City, cult., 6394.
<i>Ixeris repens</i> (L.) A. Gray	n=8	12	Taipei: Fulung, 4900.
<i>Ixeris stolonifera</i> A. Gray	2n=16	3	Chiayi: Alishan, 8636.
* <i>Vernonia maritima</i> Merr.	n=9	13	Pingtung: Oluanpi, 5465.
BERBERIDACEAE			
<i>Dyosma pleiantha</i> (Hance) Woodson	2n=12	4	Nantou: Tungpu, 6555.
COMMELINACEAE			
<i>Floscopa scandens</i> Lour.	2n=24	5	Pingtung: Nanjenshan, 5522.
CORNACEAE			
<i>Helwingia japonica</i> (Thunb.) Dietr. ssp. <i>formosana</i> (Kanehira & Sasaki) Hara & Kurosawa	2n=38	6	Nantou: Sunlinksea, 5357.
CYCADACEAE			
* <i>Cycas taiwaniana</i> Carruthers	2n=22	7	Taitung: Hungyeh Village, cult., 9043.
DROSERACEAE			
<i>Drosera burmanii</i> Vahl	n=10	14	Hsinchu: Lienhuashih, 5100.
<i>Drosera indica</i> L.	n=14		Hsinchu: Lienhuashih, 5104.
FABACEAE			
* <i>Bauhinia championii</i> Benth.	2n=28		Miaoli: Shihtan, 4728.
<i>Caesalpinia decapetala</i> (Roth) Alston	2n=24*		Taipei: Nankang, cult., 6448.
* <i>Cassia sophera</i> var. <i>penghuana</i> Liu & Lu	2n=28		Pingtung: Kenting, cult., 5555.
HERNANDIACEAE			
* <i>Hernandia sonora</i> L.	2n=40	8	Pingtung: Kenting, 5471.
ISOETACEAE			
<i>Isoetes taiwanensis</i> Devol	2n=22	9	Taipei: Chihshingshan, 4795.
LILIACEAE			
<i>Lilium speciosum</i> Thunb. var. <i>gloriosoides</i> Baker	2n=24		Taipei: Shihting, 5055.

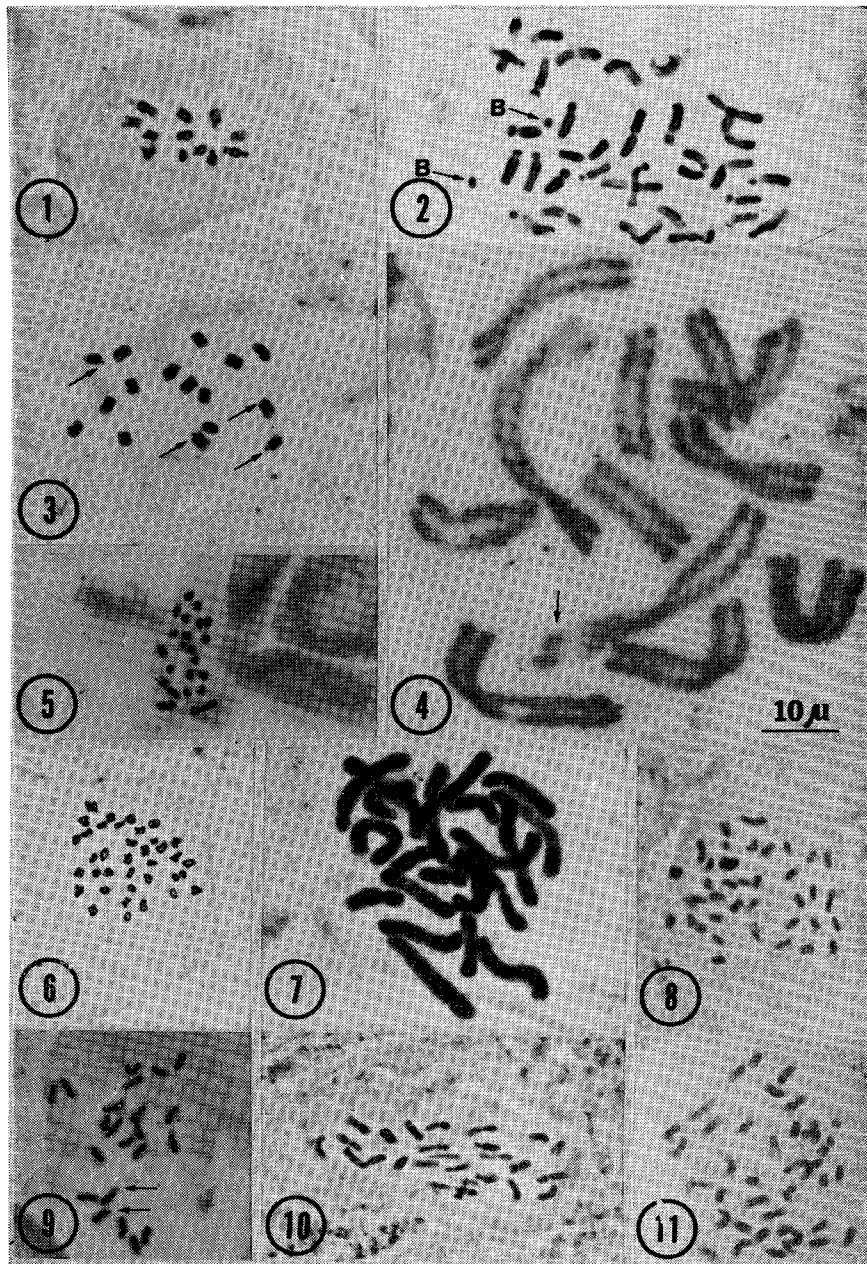
Taxon	Chromosome number	Figure	Voucher
MALVACEAE			
<i>Thespesia populnea</i> (L.) Solad. ex Correa	2n=26	10	Pingtung: Kenting, 5464.
OLEACEAE			
<i>Chionanthus retusus</i> Lindl. & Paxton	n=23*	15	Taipei: Nankang, cult., 4695.
ORCHIDACEAE			
<i>Dendrobium</i>			
<i>victoriae-reginae</i> Loher var. <i>miyakei</i> (Schultr.) Liu & Su	n=19		Taitung: Lanyu, 4880.
<i>Pleione formosana</i> Hayata	2n=40	11	Chiayi: Alishan, 4578.
PHILYDRACEAE			
<i>Philydrum lanuginosum</i> Banks & Soland	n= 8	16	Hsinchu: Lienhuashih, 5135.
THYMELAEACEAE			
* <i>Wikstroemia mononectaria</i> Hayata	2n=18		Taipei: Wulai, 8351.

or endangered plants of Taiwan. Chromosome numbers of 24 species, belonging to 22 genera in 17 families are listed, nine of which represent first counts. Following the practice of the Index to Plant Chromosome Numbers 1982-1983 (Goldblatt, 1985), the use of family names with endings in -ae or -eae (Compositae, Gramineae, etc.) has been abandoned in favor of the standardized -aceae ending. Taxa at all ranks are alphabetically arranged for easy reference. For general discussions on plant chromosome numbers readers are referred to compilations of Fedorov (1969), Moore (1973, 1974, 1977), and Goldblatt (1981, 1984, 1985).

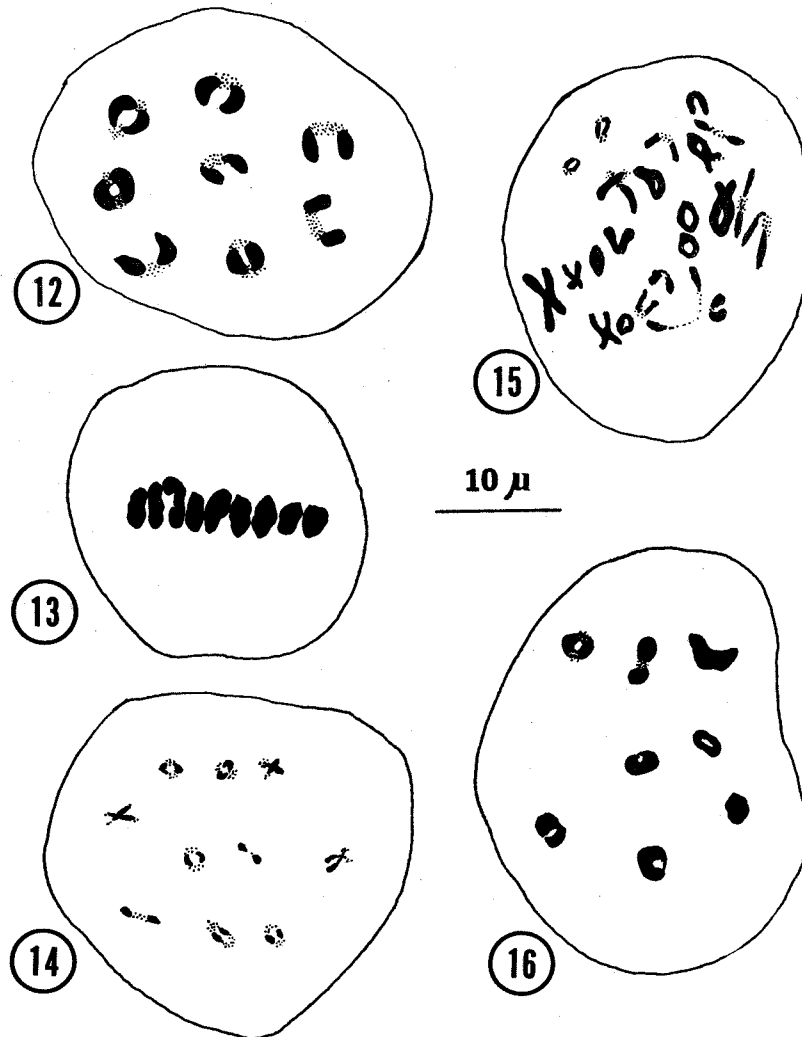
All collection numbers that appear in Table 1 are those of the first author. An asterisk "*" before the taxa indicates that the chromosome number of the taxon has not previously been reported, while an asterisk "*" after the chromosome number signifies that our data differ from all previous reports for the taxon in question. photomicrographs are given in Figures 1-11. Camera lucida drawings are presented in Figures 12-16.

ARALIACEAE

Aralia is a genus of over 30 species, the majority of which are distributed in the Old World. Four species occur in eastern North America (Li, 1952). Of the three species recognized in Taiwan (Li, 1977) the unarmed *Aralia taiwaniana*, which was described recently by Lu (1976), is the rarest, consisting of widely scattered, small populations in the Central Mountain Range. A population from Mukuashan (literally, Mt. Papaya), at about 2,000 m in elevation, was determined as having a somatic chromosome number of $2n=48$. This represents the first



Figs. 1-11. Microphotographs of somatic chromosomes of plant species from Taiwan; all same scale. B=supernumerary chromosome. —1. *Aristolochia zollingeriana*, $2n=12$. —2. *Echinops grijisii*, $2n=32+2B$. —3. *Ixeris stolonifera*, $2n=16$, arrows indicate satellites. —4. *Dyosma pleiantha*, $2n=12$, arrow indicates satellite. —5. *Floscopa scandens*, $2n=24$. —6. *Helwingia japonica* ssp. *formosana*, $2n=38$. —7. *Cycas taiwaniana*, $2n=22$. —8. *Hernandia sonora*, $2n=40$. —9. *Isoetes taiwanensis*, $2n=22$, arrows indicate satellites. —10. *Thespesia populnea*, $2n=26$. —11. *Pleione formosana*, $2n=40$.



Figs. 12-16. Camera lucida drawings of meiotic chromosomes of plant species from Taiwan; all same scale. —12. *Ixeris repens*, $n = 8$, diakinesis. —13. *Vernonia maritima*, $n = 9$, metaphase I. —14. *Drosera burmanii*, $n = 10$, diakinesis. —15. *Chionanthus retusus*, $n = 23$, diakinesis. —16. *Philydrum lanuginosum*, $n = 8$, diakinesis.

chromosome count for the species. With the exception of *A. cordata*, two Korean populations of which were previously determined as having $2n = 18$ and 50, respectively (Lee, 1970, 1972), all of the 12 other species studied previously were based on $X = 12$, having $2n = 24$ or 48. The endemic *Aralia taiwaniana*, therefore, represents an additional tetraploid species in the genus. A majority of Araliaceae that have been studied have a basic chromosome number of $x = 12$, although a few counts based on $x = 9, 10, 11$, and 13 have also been reported (Moore, 1971; Raven, 1975).

ARISTOLOCHIACEAE

Many *Aristolochia* species are cultivated for their curious flower shapes. Although *Aristolochia zollingeriana* is widely distributed in Sumatra, Java, Philippines, Taiwan, and southern Ryukyu (Hou, 1983), it has, in the past, been considered as endemic to Taiwan under the name of *A. kankauensis* Sasaki (Liu & Lai, 1976). In Taiwan, this species is found only at the southern tip of the Hengchun Peninsula as well as on the offshore islet Lanyu (literally, Orchid Island), where it occurs either around villages or on raised coral reefs. Local populations of this plant, and the natural vegetation in which it grows are being threatened by human activities, including cultivation and animal grazing. Furthermore, plants of this species are the main larval food of *Troides aeacus kaguyo* Nakahara & Esaki (Chen, 1985), an elegant endangered butterfly that is much liked by collectors and amateur entomologists. The lower, ripened wood of *Aristolochia zollingeriana* is frequently cut by merchants for vegetative propagation to be used as a food supply for insects being raised for sale (Hsu *et al.*, 1985).

In *Aristolochia*, there are many diploid species with $n=7$, and some aneuploid (to $n=4$) and polyploid derivatives (Raven, 1975). Counts of $2n=12$ (Fig. 1) were determined for *A. zollingeriana*, the chromosome number of which was unknown previously. The ends of the somatic chromosomes appear heterochromatic.

ASTERACEAE

Echinops is an unusual composite genus characterized by having numerous one-flowered heads, each with its own involucre, secondarily aggregated into spherical compound heads. The genus comprises about 100 species widely distributed in eastern Europe, Africa and Asia (Willis, 1974), with *Echinops grijisii* being the only representative in Taiwan. This species was known to occur in foothills around Hsinchu County (Dr. Chin-Te Chang, 1984, pers. comm.), but has become nearly extinct in the wild recently, ever since its roots were reported to have cured bone cancer as well as a few other malignancies. Materials for the present study were obtained from plants in cultivation in the countryside of Hsinchu. Gametic chromosome numbers of $n=13, 14, 15$, and 16 were previously known from plants of this genus (Moore, 1971, 1972; Goldblatt, 1978, 1981, 1983). Our count of $2n=32$ (Fig. 2) is the first for *E. grijisii*. Two supernumerary chromosomes were frequently observed from root-tip preparations. The genome is strongly asymmetrical, consisting of metacentric and acrocentric chromosomes.

Ixeris repens is distributed along the Pacific coast of Asia. In Taiwan it is found as a few isolated, small populations on northern sandy beach as well as on the offshore islet Lutaο (literally, Green Island). This plant has rhizomes with long internodes; only the deeply 3-lobed leaves and the yellow flower-heads rise above the surface. A study of the pollen mother cells of this coastal herb reveals

eight chromosome pairs at diakinesis (Fig. 12), a count that is in agreement with previous reports.

Ixeris stolonifera, a gracile herb with stolons, is distributed in northeastern China, Korea, Japan, Ryukyus, and Taiwan. It was also reported as being adventive in northeastern United States (Alexander, 1942; Moldenke, 1946). In Taiwan, it is known only from two stations, namely, Alishan and Taipingshan, both at middle elevations (Lu, 1978). The population we studied grew along the railway near Shenmu (literally, Sacred Tree), Alishan, about 2,200 m above sea level. Our count of $2n=16$ (Fig. 3) agrees with those of Takemoto (1952) and Lee (1972) based on Japanese and Korean populations, respectively. The karyotype is symmetrical, having metacentric chromosomes of approximately the same size (ca. 1.7-2.2 μm). Satellites were observed in four somatic chromosomes.

Vernonia maritima is an exceedingly rare maritime species known only from raised coral reefs of the southernmost tip of the Hengchun Peninsula of Taiwan and islet Hsiao Lanyu, as well as Batan Island in the Philippines (Hsu *et al.*, 1985). It is distinctive in having involucre bracts that are not reflex when the achenes mature, a character shared with *V. patula*, a more common species in the same section (*Vernonia* sect. *Cyanopsis*) in Taiwan. This feature may have been one of the factors limiting its dispersal. Nine bivalents regularly form in meiosis (Fig. 13). This is the first chromosome count for *V. maritima*.

BERBERIDACEAE

Dysosma is a genus of 7 species occurring exclusively in subtropical montane forest of mainland China and Taiwan. Its range lies between 23° and 32°N latitude and 94° and 122°E longitude, with the center of distribution in central China (Ying, 1979). *Dysosma pleiantha* is the only member of the genus in Taiwan. It used to be commonly encountered on the forest floor in mid-elevations in northern and central Taiwan. In recent years, however, it has become very rare in the field due to excessive exploitation by local merchants for its elegant leaves and flowers. Furthermore, the rhizomes are highly valued for a variety of medical uses. The decoction is especially known as an effective antidote for bites of poisonous snakes and cancers (Kan, 1981; Chiu & Chang, 1983).

A chromosome count of $2n=12$ (Fig. 4) was obtained for this endangered species, confirming previous reports of Miyaji (1930, as *Podophyllum pleiantha*) and Chen *et al.* (1977). Chen *et al.* (1977) observed four metacentric chromosome pairs, the longest of which has a satellite, and one pair each of submetacentric and acrocentric (heteromorphic in some populations) chromosomes in *D. pleiantha*. Our somatic chromosome spread (Fig. 4) was obtained from squashing a flower bud without pretreating with 8-hydroxyquinoline. The chromosomes are very long, ranging from 17-37 μm . The longest chromosome in the complement has a satellite.

The location of the centromeres in most chromosomes, however, is not clear enough to allow detailed karyotypic analysis.

COMMELINACEAE

The genus *Floscopa* contains about 25 species and is centered in tropical Africa, with extensions into Asia and South America (Morton, 1967). Although *Floscopa scandens* is widely distributed in tropical and subtropical Asia, it is rare in Taiwan, known only from a few low, swampy localities. Both a gametic count of $n=12$ and a somatic count of $2n=24$ (Fig. 18) are reported here for the first time from Taiwanese populations. The chromosome complement consists of 22 short (0.8–1.2 μm) and 2 long (2–2.3 μm) chromosomes. The bimodal karyotype in this species has previously been noted by Jones and Jopling (1972), although they observed $2n=54$ from a cultivated plant of *F. scandens* of undesignated origin. Our chromosome counts agree with those of Kammathy and Rao (1961), and Bacquar (1967–1968), for Indian and East Pakistan populations of the same species, respectively. Bhattacharya (1975), and Zaman and Chakraborty (1977), however, reported $n=15$ and $n=11$, respectively, for other Indian populations of *F. scandens*. Recently, a count of $2n=12$, the lowest chromosome number known in *Floscopa*, was reported by Renugadevi & Sampathkumar (1983) for this species. *Floscopa scandens* must be cytologically diverse, if the infraspecific polyploidy and aneuploidy suggested by the above data are all correct.

CORNACEAE

Helwingia is an unusual genus with flowers in sessile umbels that arise from abaxial midrib of the leaves. It consists of three dioecious species distributed from the Himalayas to eastern Asia (Li, 1977). *Helwingia japonica* subsp. *formosana* is an uncommon endemic of Taiwan, occurring in montane forests at middle to high elevations. The present chromosome count of $2n=38$ (Fig. 6) confirms those of Kurosawa (1971, as *H. formosana* Kanehira & Sasaki) for Taiwanese populations from Chitou and from Mt. Nanhutashan. Kurosawa (1971) further indicated that Taiwanese *Helwingia* has the same chromosome number as that of the Himalayan plants, whereas Japanese *Helwingia* is a hexaploid with $2n=\text{ca. } 114$.

CYCADACEAE

Cycas taiwaniana is a relic species in Taiwan and southeastern coastal provinces of the mainland China. It is an elegant garden plant that grows up to 5 meters tall. In Taiwan, it is known only from two localities in Taitung County of the eastern coast, where it occurs on exposed steep sides of rocky river valley at about 400–800 m in elevation. *Cycas taiwaniana* is a very rare species in Taiwan and has, in the past, been threatened greatly from intensive commercial digging

for export. Two natural reserves of about 30 and 300 hectares, respectively, have been established by the government to conserve the only native *Cycas* species of this island (Hsu & Lu, 1984). Nearly all *Cycas* species that have previously been investigated cytologically represent diploids based on $X=11$. We have also observed $2n=22$ (Fig. 7) in *C. taiwaniana*, which represents the first chromosome report for this species. The chromosomes are long, ranging from 6-15.4 μm in length.

DROSERACEAE

Members of this family are all insectivorous. Four species of *Drosera* are known to occur in northern Taiwan in acidic, moist field at low altitudes. The intensive exploitation of lowlands in Taiwan has seriously threatened the habitats of our *Drosera* species. Our chromosome counts of $n=10$ (Fig. 14) for *D. burmanii* and $n=14$ for *D. indica* confirm previous reports (Fedorov, 1969; Moore, 1971; Goldblatt, 1981).

FABACEAE

Bauhinia championii is a woody vine that is distributed in southern China and Taiwan. Its reddish brown wood with a chrysanthemum-like polystele is formed by an anomalous secondary growth resulting from the intensified growth of parenchyma distant from the cambium (Shen, 1960). This growth renders the wood an interesting flower-like appearance in cross section. The "chrysanthemum-flower wood" (*B. championii*) has, therefore, been much sought after for constructing artistic objects as well as for interior decoration. Although it can still be found occasionally in thickets and forests at low altitudes throughout the island, most of the plants are quite juvenile with slender stems. The older, flowering and/or fruiting plants are only rarely observed. Our count of $2n=28$ is the first chromosome report for this threatened species.

Caesalpinia decapetala, another legume species distributed in mainland China, Java, Malaysia, Pakistan, and East Himalaya, was recently found in Taiwan on exposed, gravelly riverside between 300-600 m above sea level (Hsu, 1980). Our count of $2n=24$ does not agree with [the only previous report of $n=11$ given by Malla *et al.* (1977) for *C. decapetala*. The latter report may be erroneous as nearly all of the *Caesalpinia* species that are known cytologically have either $n=12$ or $2n=24$ (Fedorov, 1969; Moore, 1974; Goldblatt, 1978, 1981, 1983).

Cassia sophera var. *penghuana* represents yet another rare legume species that is known only from Penghu (the Pescadores) (Lu, 1979). The somatic chromosome count of $2n=28$ confirms previous reports for the typical variety (Fedorov, 1969; Moore, 1971; Goldblatt, 1978, 1983).

HERNANDIACEAE

Hernandia sonora is widely distributed in the Old World tropics. In Taiwan, it occurs only in the coastal forests of the southernmost peninsula and islet Luta. Our chromosome report of $2n=40$ (Fig. 8) is the first for the species, and represents the lowest chromosome number recorded for the genus.

ISOETACEAE

Isoetes taiwanensis is an endemic species that grows in a shallow, secluded pond on Chihshingshan, an extinct volcanic mountain at an elevation of about 850 m near the northern tip of Taiwan (DeVol, 1972). This pond of less than 500 m² remains the only locality where this endemic *Isoetes* can be found since its discovery in 1971. Ever since news of this rare and unusual plant species was spread, this particular pond has, unfortunately, become a holiday resort for many curious tourists. Pollution as well as the destruction of habitats resulting from the activities of these people (picnicking, camping, etc.) have seriously threatened the small population of *Isoetes taiwanensis*.

DeVol (1972), in his publication of this new species, indicated that *I. taiwanensis* is a diploid with a chromosome number of $2n$ =about 22. The first unambiguous count of $2n=22$ was made by Chang and Hsu (1977), and is confirmed by our observations (Fig. 26). The chromosomes are either metacentric or sub-metacentric, ranging from 2.3–3 μ m in length. A pair of satellited chromosomes is observed. A doubtful octoploid count of $n=44$ was recently reported (Tsai & Shieh, 1983) for the same population that we studied.

LILIACEAE

Lilium speciosum var. *gloriosoides* is distributed in southeastern China, and is very rare in Taiwan, known only on a very few rocky mountain ridges in Taipei County. Plants of this species were frequently collected by merchants and mountain hikers for its unparalleled beautiful flowers. As a result, they can now only be found at precipices too dangerous to reach. Our count of $2n=24$ agrees with all previous reports (Moore, 1974).

MALVACEAE

Thespesia populnea is widely distributed in the tropical regions of the world. In Taiwan, however, it is a rare species found only in scattered populations along the coast of the southern Hengchun Peninsula. The chromosome number of $2n=26$ (Fig. 10) agrees with most of the previous reports. Observations not consistent with our count came from Hazra and Sharma (1971) who reported $n=12$ and $2n=24$, and Dasgupta and Bhatt (1981, 1982) who reported $n=14$ and $2n=28$ for this species.

OLEACEAE

Chionanthus includes several species of deciduous small trees, which represent a typical example of the classic eastern Asia—eastern North America disjunct pattern of distribution (Li, 1952). One of the Asiatic species, *C. retusus*, is widely distributed in mainland China, Korea, Japan, and Taiwan. Although it is a famed ornamental tree in northern Taiwan, wild populations were unknown for nearly half a century and were thought to be extinct. The unexpected rediscovery of this species in the wild, however, was made recently by Lee (1985) who botanized the much developed Linkou terrace tableland of Taipei County. Small scattered populations were found along slope borders or edges of the terrace tableland at an elevation of ca. 200 m. The plants grow in red soil, frequently intermixed with stands of *Acacia confusa* (Hsu & Lu, 1984; Lee, 1985). More recently, an additional small population was found by Mr. Lee and the first author in Hsienjiaoshih, Hsinchu County, in somewhat similar habitat.

The chromosome numbers of both species of *Chionanthus* have previously been studied. Populations of the American *C. virginicus* were previously determined as diploid having $2n=46$ (Sax & Abbe, 1932; Taylor, 1945), whereas a plant possibly of cultivated origin of *C. retusus* from Taiwan was reported as having 46 bivalents in diakinesis (Chuang *et al.*, 1962), apparently a tetraploid count based on $X=23$. Our study on a similarly cultivated plant of *C. retusus* from the campus of the Academia Sinica, Taipei, however, disagrees with that of Chuang *et al.* (1962). Pollen mother cells of the plant we studied consistently showed 23 bivalents in diakinesis (Fig. 15), an observation comparable to those of the American species.

We tried but were unable to locate the voucher specimen for the count reported by Chuang *et al.*, Chuang 3327, Taipei, that was supposed to be preserved either at HAST or TAI. We cannot therefore verify his collection although we suspect that Chuang *et al.* (1962) may have misinterpreted their meiotic observation. Additional cytological studies especially on wild populations are required before further conclusions can be drawn concerning the chromosome number of the Asiatic *C. retusus*.

ORCHIDACEAE

Dendrobium victoriae-regiane var. *miyakei* is an attractive epiphytic orchid endemic to Taiwan in the thickets of Lanyu (Liu & Su, 1978). This is another example of a plant species that has a narrow range and is overexploited for its beauty. The typical variety of in the species occurs in the Philippines. Observations from pollen mitosis reveal $n=19$, which agrees with previous reports (Hsu, 1972; Hashimoto, 1981, both as *D. miyakei*).

Pleione formosana Hayata is another extraordinary attractive orchid endemic to Taiwan. It grows in rocky and often foggy habitats at elevations of 1,500–2,500 m,

usually intermixed with mosses (Su, 1978), and has a very big horticultural market both domestically and internationally. As a result of heavy collection, it has become very rare in its native habitats. Our chromosome count of $2n=40$ (Fig. 11) for this species agrees with previous reports (Fedorov, 1969; Moore, 1971).

PHILYDRACEAE

Philydrum is a monotypic genus with a single species, *P. lanuginosum*, which is distributed in eastern Asia, Malaysia, and Australia (Yang, 1978). This herb occurs in marshy lowlands of northern Taiwan, and like many other Taiwanese plant species that occur in this habitat type, it is threatened greatly from urban expansion, road construction, and water pollution. Our gametic count of $n=8$ (Fig. 16) is the first report for populations from Taiwan; it confirms previous reports (Fedorov, 1969).

THYMELAEACEAE

Wikstroemia mononectaria Hayata is a rare endemic with a few sporadic populations in Taiwan. Study of one of these population from a moist, shady habitat in Wulai, Taipei County, revealed a diploid chromosome numbers of $2n=18$. This represents the first report for this species. Previous chromosome counts on plants of this genus were nearly all based on $X=9$ (Moore, 1971, 1974; Goldblatt, 1978). Polyploids up to $2n=72$ were also known (Skottsberg, 1955).

Acknowledgements

We are grateful to Porter P. Lowry II for his careful criticism of the manuscript. We also thank Horng-Jye Su, Chern-Hsiung Ou, Ta-Wei Hu, Teh-Shun Chen, Wen-Liang Chiou, Chin-Te Chang, and Tsong-Yu Yang who kindly provided viable seeds or living collections for our cytological study. We were accompanied and assisted by Chung-Cheng Lu, Wen-Liang Chiou, Chang-Sheng Kuo, Ray-Tsong Lee, Kuoh-Cheng Yang, and Shun-Hua Chen in several field trips. Literature kindly provided by Kuo-Shih Hsu, Yuen-Po Yang, and Wei-Shou Chen is greatly appreciated. This study was supported in part by a R.O.C. National Science Council Grant NSC 72-0204-B001-R02 and a research grant from the Academia Sinica, Taipei, Taiwan, Republic of China to Ching-I Peng.

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臺灣稀有及瀕臨滅絕植物之染色體研究 I

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本文整理臺灣自1961年迄今有關自生維管束植物染色體研究之文獻，並報導17科22屬24種臺灣稀有及瀕臨滅絕植物之染色體數目與形態，其中9種植物之染色體數為以往文獻所未曾報導，另有2種植物之染色體數與前人之研究結果不同。除進行植物染色體觀察外，並討論其分佈、生育地生態、及野生族群現況。