
POLYPLOIDY IN THE FLORA
OF THE HENGDUAN
MOUNTAINS HOTSPOT,
SOUTHWESTERN CHINA¹

Ze-Long Nie,² Jun Wen,³ Zhi-Jian Gu,²
David E. Boufford,⁴ and Hang Sun²

ABSTRACT

The Hengduan Mountain region is located at the eastern end of the Himalayan range and in the southeastern corner of the Qinghai-Tibet Plateau in eastern Asia. It is probably the richest temperate region in the world biologically, with about 8000 species recorded from the 500,000 km² region. A high rate of polyploidy was expected in the Hengduan Mountains because of the unusually high species diversity and endemism, the widespread alpine environment in this region, and the importance of polyploidy in plant evolution. Chromosome numbers for 552 taxa of native Hengduan angiosperms were obtained from published literature. If the criterion of infrageneric polyploidy is used (i.e., the possession of three or more basic chromosome sets in a nucleus), the frequency of polyploidy is only 22%. It is 37% and 58% if taxa with haploid chromosome number $n = 14$ or more, or $n = 11$ or more are considered to be polyploids, respectively. Several highly diversified groups such as *Aconitum* and *Delphinium* also show a low proportion of polyploidy (18.6% and 0%, respectively) in the Hengduan Mountains. Examples from other large plant groups (e.g., *Saxifraga*, *Ligularia*, and *Cremathodium*) and endemic genera (e.g., *Solms-laubachia*, *Tibetia*, and *Nomocharis*) again indicated that polyploidy, especially infrageneric polyploidy, may have played a minor role in the evolutionary diversification of these plants in the Hengduan Mountains.

Key words: chromosome number, diversification, Hengduan Mountains, Hotspot, polyploidy.

The Hengduan Mountains are located at the eastern end of the Himalayan range and in the southeastern corner of the Qinghai-Tibet Plateau, the highest and youngest plateau in the world. The region comprises more than 500,000 km² of temperate to alpine mountains in southwestern China and is bounded in the northwest by the dry Qinghai-Tibet Plateau, in the north by the Tao River of southern Gansu, and in the east by the Sichuan Basin and the plateau of eastern Yunnan. It also includes small portions of extreme northern Myanmar and extreme eastern India. About 8000 species of flowering plants have been recorded from this region (X. W. Li & Li, 1993; W. T. Wang et al., 1993, 1994), making it one of the two most speciose floristic subregions of the Sino-Himalayan Floristic

Region, the other being the East Himalayan subregion (Wu, 1979, 1988; X. W. Li, 1994). The region is also renowned as the home of the giant panda (Wu, 1988). Based on a series of expeditions to the region during 1981–1983 organized by the Chinese Academy of Sciences (Wu, 1988), W. T. Wang et al. (1993, 1994) and X. W. Li and Li (1993) published a preliminary appraisal of the flora that documented its high levels of species diversity and endemism. Although the Hengduan Mountains are still poorly known to the western scientific community, they are biologically among the world's richest and most diverse regions (Boufford & van Dyck, 1999) and have recently been recognized as the biologically richest temperate region in the world, characterized by the occurrence of some of

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² Kunming Institute of Botany, Chinese Academy of Sciences, Kunming, Yunnan 650204, People's Republic of China. hsun@mail.kib.ac.cn (H. Sun).

³ Department of Botany, Field Museum of Natural History, 1400 S. Lake Shore Dr., Chicago, Illinois 60605-2496, U.S.A., and Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Nanxincun 20, Xiangshan, Beijing 100093, People's Republic of China. wen@fieldmuseum.org; current address: Department of Botany, National Museum of Natural History, MRC-166, Smithsonian Institution, P.O. Box 37012, Washington, D.C. 20013-7012, U.S.A.

⁴ Harvard University Herbaria, 22 Divinity Avenue, Cambridge, Massachusetts 02138-2020, U.S.A. boufford@oeb.harvard.edu.

the world's most distinctive species, such as *Acanthochlamys bracteata* P. C. Kao (Velloziaceae), *Sinadoxa corydalifolia* C. Y. Wu et al. (Adoxaceae), *Salweenia wardii* E. G. Baker (Fabaceae), and *Takakia ceratophylla* (Mitt.) Grolle (Bryophyta). Other floristic characteristics of the range include great regional radiations within a large number of plant groups, and the occurrence of a large number of relict plant lineages (Ying & Zhang, 1984; Wu, 1988; H. S. Wang, 1989; Wilson, 1992; X. W. Li & Li, 1993; Ying et al., 1993; H. S. Wang & Zhang, 1994; Boufford & van Dyck, 1999; H. Sun, 2002a, b; H. Sun & Li, 2003). The area was previously included in the Eastern Himalayan "hot spot" (Myers, 1988; Wilson, 1992), but more recently has been referred to as the South-Central China Hotspot (Myers et al., 2000) or the Hengduan Mountains Hotspot (Boufford & van Dyck, 1999). This Hotspot is a focus for studies of relationships between florogenesis and plate tectonics, on the origins of the north temperate flora, including the floras of eastern Asia, North America, and Europe, and on the evolution of seed plants in general (Wu, 1988).

Polyploidy, the possession of three or more basic chromosome sets in nuclei (Bennett, 2004), has long been recognized as a prominent force in the evolutionary diversification of plants (Winge, 1917; Darlington, 1937; Stebbins, 1940, 1950, 1971; Grant, 1981; Levin, 2002), especially ferns (Wagner, 1980; Werth et al., 1985) and flowering plants (Lewis, 1980; Soltis & Soltis, 2000; Wendel, 2000). This phenomenon occurs in up to 80% of all angiosperm species and is considered to be one of the most important cytogenetic mechanisms in plant evolution (Masterson, 1994; Levin, 2002), especially in facilitating rapid speciation (Hiremath & Salimath, 1991).

At the beginning of this research, our working hypothesis was that a high proportion of polyploids occurs in the angiosperm flora of the Hengduan Mountains. Below we outline the reasoning behind this hypothesis and provide a general introduction on the physical and biological characteristics of the Hengduan Mountains Hotspot.

The Hengduan Mountains are geologically young, yet possess an extremely rich flora both in terms of overall species diversity and endemics. The Hengduan Mountains rose relatively rapidly from sea level to the present high mountains (up to 7600 m) with rugged and dissected topography following the collision of the Eurasian and Indian plates about 50 million years ago (Patriat & Achache, 1984; C. S. Wang & Ding, 1998; Tao, 1992, 2000). The most common mechanism for rap-

id speciation in plants is through polyploidy (Grant, 1981). Recent studies in several plant groups have revealed that the genesis of allopolyploidy under both synthetic and natural conditions is often accompanied by rapid genetic and sometimes evolutionarily conserved epigenetic changes (B. Liu et al., 1998; Ozkan et al., 2001; B. Liu & Wendel, 2003; Osborn et al., 2003; Soltis et al., 2004). The capacity of angiosperms to form new combinations via polyploidy may help explain rapid diversification and high endemism in a given region with high biodiversity. Polyploidization might thus account for the high species diversity and endemism in the Hengduan region.

In regions such as the Hengduan Mountains with highly diversified floras, a high frequency of polyploidy would also be expected because of the crucial role of polyploidy in plant speciation (Grant, 1981). Polyploids can have more than two different alleles at any given locus. The intrinsic advantages of heterozygosity may be a key factor in the growth, performance, and adaptability of a polyploid (Grant, 1981; Levin, 1983; Ramsey & Schemske, 1998, 2002; Soltis et al., 2004). Polyploid populations often demonstrate extensive genomic rearrangement including the origin of novel regions of DNA (Song et al., 1995; Arnold, 1997).

Alpine and arctic floras have been reported to have high frequencies of polyploidy (Hanelt, 1966; Löve & Löve, 1967, 1975; Ohba, 1988; Abbott & Brochmann, 2003; Brochmann et al., 2004). Likewise, polyploids are more common in cold climates associated with harsh environmental conditions (Löve & Löve, 1949, 1967). Grant (1981) also suggested that disturbed habitats and stressful environments, which are often associated with cold climates, usually favor polyploidy. The great ecological amplitude that polyploid species can exhibit gives them a high degree of buffering against environmental changes over long periods of time due to glaciation, mountain building and degradation, and overall fluctuations in climate (Stebbins, 1971; Grant, 1981). The Hengduan region has extensive alpine areas. Environmental extremes such as cold and severe climate, and nutrient stress in high latitude or altitude areas have been suggested to increase the frequency of $2n$ gamete formation (Thompson & Lumaret, 1992; Levin, 2002), which leads to polyploidy.

Polyploids have been suggested to be more adaptive in disturbed or novel niches than their diploid progenitors (Ehrendorfer, 1980; Grant, 1981; Stebbins, 1985; Morton, 1993; Otto & Whitton, 2000; Levin, 2004). The Tertiary Himalayan orogeny has led to changes in the climate and topography of the

Hengduan Mountains (J. J. Li et al., 1995; Shi et al., 1998), whose uplifting and the advance and retreat of ice sheets and glaciers may have provided opportunities for the establishment of polyploids through hybridization and other mechanisms in the contact zones between existing species. The advantages and fitness polyploidy can bestow on organisms will be most effective when new habitats are being created and become available for colonization (Morton, 1993). Ehrendorfer (1980) also surveyed various plant communities to determine polyploid frequency in the flora of lower Austria, and found that the highest proportion of polyploid species was found in disturbed areas.

The objectives of this paper are to: (1) present a comprehensive review of chromosome numbers for the flora of the Hengduan Mountains, (2) calculate the frequency of polyploidy in this region and in exemplar taxa, and (3) test the hypothesis that polyploidy is important in the evolutionary diversification of its rich angiosperm flora.

METHODS AND TERMINOLOGY

For each taxon (including species and subspecies), chromosome numbers were recorded from published reports. Several chromosome atlases were also consulted (Darlington & Wylie, 1955; Bolkhovskikh et al., 1969; Moore, 1973, 1974, 1977; Goldblatt, 1981, 1984, 1985, 1988; Goldblatt & Johnson, 1990, 1991, 1994, 1996, 1998, 2000, 2003).

We employed three methods to evaluate polyploids. First, taxa with three or more basic chromosome sets in nuclei are regarded as polyploids (Bennett, 2004), i.e., as resulting from infrageneric polyploidy (Stebbins, 1950). The second method recognizes polyploidy based on the criterion of haploid number $n = 14$ or more for statistical purposes (Grant, 1963, also see 1981: 296). Goldblatt (1980) suggested a third method, arguing that Grant's (1963) estimate was too conservative, and proposed that taxa with haploid number $n = 11$ or more should be considered as polyploids. In our study, we have employed all three methods to estimate the incidence of polyploidy in the Hengduan region. We emphasize infrageneric polyploidy in our discussion, because we consider this measure to be the most accurate of the three. We also inferred the ploidal level for each taxon based on Stebbins's (1950) criterion (results shown in Appendix 1). A few taxa with both polyploid and diploid counts are treated as polyploids in our calculation.

In this paper, $2n$ refers to a taxon's somatic chromosome number and n to the gametic chromosome

number regardless of the ploidy level, while x is the most probable base number. The large number of species and the paucity of taxonomic treatments for the study region made it difficult to assign previously published records to currently recognized taxa. We thus report chromosome numbers under the names that were originally published.

FREQUENCY OF POLYPLIIDY IN THE HENGDUAN MOUNTAINS

Chromosome counts for 552 species and infra-specific taxa in 152 genera and 44 families from the Hengduan Mountains are shown in Appendix 1. Most taxa are representatives of genera that are taxonomically diversified and ecologically common in the region, such as *Rhododendron*, *Silene*, *Artemisia*, *Rubus*, *Ligularia*, *Delphinium*, *Poa*, *Astragalus*, *Saussurea*, *Aconitum*, *Primula*, *Gentiana*, and *Pedicularis*, all of which are characterized by regional radiation. Others, such as *Acanthochlamys*, *Beesia*, *Circaea*, *Dichotomanthes*, *Kingdonia*, *Nomocharis*, *Pomatosace*, *Przewalskia*, *Salweenia*, *Solms-laubachia*, and *Souliea*, are largely endemics to the region. At present no chromosome counts are available for certain large families, such as Lamiaceae, Cyperaceae, and Crassulaceae.

When polyploidy is calculated based on three or more basic chromosome sets in nuclei recorded in a genus (infrageneric polyploidy), only 22% (124/552) of the angiosperm taxa sampled in the Hengduan Mountains are polyploids. Using this same method, 30%–35% are estimated to be polyploids for all flowering plants whose chromosome numbers have been counted (Stebbins, 1950) and 36% for monocots (Goldblatt, 1980: 225).

Based on the criterion that haploid number $n = 14$ or more denotes polyploidy sensu Grant (1963, 1981), 37% (204/552) of the angiosperm taxa from the Hengduan Mountains are polyploids (Table 1). These values are relatively low compared with previous estimates. Grant (1963) reported that 47% of the 17,138 species of flowering plants he sampled were polyploids. According to the method of Goldblatt (1980) with $n = 11$ or above as polyploids, 58% (322/552) of the angiosperm taxa in the Hengduan region are polyploids. Using the same criterion, Goldblatt (1980) reported that 68% of the 10,580 species of monocots he surveyed were polyploids.

COMPARISONS WITH OTHER REGIONS

Because of the limited sample size of our chromosome data (ca. 6.9% of the estimated 8000 species present in the Hengduan Mountains), we com-

Table 1. Polyploidy statistics of angiosperms in the Hengduan Mountains based on three methods: (a) infrageneric polyploids—taxa with three or more base chromosome number sets (Stebbins, 1950; Bennett, 2004); (b) haploid number $n = 14$ or more (Grant, 1963); (c) $n = 11$ or more (Goldblatt, 1980).

	Total species (%)	Infrageneric polyploidy Species number (%)	Polyploidy ($n \geq 14$) Species number (%)	Polyploidy ($n \geq 11$) Species number (%)
All species sampled	552	124 (22)	204 (37)	322 (58)
Endemic species	183 (33)	29 (16)	49 (27)	89 (49)

pared our findings with chromosome data for the plants of Pakistan. Pakistan is located on the western end of the Himalayan range. The chromosome data from Pakistan are based on a larger sample size, i.e., 1777 species and infraspecific taxa sampled (34% of its total angiosperm flora). As shown in Table 2, the frequency of polyploidy in Pakistan is similar to what we found for the Hengduan Mountains, with 29% infrageneric polyploidy, and 44% ($n = 14$ or more) or 63% ($n \geq 11$) based on the two methods for estimating polyploidy, as calculated using data taken from Khatoun and Ali (1993). The similar incidence of polyploidy in these two regions may reflect a broader characteristic of polyploid distribution in the Himalayan range. Although the sample size in our study includes only a small proportion of the angiosperm flora of the Hengduan Mountains, it nevertheless provides good taxonomic and ecological representation. The available data suggest that the flora of the Hengduan Mountains is characterized by a relatively low frequency of polyploidy.

As indicated above, the frequency of polyploidy is higher in arctic floras than those at lower latitudes (Hanelt, 1966; Löve & Löve, 1975; Abbott & Brochmann, 2003). The frequency of polyploid species in the vascular flora of the arctic region as a

whole is nearly 60% in the low arctic zone, but 70% in the high arctic and as high as 80% in high-arctic endemics (Löve & Löve, 1975). Brochmann and Steen's (1999) research on the isolated arctic archipelago of Svalbard, which was almost completely ice-covered during the last glaciation, showed that nearly 80% of the 161 native species are polyploids. A recent review on arctic plants based on 1719 taxa showed that the majority (60.7%) are polyploids, especially for arctic specialist taxa (73.7%) (Brochmann et al., 2004).

Löve and Löve (1967) pointed out that the frequency of polyploidy is significantly high in the alpine zone, as on Mt. Washington in the White Mountains of New Hampshire, where 63.6% of the alpine taxa of vascular plants are polyploids. Another example is from the flora of the Cameroon Mountains (Morton, 1993), which shows a frequency of 52.9%, higher than generally reported (sensu Grant, 1981). Hanelt (1966) gave percentages ranging from 45% to 85% polyploids in various high mountain floras in Eurasia, the Americas, and New Guinea.

Our finding of only 22% polyploidy in the angiosperm flora of the Hengduan Mountains based on the same method of calculation (Stebbins, 1950) stands in sharp contrast with these earlier results.

Table 2. Comparison of frequency of polyploidy among selected regions or plant groups.

	Reference	Infrageneric polyploidy, %	Polyploidy ($n \geq 14$), %	Polyploidy ($n \geq 11$), %
Hengduan Mountains		22	37	58
Pakistan	Khatoun & Ali (1993)	29	44	63
Monocots	Goldblatt (1980)	36		68
Angiosperms	Stebbins (1950)	30–35		
	Grant (1963, 1981)		47	
High mountain floras	Hanelt (1966)	45–85		
Cameroon Mountains	Morton (1993)	52.9		
Mt. Washington	Löve & Löve (1967)	63.6		
Arctic flora	Löve & Löve (1975)	60–80		
	Brochmann et al. (2004)	60.7		
Svalbard	Brochmann & Steen (1999)	ca. 80		
Juan Fernandez Islands	Sanders et al. (1983)		75	
Hawaii	Carr (1998)		80	

A similar survey on Chihuahuan Desert flora showed that a relatively low frequency of 17.8% polyploidy occurs among the gypsophilic species compared to 32.7% polyploidy for the non-gypsum vegetation (Powell & Sloan, 1975). Further chromosome reports on some species from the Hohxil region of Qinghai, a harsh, cold, uninhabited, alpine desert at an average elevation of 5000 m near the center of the Qinghai-Xizang Plateau, also showed that most plants there are diploids (Y. P. Yang & Wu, 1993).

Several studies using the more inclusive criterion that taxa with gametic numbers of $n = 14$ and above are regarded as polyploids (Grant, 1963) have found higher levels of polyploidy than the 58% we estimated for the Hengduan region. For example, Sanders et al. (1983) reported 75% polyploidy for the flora of the Juan Fernandez Islands, and Carr (1998) reported 80% for Hawaiian plants.

POLYPLIIDY IN REPRESENTATIVE TAXA

We expected to find a high level of polyploidy before we began this study, but it seems that polyploidy is not common in the Hengduan Mountains based on regional cytological statistical comparisons. This result is even more pronounced when one considers the frequency of polyploidy in several representative taxa from the Hengduan Mountains Hotspot.

HIGHLY DIVERSIFIED GROUPS

Aconitum and *Delphinium* are two closely related genera of Ranunculaceae in the tribe Delphineae and are widely distributed in north temperate areas. About half of the species of *Aconitum* and more than 63% of the species of *Delphinium* are found in the Hengduan mountains (Q. E. Yang et al., 1989). The species in these two genera are highly diversified in the region, with both primitive and advanced representatives, including many local endemics (X. W. Li & Li, 1993; Q. E. Yang, 1996). The cytological data reveal that of 43 species in *Aconitum* in the Hengduan region (41% of the total 104 species), 30 are endemic to the area, and only eight are polyploids (18.6%). There are no polyploids among the 23 species (11 endemics) of *Delphinium* reported (32% of the total 71 species in the region). However, in Simon et al.'s (1999) comprehensive chromosome survey of Delphineae, which included about 40% of species in the tribe, 48% and 31% of *Aconitum* and *Delphinium* species were found to be polyploids, respectively. These figures are much higher than our estimates from the Hengduan region. The high diversity of these gen-

era in this region has resulted mainly from speciation within diploid lineages.

Ligularia and *Cremanthodium* (Asteraceae) are two related genera that are also highly diversified in the Hengduan Mountains (Liu, 2004). *Ligularia* has 129 species in the region, with about 100 native and 60 endemic. This genus is morphologically diverse and has members in a variety of habitats, from forests to high alpine meadows, ranging from 1000 to 4000 m in altitude, although most species are found in the mountains (S. W. Liu et al., 1994). *Cremanthodium* comprises 67 species growing in alpine meadows, largely in the Hengduan Mountains and on the Qinghai-Tibet Plateau. Although these genera do not qualify for Stebbins's (1950) definition of infrageneric polyploidy, their high haploid chromosome numbers of $n = 30$ and $n = 29$ suggest ancient polyploidizations. Variation of karyotype structure at the diploid level seems to be the predominant feature in these groups, and sympatric speciation via hybridization and polyploidization has played a minor role in their species diversity (J. Q. Liu, 2004).

A similar phenomenon can be seen in several other groups occurring around or within the Himalaya and Qinghai-Tibet Plateau. *Saxifraga* (Saxifragaceae) is widely distributed in the temperate zone of the Northern Hemisphere and is one of the most important components of the alpine flora of the Himalayan region (Ohba, 1986). In particular, some species are quite diverse in the high alpine region of the Himalaya as well as in the Hengduan Mountains. In the Hengduan Mountains, four of the nine species reported are polyploids (44.4%). However, cytological studies of *Saxifraga* in the Himalayas by Wakabayashi and Ohba (1988) showed that diploids prevail and polyploids comprise only 17% of the species. Polyploidy thus may not have played an important role in the diversification of *Saxifraga* in the Himalayan range (Wakabayashi & Ohba, 1988).

ENDEMIC TAXA

High levels of endemism are a major feature of the flora of the Hengduan Mountains. About 37.7% of the angiosperms are endemic or mainly restricted to this area (X. W. Li & Li, 1993). Of the 552 taxa sampled, 33% are endemic to the Hengduan region (Table 1), a proportion similar to that of the total angiosperms in the region. But infrageneric polyploidy is particularly low among endemics (just 16%). Below we discuss several endemic genera to illustrate this phenomenon.

The nine species of *Solms-laubachia* (Brassica-

ceae) are nearly restricted to scree slopes and rocky crevices at altitudes of 3400–5700 m in the Hengduan Mountains (Al-Shehbaz & Yang, 2001; Yue et al., 2004). All species are $2n = 14$, although one species (*S. pulcherrima* Muschl.) has a tetraploid cytotype (Yue et al., 2003, 2004). Speciation within *Solms-laubachia* may have been the result of primarily intrachromosomal variation at the diploid level, and the genus probably evolved within the Himalayan-Hengduan Mountains instead of migrating from other regions (Yue et al., 2004).

Another example is the small, localized, nearly endemic genus *Tibetia* (Fabaceae). This genus apparently differentiated from the widely distributed north temperate *Gueldenstaedtia* and became adapted to the alpine environment (Tsui, 1979; Nie et al., 2002) as the Hengduan Mountains uplifted. The cytological studies of Nie (2002), Nie et al. (2002), and D. K. Yang (2002) show that the species of *Tibetia* have all evolved at the diploid level of $2n = 16$, but with alterations of their karyotypes. These authors suggest the importance of allopatric speciation at the diploid level in *Tibetia* in the Hengduan Mountains.

Nomocharis (Liliaceae), comprising ca. 10 species with the Sino-Himalayan distribution pattern, is restricted to the Hengduan Mountains and the southeastern edge of the Tibetan Plateau. All its members are not infrageneric polyploids, with $2n = 24$, and appear to have diversified at the diploid level after ancient polyploidization (Xie et al., 1992). Other taxa, such as *Salweenia* (Q. X. Zhou et al., 2000), *Beesia* (Q. E. Yang et al., 1995), and *Kingdonia* (Z. Y. Zhang, 1982), are likewise all diploids that have developed and become localized in the Hengduan Mountains area.

EVOLUTION OF HIGH SPECIES DIVERSITY IN THE HENGDUAN MOUNTAINS HOTSPOT

If polyploidy did not play a major role in the evolution of Hengduan plants, what other mechanisms might have shaped the substantially high species diversity and endemisms in the region? Below we propose a few hypotheses based on physical and historical factors.

Alpine plants survive under the environmental conditions they encounter because of adaptive features such as cushion or rosette habit, pubescence, and coriaceous leaves (Chaverri-Polini, 1998; Körner, 2003). Morphological differentiation can be accumulated in a relatively short period under certain alpine environments through natural selection, without drastic genetic or chromosomal divergence. For example, *Sinadoxa*, an endemic monotypic ge-

nus of Adoxaceae from the Hengduan region, is closely related to *Adoxa* (J. Q. Liu et al., 2000b), but is morphologically very distinct, despite low ITS sequence divergence (3.4%), which suggests a recent origin of *Sinadoxa*. Both genera have the same chromosome number of $2n = 36$ and a similar karyotype, and the initial differentiation between them might have resulted from allopatric isolation when the first large-scale uplifting of the Qinghai-Tibet Plateau occurred about 3.4–1.7 million years ago (J. Q. Liu et al., 1999, 2000b).

Geographical and ecological heterogeneity may have played an important role in the diversification of plants in the Hengduan Mountains. Most parts of the region are characterized by a series of parallel mountain ranges dissected by deep river valleys that run from north to south, which present physical barriers to gene flow. The high speciation rate in the Hengduan flora may also be due to highly varied local climates that result from geographic differences in the mountains. The wide diversity of climates combined with local differences in geomorphological, edaphic, and ecological features may have generated distinct niches for different species. *Rhododendron* (Ericaceae), for example, is the largest genus in the region with about 220 species extending throughout the Hengduan area, but most species have highly localized distributions. Both diploids and polyploids are common among *Rhododendron* in the Hengduan Mountains, with a high base chromosome number of $x = 13$ (Darlington & Wylie, 1955; Gao, 2002). The radiation of *Rhododendron* in this region is perhaps related to geographic heterogeneity in conjunction with polyploidy.

Animals such as insects may have played a vital role in the dispersal as well as the evolution of reproductive isolation of some groups in the region. *Pedicularis* is a circumpolar genus of Scrophulariaceae, consisting of approximately 500 species, with about 200 occurring in the Hengduan Mountains, making it the second largest genus of angiosperms in the region (X. W. Li & Li, 1993). *Pedicularis* shows extreme variation in floral morphology that is correlated with specific mechanisms of pollination involving a diverse group of insects. Chromosome numbers of *Pedicularis* recorded in the Hengduan Mountains are $2n = 14$ and 16 (J. Cai et al., 2004), suggesting that the evolution has taken place at the diploid level and that diversification is perhaps facilitated by the behavior of pollinators.

Climatic changes during the Pleistocene glacial and interglacial periods may have resulted in the formation of many refugia in the region; these re-

fugia may have served as shelters for a rich diversity of species, as well as sources for dispersion to neighboring areas during the warm interval. The arctic and Tethyan Tertiary floras also served as a source of the floristic development of the region, with the existence of migration routes for plants from the north to the south and vice versa (H. Sun, 2002a, 2002b; H. Sun & Li, 2003).

CONCLUSIONS

Polyploidy (especially infrageneric polyploidy) is not common in the alpine flora of the Hengduan Mountains Hotspot based on our cytological statistical analysis. This finding is further strengthened by case studies of representative taxa in the region. High levels of speciation activities in the Hotspot are probably attributable at least in large part to the geographic, climatic, and geological heterogeneity that resulted from the Tertiary Himalayan orogeny and Cenozoic ice-age cycles. Further investigations, particularly of taxa characteristic of the area, are needed to (a) further test our findings of low frequency of polyploids in the Hengduan region in a phylogenetic framework, (b) examine other prominent evolutionary forces involved in speciation in the Hotspot, and (c) explore the possible reasons for the apparently low rate of formation and/or survival of polyploid species. We hope this cytological study will stimulate further chromosomal and evolutionary work on the Hengduan Mountains Hotspot, and on other conservation hotspots as well.

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Appendix 1. Chromosome reports and ploidal levels in angiosperms of the Hengduan Mountains. $2n$ = somatic chromosome number; n = gametic or haploid chromosome number; x = chromosome base number; GS = Gansu; QH = Qinghai; SC = Sichuan; XZ = Xizang; YN = Yunnan Province, China.

Taxon	Locality	n	$2n$	Ploidy	Reference
ADOXACEAE					
<i>Sinadoxa corydalifolia</i> Z. Y. Wu, Z. L. Wu & R. F. Huang	QH: Yushu		36	2x	X. F. Lu et al. (2002)
<i>Tetradoxa omeiensis</i> (Hara) C. Y. Wu	SC: Mt. Emei, 2300 m		36	2x	H. X. Liang (1986)
APIACEAE					
<i>Angelica chinghaiensis</i> Shan ex K. T. Fu	SC: Songpan, 3500 m		44	4x	Z. H. Pan et al. (1991)
<i>A. dielsii</i> H. Boissieu	SC: Songpan, 3000 m		22	2x	Z. H. Pan et al. (1991)
<i>A. laxifoliata</i> Diels	SC: Hanyuan, 1900 m		22	2x	Z. H. Pan et al. (1991)
<i>A. maowenensis</i> C. Q. Yuan & R. H. Shan	SC: Songpan, 2800 m		22	2x	Z. H. Pan et al. (1991)
<i>A. omeiensis</i> C. Q. Yuan & R. H. Shan	SC: Mt. Emei, 2100 m		22	2x	Z. H. Pan et al. (1991)
<i>A. setchuensis</i> Diels	SC: Songpan, 2800 m		22	2x	Z. H. Pan et al. (1991)
<i>A. sinensis</i> (Oliv.) Diels	SC: Songpan, 2900 m		22	2x	Z. H. Pan et al. (1991)
<i>Bupleurum marginatum</i> Wall. ex DC. var. <i>stenophyllum</i> (Wolff) Shan & Y. Li	YN: Heqin	7		2x	Chin et al. (1989)
<i>Heracleum candicans</i> Wall.	SC: Songpan		22	2x	X. J. He et al. (1994)
<i>H. franchetii</i> M. Hiroe	SC: Xiaojin		22	2x	X. J. He et al. (1994)
<i>H. hemsleyanum</i> Diels	SC: Lixian		22	2x	X. J. He et al. (1994)
<i>H. henryi</i> H. Wolff	YN: Lushui	22		4x	X. J. He et al. (1994)
<i>H. millefolium</i> Diels	SC: Songpan		22	2x	X. J. He et al. (1994)
<i>H. millefolium</i> Diels var. <i>longilobum</i> C. Norman	SC: Songpan		22, 24	2x	X. J. He et al. (1994)
<i>H. obtusifolium</i> Wall.	SC: Wenchuan		22	2x	X. J. He et al. (1994)
<i>H. stenopterum</i> Diels	SC: Songpan		22	2x	X. J. He et al. (1994)
<i>H. vicinum</i> H. Boissieu	SC: Wenchuan		22	2x	X. J. He et al. (1994)
<i>H. wolongense</i> F. T. Pu & X. J. He	SC: Wenchuan		22	2x	X. J. He et al. (1994)
<i>H. yungningense</i> Hand.-Mazz.	SC: Xiaojin		22	2x	X. J. He et al. (1994)
<i>Ligusticum acuminatum</i> Franch.	SC: Xiaojin		22	2x	Z. H. Pan et al. (1985)
<i>L. brachylobum</i> Franch.	YN: Heqin	11		2x	Chin et al. (1989)
<i>L. pteridophyllum</i> Franch. ex Gliver	YN: Dali	11		2x	Chin et al. (1989)
<i>Physospermopsis rubrinervis</i> (Franch.) C. Norman	YN: Lijiang	11		2x	Chin et al. (1989)
<i>Pimpinella flaccida</i> C. B. Clarke	YN: Binchuan	10		2x	Chin et al. (1989)
<i>Pleurospermum angelicoides</i> Benth. ex C. B. Clarke	YN: Lijiang		22	2x	Chin et al. (1989)
<i>P. rivulorum</i> (Diels) K. T. Fu & Y. C. Ho	YN: Lijiang		22	2x	Chin et al. (1989)
<i>Tongoloa elata</i> H. Wolff	YN: Dali	11		2x	Chin et al. (1989)
<i>Trachyspermum scaberulum</i> (Franch.) H. Wolff var. <i>ambrosiifolium</i> (Franch.) R. H. Shan	YN: Binchuan	9		2x	Chin et al. (1989)
ARACEAE					
<i>Acorus calamus</i> L.	YN: Zhongdian		66	6x	H. Wang et al. (2001)
<i>Amorphophallus bannanensis</i> H. Li	YN: Gongshan, 1280 m		26	2x	Gu et al. (1992)
<i>Arisaema bauriculatum</i> W. W. Sm.	YN: Gongshan, 2600 m		28	2x	Gu et al. (1992)
	XZ: Motuo, 1100 m		28	2x	Gu & Sun (1998)
<i>A. dulongense</i> H. Li	YN: Gongshan, 2600 m		26	2x	Gu et al. (1992)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>A. erubescens</i> Schott	YN: Gongshan, 2300 m		56	4x	Gu et al. (1992)
<i>A. heterophyllum</i> Blume	SC: Mt. Emei		28	2x	Murata & Iijima (1983)
<i>A. lobatum</i> Engl.	SC: Mt. Emei, 1700 m		56	4x	Hong & Zhang (1990)
<i>Colocasia gaoligongensis</i> H. Li & C. L. Long	YN: Tengchong, 3700 m		28	2x	Z. Y. Yang et al. (2003)
<i>Remusatia hookeriana</i> Schott	YN: Gongshan, 2800 m		28	2x	Gu et al. (1992)
	YN: Dali		28	2x	Long et al. (1989)
<i>R. vivipara</i> Schott	YN: Dali		42	3x	H. Li & Hay (1992)
	YN: Dali		42	3x	Long et al. (1989)
<i>Sauromatum gaoligongense</i> Z. L. Wang & H. Li	YN: Baoshan, 2290 m		26	2x	Bian et al. (2001)
ASTERACEAE					
<i>Ajania myriantha</i> (Franch.) Ling ex C. Shih	SC: Wenchuan, 1400 m		18, 36	2x, 4x	Kondo et al. (1995)
<i>A. przewalskii</i> Poljakov	SC: Lixian, 3800 m		36	4x	Kondo et al. (1992)
<i>A. ramosa</i> (Chang) C. Shih	SC: Kangding, 3100 m		18	2x	Kondo et al. (1992)
<i>A. tenuifolia</i> (Jacq.) Tzvelev	SC: Kangding, 4150 m		36	4x	Kondo et al. (1992)
<i>Aster diplostephioides</i> Benth. & Hook. f.	QH: Yushu, 3850 m		18	2x	J. Q. Liu (1999)
<i>A. souliei</i> Franch.	QH: Yushu, 3950 m		18	2x	J. Q. Liu (1999)
<i>A. yunnanensis</i> Franch. var. <i>labrangensis</i> (Hand.-Mazz.) Y. Ling	QH: Yushu, 3850 m		18	2x	J. Q. Liu (1999)
<i>Cremanthodium brunneopilosum</i> S. W. Liu	SC: Hongyuan, 3900 m		58	2x	J. Q. Liu et al. (2001)
<i>C. discoideum</i> Maxim.	QH: Maduo, 4900 m		58	2x	J. Q. Liu et al. (2001)
<i>C. ellisii</i> (Hook. f.) S. Kitamura	QH: Maduo, 4800 m		58	2x	Huang et al. (1996a)
	QH: Yushu, 4500 m		58	2x	J. Q. Liu et al. (2001)
<i>C. humile</i> Maxim.	QH: Maduo, 4800 m		116	4x	Huang et al. (1996a)
	QH: Maqing, 4300 m		60	2x	J. Q. Liu et al. (2001)
<i>C. lineare</i> Maxim.	QH: Maduo, 4500 m		58	2x	J. Q. Liu et al. (2001)
<i>C. microglossum</i> S. W. Liu	QH: Yushu, 4700 m		58	2x	J. Q. Liu et al. (2001)
<i>C. stenoglossum</i> Ling & S. W. Liu	QH: Maduo, 5000 m		58	2x	J. Q. Liu et al. (2001)
<i>Dendranthema glabriusculum</i> (W. W. Sm.) C. Shih	SC: Zhaojue, 1950 m		54	6x	Kondo et al. (1998)
<i>D. lavandulifolium</i> (Fisch. ex Trautv.) Y. Ling & C. Shih	SC: Mt. Emei, 600 m		36	4x	J. W. Wang et al. (1993)
<i>Erigeron annuus</i> Pers.	SC: Baoxing, 1500 m	9		2x	Hong & Zhang (1990)
<i>Gnaphalium affine</i> D. Don	SC: Mt. Emei, 800 m	7		2x	Hong & Zhang (1990)
<i>Ligularia cyathiceps</i> Hand.-Mazz.	YN: Lijiang, 3600 m		58	2x	Y. Z. Pan et al. (2004a)
<i>L. dentata</i> (A. Gray) Hara	SC: Mt. Emei, 1500 m		58	2x	J. Q. Liu (2004)
<i>L. dictyoneura</i> (Franch.) Hand.-Mazz.	YN: Zhongdian		58	2x	Gong et al. (2001)
	YN: Lijiang, 3300 m		58	2x	J. Q. Liu (2004)
<i>L. hookeri</i> (C. B. Clarke) Hand.-Mazz.	YN: Dali		58	2x	Gong et al. (2001)
<i>L. kanaitzensis</i> (Franch.) Hand.-Mazz.	YN: Lijiang		58	2x	Gong et al. (2001)
<i>L. liatroides</i> (C. Winkler) Hand.-Mazz.	QH: Yushu, 3500 m		58	2x	J. Q. Liu (2004)
<i>L. latihastata</i> Hand.-Mazz.	YN: Lijiang		58	2x	Gong et al. (2001)
<i>L. pleurocaulis</i> Hand.-Mazz.	SC: Daocheng, 4500 m		58	2x	Y. Z. Pan et al. (2004a)
<i>L. phyllocolea</i> Hand.-Mazz.	YN: Ninglang, 3700 m		58	2x	Y. Z. Pan et al. (2004a)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>L. purdomii</i> (Turrill) Chittenden	SC: Hongyuan		58	2x	J. Q. Liu (2004)
<i>L. stenocephala</i> Matsum. & Koidzumi	YN: Dali		58	2x	Gong et al. (2001)
<i>L. tangutorum</i> Pojark.	QH: Maqin, 3200 m		58	2x	J. Q. Liu (2004)
<i>L. tongolensis</i> (Franch.) Hand.-Mazz.	YN: Zhongdian, 3200 m		58	2x	Y. Z. Pan et al. (2004a)
<i>L. tsangchanensis</i> (Franch.) Hand.-Mazz.	YN: Dali, 3000 m		58	2x	J. Q. Liu (2004)
<i>L. vellerea</i> Hand.-Mazz.	YN: Lijiang		58	2x	Gong et al. (2001)
<i>L. virgaurea</i> Mattf. ex Rehder & Kobuski	SC: Ruoergai		58	2x	J. Q. Liu (2004)
	QH: Maqing, 3700 m		87	3x	J. Q. Liu (2004)
<i>L. yunnanensis</i> (Franch.) Chang	YN: Dali, 3600 m		58	2x	Y. Z. Pan et al. (2004a)
<i>Nannoglottis gynura</i> (C. Winkler) Ling & Y. L. Chen	QH: Yushu, 3600 m		18	2x	J. Q. Liu et al. (2000a)
<i>Nouelia insignis</i> Franch.	YN: Zhongdian, 1988 m		54	6x	Peng et al. (2002)
<i>Picris hieracioides</i> L. subsp. <i>japonica</i> Krylv.	SC: Baoxing, 1800 m	5		2x	Hong & Zhang (1990)
<i>Saussurea ceterach</i> Hand.-Mazz.	QH: Nangqian, 3940 m		30	2x	Ho et al. (2002c)
<i>S. eopygmaea</i> Hand.-Mazz.	QH: Yushu, 4060 m		30	2x	Ho et al. (2002c)
<i>S. gnaphalodes</i> (Royle) Sch. Bip.	QH: BayanHarashan, 5200 m		48		Huang et al. (1996a)
<i>S. tangutica</i> Maxim.	QH: BayanHarashan, 5200 m		28	2x	Huang et al. (1996a)
<i>S. wellbyi</i> Hemsl.	QH: Maduo, 4700– 4800 m		28	2x	Huang et al. (1996a)
<i>Sonchus arvensis</i> L.	SC: Mt. Emei, 800 m	9		2x	Hong & Zhang (1990)
<i>Youngia erythrocarpa</i> (Vaniot) Bab. & Stebbins	SC: Baoxing, 1500 m	8		2x	Hong & Zhang (1990)
<i>Y. heterophylla</i> (Hemsl.) Bab. & Stebbins	SC: Mt. Emei, 1200 m	6		2x	Hong & Zhang (1990)
BEGONIACEAE					
<i>Begonia cavaleriei</i> H. Lév.	YN: Eryuan		30	3x	Tian et al. (2002)
BERBERIDACEAE					
<i>Diphylleia sinensis</i> Li	YN: Zhongdian, 3200 m		12	2x	Ma & Hu (1996)
<i>Dyosma versipellis</i> (Hance) M. Cheng	SC: Mt. Emei, 805 m		12	2x	Ma & Hu (1996)
<i>Sinopodophyllum hexandrum</i> (Royle) Ying	YN: Zhongdian, 3200 m		12	2x	Ma & Hu (1996)
BIGNONIACEAE					
<i>Incarvillea arguta</i> Royle	YN: Zhongdian		22	2x	S. T. Chen et al. (2004)
<i>I. berezovskii</i> Batalin	SC: Maerkang		22	2x	S. T. Chen et al. (2004)
<i>I. compacta</i> Maxim.	SC: Shiqu		22	2x	S. T. Chen et al. (2004)
<i>I. delavayi</i> Bureau & Franch.	YN: Lijiang		22	2x	S. T. Chen et al. (2004)
<i>I. dissectifolia</i> Q. S. Zhao	SC: Yanyuan		22	2x	S. T. Chen et al. (2004)
<i>I. forrestii</i> Fletcher	YN: Zhongdian		22	2x	H. Xiao et al. (2002)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>I. lutea</i> Bureau & Franch.	SC: Daocheng		22	2x	S. T. Chen et al. (2004)
<i>I. mairei</i> (H. Lév.) Grierson	YN: Lijiang		22	2x	H. Xiao et al. (2002)
	YN: Zhongdian		22	2x	H. Xiao et al. (2002)
	YN: Dali		22	2x	S. T. Chen et al. (2004)
<i>I. mairei</i> (H. Lév.) Grierson var. <i>grandiflora</i> (Wehrhahn) Grierson	YN: Lijiang		22	2x	S. T. Chen et al. (2004)
<i>I. sinensis</i> Lam.	SC: Maerkang		22	2x	S. T. Chen et al. (2004)
<i>I. younghusbandii</i> Sprague	XZ: Nielamu		22	2x	S. T. Chen et al. (2004)
<i>I. zhongdianensis</i> Grey-Wilson	YN: Lijiang		22	2x	H. Xiao et al. (2002)
	YN: Zhongdian		22	2x	S. T. Chen et al. (2004)
BRASSICACEAE					
<i>Solms-laubachia eurycarpa</i> (Maxim.) Botsch.	YN: Deqin, 4600 m		14	2x	Yue et al. (2003)
	XZ: Basho, Yelashan		14	2x	Yue et al. (2004)
<i>S. lanata</i> Botsch.	XZ: Lhasa, Resela		14	2x	Yue et al. (2004)
<i>S. linearifolia</i> O. E. Schulz	YN: Deqin, 4310 m		14	2x	Yue et al. (2003)
<i>S. minor</i> Hand.-Mazz.	YN: Zhongdian, 4500 m		14	2x	Yue et al. (2003)
	XZ: Nyenchengtang La				Yue et al. (2004)
<i>S. pulcherrima</i> Muschl.	YN: Lijiang, 4500 m		14	2x	Yue et al. (2003)
	YN: Lijiang		14	2x	Yue et al. (2004)
<i>S. retropilosa</i> Botsch.	SC: Xiangcheng, 4000 m		28	4x	Yue et al. (2003)
	XZ: Zuogong		14	2x	Yue et al. (2004)
	SC: Daocheng		14	2x	Yue et al. (2004)
<i>S. xerophyta</i> (W. W. Sm.) Comber	SC: Daocheng		14	2x	Yue et al. (2004)
<i>Thlaspi arvense</i> L.	SC: Baoxing, 2600 m	7		2x	Hong & Zhang (1990)
CAMPANULACEAE					
<i>Adenophora lobophylla</i> D. Y. Hong	SC: Jingchuan		34+2B	2x	K. Q. Wang & Ge (1998)
<i>A. potanini</i> Korsh.	SC: Baoxin		34	2x	K. Q. Wang & Ge (1998)
<i>A. stricta</i> Miq.	SC: Jingchuan		68	4x	K. Q. Wang & Ge (1998)
CAPRIFOLIACEAE					
<i>Lonicera schneideriana</i> Rehder	SC: Baoxing, 2600 m	9		2x	Hong & Zhang (1990)
CARYOPHYLLACEAE					
<i>Psammosilene tunicoides</i> W. C. Wu & C. Y. Wu	YN: Lijiang		28	2x	Y. Z. Pan et al. (2004b)
	SC: Mt. Emei, 2100 m	22		4x	Hong & Zhang (1990)
CHLORANTHACEAE					
<i>Chloranthus nervosus</i> Collett & Hemsl.	YN: Yangbi, Meixi		30	2x	Kong (2000)
CUCURBITACEAE					
<i>Gynostemma longipes</i> C. Y. Wu	YN: Lijiang		44	4x	X. F. Gao et al. (1995)
<i>Thladiantha davidii</i> Franch.	SC: Pengxian, 1230 m		18	2x	J. Q. Li et al. (1993)
<i>T. dentata</i> Cogn.	SC: Nanchuan, 1650 m		18	2x	J. Q. Li et al. (1993)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>T. lijiangensis</i> A. M. Lu & Zhi Y. Zhang	YN: Lijiang, Longpan		18	2x	J. Q. Li et al. (1993)
<i>T. nudiflora</i> Hemsl. ex Forb. & Hemsl.	SC: Mt. Emei, 1650 m		18	2x	J. Q. Li et al. (1993)
DIOSCOREACEAE					
<i>Dioscorea althaeoides</i> Knuth	YN: Weixi	10	20	2x	Jiangsu Institute of Botany (1976)
<i>D. collettii</i> Hook. f.	SC: Emei	10	20	2x	Jiangsu Institute of Botany (1976)
<i>D. deltoidea</i> Wall.	YN: Deqin	10	20	2x	Jiangsu Institute of Botany (1976)
<i>D. opposita</i> Thumb.	SC: Mt. Emei		138–142	14x	Chin et al. (1985)
<i>D. panthaica</i> Prain & Burkill	YN: Lijiang	20	40	4x	Jiangsu Institute of Botany (1976)
<i>D. parviflora</i> C. T. Ting	YN: Yongsheng	10	20	2x	Pei et al. (1979)
<i>D. zingiberensis</i> C. H. Wright	YN: Liuku	10	20	2x	Jiangsu Institute of Botany (1976)
ELAEAGNACEAE					
<i>Hippophae neurocarpa</i> S. W. Liu & T. N. He	SC: Daocheng		24	2x	Y. L. Cao & Lu (1989)
<i>H. rhamnoides</i> L. subsp. <i>sinensis</i> Rousi	SC: Nanping		24	2x	Y. L. Cao & Lu (1989)
<i>H. rhamnoides</i> L. subsp. <i>yunnanensis</i> Rousi	YN: Zhongdian		24	2x	Y. L. Cao & Lu (1989)
<i>H. tibetana</i> Schlecht.	SC: Hongyuan		24	2x	Y. L. Cao & Lu (1989)
ERICACEAE					
<i>Rhododendron mackenzianum</i> Forrest	YN: Gongshan		26	2x	L. M. Gao (2002)
<i>R. leptothrium</i> Balf. f. & Forrest	YN: Weixi		26	2x	L. M. Gao (2002)
FABACEAE					
<i>Astragalus acaulis</i> Baker	SC		16	2x	S. M. Mu & Shue (1985)
<i>A. ernestii</i> Comber	SC: Kangding		16	2x	S. M. Mu & Shue (1985)
<i>A. kialensis</i> N. D. Simpson	YN		16	2x	S. M. Mu & Shue (1985)
<i>A. pastorius</i> Tsai & Yu	SC		32	4x	S. M. Mu & Shue (1985)
<i>A. przewalskii</i> Bunge ex Maxim.	SC		16	2x	S. M. Mu & Shue (1985)
<i>A. strictus</i> Graham	XZ: Bomi, 3300 m		32	4x	W. T. Wang et al. (1994)
<i>A. tongolensis</i> Ulbrich	SC		16	2x	S. M. Mu & Shue (1985)
<i>Caragana bicolor</i> Kom.	SC		16	2x	S. M. Mu & Shue (1985)
<i>Crotalaria medicaginea</i> Lam.	YN: Heqin		16	2x	J. Q. Li (1988)
<i>C. sessiliflora</i> L.	XZ: Motuo, 900 m		16	2x	Gu & Sun (1993)
<i>Desmodium yunnanense</i> Franch.	YN: Heqing		22	2x	Cui (1987)
<i>Gueldenstaedtia delavayi</i> Franch.	YN: Lijiang		16	2x	Nie (2002)
<i>Mastersia assamica</i> Benth.	XZ: Motuo, 900 m		22	2x	Gu & Sun (1993)
<i>Medicago lupulina</i> L.	SC: Baoxing	8		2x	Hong (1984)
<i>Salweenia wardii</i> Baker f.	SC: Daocheng		16	2x	Q. X. Zhou et al. (2000b)
<i>Tibetia coelestis</i> (Diels) H. P. Tsui	YN: Zhongdian		16	2x	Nie (2002)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>T. himalaica</i> (Baker) H. P. Tsui	SC: Daocheng		16	2x	Nie et al. (2002)
	SC: Litang		16	2x	Nie (2002)
<i>T. tongolensis</i> (Ulbr.) H. P. Tsui	SC: Daocheng		16	2x	Nie et al. (2002)
<i>T. yunnanensis</i> (Franch.) H. P. Tsui	YN: Zhongdian		16	2x	Nie et al. (2002)
<i>Vicia hirsuta</i> (L.) Gray	SC: Baoxing	7		2x	Hong (1984)
<i>V. sativa</i> L.	SC: Baoxing	6		2x	Hong (1984)
<i>V. villosa</i> Roth	SC: Baoxing		12	2x	Hong (1984)
FAGACEAE					
<i>Quercus guyavaefolia</i> H. Lév.	YN: Lijiang		24	2x	M. Cao & Zhou (2000)
FUMARIACEAE					
<i>Corydalis omeiana</i> H. Tsaung	SC: Mt. Emei, 1700 m	8		2x	Hong & Zhang (1990)
GENTIANACEAE					
<i>Comastoma arrectum</i> (Franch.) Holub	YN: Deqin, 3900 m		18	2x	J. Q. Liu & Ho (2002)
<i>C. beesianum</i> (W. W. Sm.) Holub	YN: Lijiang, 2800 m		18	2x	J. Q. Liu & Ho (2002)
<i>C. chiuchense</i> T. N. Ho & J. Q. Liu	QH: Maqin, 4450 m		20	2x	J. Q. Liu & Ho (2002)
<i>C. pulmonarium</i> (Turcz.) Toyokuni	QH: Maqin, 4000 m		18	2x	J. Q. Liu & Ho (2002)
<i>C. traillianum</i> (Forrest) Holub	YN: Zhongdian, 3382 m		18	2x	J. Q. Liu & Ho (2002)
<i>Gentiana alsinoides</i> Franch.	YN: Lijiang, 2950 m		20	2x	Küpfer & Yuan (1996)
<i>G. altorum</i> Harry Sm.	SC: Kangding, 3600 m		24	2x	J. Q. Liu et al. (2002a)
<i>G. ampla</i> Harry Sm.	YN: Lijiang, 3700 m		48	4x	Chen et al. (1997)
<i>G. arethusae</i> Burkill subsp. <i>delicatula</i> (C. Marquand) Halda	YN: Deqin, 3800 m		24	2x	J. Q. Liu et al. (2002a)
<i>G. aristata</i> Maxim.	GS: Luqu, 3450 m	7	14	2x	Küpfer & Yuan (1996)
	GS: Maqu, 3500 m		14	2x	Yuan & Küpfer (1997)
<i>G. asterocalyx</i> Diels	YN: Lijiang, 2900 m		20	2x	Küpfer & Yuan (1996)
<i>G. caeruleogrisea</i> T. N. Ho	QH: Maqin, 3500 m		16	2x	Ho et al. (2002b)
<i>G. callistantha</i> Diels & Gilg	GS: Luqu, 3500 m		26	2x	Yuan & Küpfer (1997)
<i>G. cephalantha</i> Franch.	YN: Lijiang, 3000 m		24	2x	J. Q. Liu et al. (2002a)
<i>G. chinensis</i> Kusnezow	SC: Mt. Emei, 3000 m		24	2x	Ho et al. (2002a)
<i>G. crassicaulis</i> Duthie ex Burkill	YN: Zhongdian, 3300 m		26	2x	Yuan et al. (1998)
<i>G. crassula</i> Harry Sm.	YN: Lijiang, 4300 m		20	2x	Yuan et al. (1998)
<i>G. crassuloides</i> Bureau & Franch.	YN: Deqin, 4100 m		40	4x	Yuan et al. (1998)
<i>G. crenulatotruncata</i> (C. Marquand) T. N. Ho	GS: Maqu, 4200 m		18	2x	Yuan & Küpfer (1997)
<i>G. delavayi</i> Franch.	YN: Lijiang, 2900 m		26	2x	Yuan & Küpfer (1997)
<i>G. exigua</i> Harry Sm.	YN: Lijiang, 2400 m		20	2x	Küpfer & Yuan (1996)
<i>G. haynaldii</i> Kanitz	YN: Zhongdian, 3400 m		20	2x	Yuan & Küpfer (1997)
	XZ: Dingqing, 4250 m		20	2x	Yuan et al. (1998)
	SC: Litang, 3800 m		18	2x	S. L. Chen et al. (1997)
<i>G. heleonastes</i> Harry Sm.	GS: Maqu, 3650 m		12	2x	Küpfer & Yuan (1996)
	GS: Maqu, 3650 m		12	2x	Yuan & Küpfer (1997)
	GS: Maqu, 3900 m		36	6x	Yuan et al. (1998)
<i>G. heterostemon</i> Harry Sm.	YN: Dali, 2100 m		20	2x	Küpfer & Yuan (1996)
<i>G. hyalina</i> T. N. Ho	QH: Maduo, 4300 m		12	2x	Yuan & Küpfer (1997)
<i>G. intricata</i> C. Marquand	YN: Lijiang, 3200 m		20	2x	Küpfer & Yuan (1996)
	YN: Lijiang, 2700 m		20	2x	Yuan & Küpfer (1997)
<i>G. leucomelaena</i> Maxim.	SC: Ruogai, 4200 m		36	4x	Yuan et al. (1998)
<i>G. lhasica</i> Burkill	XZ: Dingqing, 4200 m		26	2x	Yuan et al. (1998)
<i>G. mairei</i> H. Lév.	YN: Lijiang, 3200 m		20	2x	Yuan et al. (1998)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>G. microdonta</i> Franch.	YN: Lijiang, 3700 m		24	2x	S. L. Chen et al. (1997)
	YN: Lijiang, 2900 m		24	2x	Ho et al. (2002a)
<i>G. nubigena</i> Edgew.	QH: Maqin, 4900 m		24	2x	Ho et al. (2002b)
<i>G. panthaica</i> Burkill	YN: Dali, 3200 m		20	2x	Yuan & Küpfer (1997)
<i>G. praticola</i> Franch.	YN: Dali, 2200 m		20	2x	Küpfer & Yuan (1996)
<i>G. prattii</i> Kusnezow	SC: Sungpan, 3700 m		20	2x	Yuan et al. (1998)
	GS: Luqu, 3500 m		18	2x	Küpfer & Yuan (1996)
<i>G. pseudoaquatica</i> Kusnezow	GS: Luqu, 3300 m		20	2x	Küpfer & Yuan (1996)
	GS: Maqu, 3800 m		20	2x	Yuan & Küpfer (1997)
	XZ: Dingqing, 4250 m		20	2x	Yuan et al. (1998)
<i>G. pseudosquarrosa</i> Harry Sm.	SC: Sungpan, 3400 m		20	2x	Yuan et al. (1998)
<i>G. pudica</i> Maxim.	GS: Maqu, 3700 m		20	2x	Yuan & Küpfer (1997)
<i>G. serra</i> Franch.	YN: Lijiang, 2400 m		34	2x	Ho et al. (2002b)
<i>G. souliei</i> Franch.	YN: Lijiang, 2400 m		46	2x	Ho et al. (2002b)
<i>G. squarrosa</i> Ledeb.	GS: Luqu, 3700 m		38	2x	Yuan et al. (1998)
<i>G. stipitata</i> Edgew. subsp. <i>tizuensis</i> (Franch.) T. N. Ho	SC: Litang, 3800 m		26	2x	S. L. Chen et al. (1997)
<i>G. straminea</i> Maxim.	GS: Maqu, 3500 m		52	4x	Yuan & Küpfer (1997)
<i>G. subintricata</i> T. N. Ho	YN: Lijiang, 2900 m		20	2x	Küpfer & Yuan (1996)
	YN: Zhongdian, 3200 m		20	2x	Yuan et al. (1998)
<i>G. tibetica</i> King ex Hook. f.	XZ: Changdu, 3650 m		52	4x	Yuan et al. (1998)
<i>G. veitchiorum</i> Hemsl.	SC: Litang, 3800 m		24	2x	S. L. Chen et al. (1997)
<i>G. waltonii</i> Burkill	XZ: Quxu, 3700 m		26	2x	Ho et al. (2002a)
<i>G. wasenensis</i> C. Marquand	SC: Baoxing, 3400 m		24	2x	Ho et al. (2002b)
<i>G. yunnanensis</i> Franch.	YN: Dali, 3700 m		24	2x	Yuan et al. (1998)
<i>Gentianella gentianoides</i> (Franch.) Harry Sm.	YN: Lijiang, 2900 m		22	2x	J. Q. Liu et al. (2002c)
<i>G. azurea</i> (Bunge) Holub	QH: Dari, 4200 m		22	2x	J. Q. Liu et al. (2002c)
<i>Gentianopsis barbata</i> (Froel.) Ma	YN: Lijiang		26	2x	Yuan & Küpfer (1993)
<i>G. grandis</i> (Harry Sm.) Ma	YN: Lijiang		52	4x	Yuan & Küpfer (1993)
<i>G. lutea</i> Ma	YN: Lijiang		26	2x	Yuan & Küpfer (1993)
<i>Lomatogoniopsis alpina</i> T. N. Ho & S. W. Liu	QH: Dari		12	2x	J. Q. Liu et al. (2002b)
<i>Megacodon stylophorus</i> (C. B. Clarke) Harry Sm.	YN: Deqin		28	4x	J. Q. Liu et al. (2002b)
<i>Swertia franchetiana</i> Harry Sm.	XZ: Changdu, 3800 m		20	2x	T. N. He et al. (1999)
<i>S. tetraptera</i> Maxim.	QH: Maqin, 3800 m		14	2x	T. N. He et al. (1999)
<i>S. wolfgangiana</i> Gruning	QH: Maduo, 3700 m		28	4x	T. N. He et al. (1999)
GERANIACEAE					
<i>Geranium eriostemon</i> Fisch. ex DC.	SC: Baoxing, 2500 m	14		2x	Hong & Zhang (1990)
GESNERIACEAE					
<i>Ancylostemon aureus</i> (Franch.) B. L. Burt	YN: Binchuan		34	2x	Y. Z. Wang & Gu (1999)
<i>Corallodiscus flabellatus</i> (Craib) B. L. Burt	YN: Zhongdian		40	4x	Y. X. Lu et al. (2002)
<i>Loxostigma griffithii</i> (Wight) C. B. Clarke	YN: Rujiang River		34	2x	P. Zhou (2003)
JUGLANDACEAE					
<i>Juglans sigillata</i> Dode	YN: Yangbi		32	2x	Y. L. Mu et al. (1990)
LAURACEAE					

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>Cinnamomum longipaniculatum</i> (Gamble) N. Chao ex H. W. Li	SC: Dujiangyan		24	2x	C. B. Chen et al. (1998)
<i>Lindera communis</i> Hemsl.	SC: Dujiangyan		24	2x	C. B. Chen et al. (1998)
<i>L. megaphylla</i> Hemsl.	SC: Dujiangyan		24	2x	C. B. Chen et al. (1998)
<i>L. pulcherrima</i> (Nees) Benth. ex Hook. f.	SC: Dujiangyan		24	2x	C. B. Chen et al. (1998)
LILIACEAE					
<i>Allium carolinianum</i> Delar.	QH: Maduo, 4450 m		16	2x	Huang et al. (1996a)
<i>A. chienchuanense</i> J. M. Xu	YN: Jianchuan, 2800 m		22	2x	Huang et al. (1995)
<i>A. cyathophorum</i> E. Bureau & Franch.	YN: Zhongdian, 3250 m		16	2x	
<i>A. fasciculatum</i> Rendle	XZ: Zhayab, 3780 m		16	2x	L. Yang et al. (1998)
	SC: Xiangcheng, 2950 m		20	2x	Huang et al. (1995)
	SC: Xiangcheng, 2800 m		20	2x	Xu et al. (1998)
<i>A. hookeri</i> Thwaites	YN: Zhongdian, 3200 m		22	2x	Huang et al. (1995)
	YN: Dali, 2050 m		33	3x	Huang et al. (1995)
	YN: Dali, 2050 m		44	4x	Huang et al. (1995)
<i>A. hookeri</i> Thwaites var. <i>muliense</i> Airy Shaw	YN: Zhongdian, 3200 m		22	2x	Huang et al. (1996b)
<i>A. macranthum</i> Baker	YN: Zhongdian, 3250 m		28	4x	Huang et al. (1996b)
	YN: Zhongdian, 3250 m		14	2x	Huang et al. (1995)
	YN: Zhongdian, 3250 m		28	4x	Huang et al. (1995)
<i>A. macrostemon</i> Bunge	SC: Wenchuan, 1200 m		32	4x	S. M. Zhu & Xu (1999)
<i>A. nanodes</i> Airy Shaw	SC: Daocheng, 4500 m		16	2x	Jing et al. (1999)
<i>A. omeiense</i> Z. Y. Zhu	SC: Emei, 1400 m		22	2x	Huang et al. (1995)
<i>A. ovalifolium</i> Hand.-Mazz.	SC: Wenchuan, 2200 m		24	3x	Jing et al. (1999)
	YN: Zhongdian, 3600 m		16	2x	Jing et al. (1999)
<i>A. prattii</i> C. H. Wright	SC: Lixian, 3600 m		32	4x	Jing et al. (1999)
	SC: Litang, 4100 m		16	2x	Jing et al. (1999)
<i>A. przewalskianum</i> Regel	QH: Maqin, 3400 m		32	4x	Xue et al. (2000)
	QH: Nangqian, 3550 m		64	6x	Xue et al. (2000)
	XZ: Zhayab, 3780 m		32	4x	L. Yang et al. (1998)
<i>A. trifurcatum</i> (Wang & Tang) J. M. Xu	YN: Zhongdian, 3300 m		16	2x	Huang et al. (1995)
<i>A. tuberosum</i> Rottl. ex Spreng.	YN: Baoshan, 1500 m		24	3x	Huang et al. (1985)
	SC: Lixian, 1100 m		32	4x	L. Yang et al. (1998)
<i>A. wallichii</i> Kunth	YN: Binchuan, 2900 m		14	2x	Huang et al. (1995)
	YN: Binchuan 3200 m		14	2x	Huang et al. (1996c)
<i>A. wallichii</i> Kunth var. <i>platyphyllum</i> (Diels) J. M. Xu	YN: Zhongdian, 3300 m		14	2x	Huang et al. (1995)
<i>Cardiocrinum giganteum</i> Makino	SC: Mt. Emei		24	2x	Tang et al. (1984)
	YN: Gongshan, 2700 m		24	2x	Xie et al. (1992)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>Clintonia udensis</i> Trautv. & Mey.	SC: Mt. Emei, 2750 m		14	2x	S. F. Li & Chang (1996)
	YN: Lijiang, 3700 m		28	4x	S. F. Li & Chang (1996)
	YN: Yunlong, 3300 m		14	2x	L. Wang et al. (1993)
<i>Disporopsis aspersa</i> (Hua) Engl.	SC: Mt. Emei		40	2x	Gu et al. (1990)
<i>D. fusco-picta</i> Hance	YN: Tengchong		40	2x	Gu et al. (1990)
<i>Disporum bodinieri</i> (H. Lév. & Van- iot) F. T. Wang & T. Tang	XZ: Motuo, 1500 m		16	2x	Gu & Sun (1998)
<i>D. cantoniense</i> Merr.	YN: Lijiang, 2600 m		14	2x	Gu et al. (1993a)
	SC: Mt. Emei	8		2x	Tang et al. (1984)
<i>Fritillaria cirrhosa</i> D. Don	YN: Gongshan, 4100 m		24	2x	Xie et al. (1992)
<i>Hemerocallis forrestii</i> Diels	YN: Lijiang, 3200 m		22	2x	Xiong & Chen (1998)
	YN: Lijiang		22	2x	Xiong et al. (1997)
<i>H. multiflora</i> Stout	YN: Dali, 2500 m		33	3x	Xiong & Chen (1998)
<i>H. plicata</i> Stapf	YN: Dali, 2300 m		22	2x	Xiong & Chen (1998)
	YN: Dali, 2300 m		22	2x	Xiong et al. (1997)
<i>Lilium bakerianum</i> Coll. & Hemsl. var. <i>rubrum</i> Stearn	YN: Dali, 3200 m		24	2x	L. Wang et al. (1993)
	YN: Lushui, 2000 m		24	2x	Xie et al. (1992)
<i>L. brownii</i> F. E. Brown ex Spae	YN: Gongshan		36	3x	Xie & Wu (1993)
	YN: Dali, 2400 m		24	2x	Yu et al. (1996a)
<i>L. duchartrei</i> Franch.	YN: Zhongdian, 3200 m		24	2x	Huang & Li (1996)
	YN: Lijiang, 2800 m		24	2x	L. Wang et al. (1993)
<i>L. nepalense</i> D. Don	YN: Lushui, 2700 m		24	2x	Xie et al. (1992)
<i>L. souliei</i> (Franch.) Sealy	YN: Gongshan, 3500 m		24	2x	Xie et al. (1992)
	YN: Gongshan, 2000 m		24	2x	Xie et al. (1992)
<i>Nomocharis aperta</i> W. W. Sm. & W. E. Evans	YN: Gongshan, 3300 m		24	2x	Xie et al. (1992)
<i>N. basilissa</i> Farrer ex W. E. Evans	YN: Gongshan, 3400 m		24	2x	Xie et al. (1992)
<i>N. biluoensis</i> S. Y. Liang	YN: Lijiang, 3000 m		24	2x	L. Wang et al. (1993)
<i>N. farreri</i> Cox	YN: Lushui, 3100 m		24	2x	Xie et al. (1992)
<i>N. forrestii</i> Balf. f.	YN: Zhongdian		24	2x	Yu & Huang (1994)
	YN: Zhongdian, 3800 m		24	2x	Yu et al. (1996d)
<i>N. mairei</i> H. Lév.	YN: Dali, 3500 m		24	2x	Yu et al. (1996b)
<i>N. meleagrina</i> Franch.	YN: Gongshan, 3300 m		24	2x	Xie et al. (1992)
	YN: Dali, 3200 m		24	2x	L. Wang et al. (1993)
<i>N. pardanthina</i> Franch.	YN: Gongshan, 3000 m		24	2x	Xie et al. (1992)
	YN: Gongshan, 3300 m		24	2x	Xie et al. (1992)
<i>N. pardanthina</i> Franch. f. <i>punctulata</i> Sealy	YN: Gongshan, 3300 m		24	2x	Xie et al. (1992)
<i>N. saluenensis</i> Balf. f.	YN: Yunlong, 3100 m		24	2x	L. Wang et al. (1993)
<i>Notholirion bulbiferum</i> (Lingelsh.) Stearn	YN: Zhongdian, 3400 m		24	2x	Yu et al. (1996c)
	YN: Dali, 3200 m		24	2x	L. Wang et al. (1993)
<i>N. campanulatum</i> Cotton & Stearn	YN: Ninglang, 3500 m		24	2x	Yu et al. (1996c)
	YN: Weixi, 3100 m		72	4x	D. M. Zhang (1998)
<i>Ophiopogon angustifolius</i> (Wang & Tang) S. C. Chen	YN: Weixi, 3100 m		72	4x	D. M. Zhang (1998)
<i>O. bodinieri</i> H. Lév.	YN: Zhongdian, 3600 m		108	6x	D. M. Zhang (1998)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>O. clarkei</i> Hook. f.	YN: Lijiang, 2750 m		36	2x	D. M. Zhang (1998)
<i>O. intermedius</i> D. Don	YN: Lijiang, 2750 m		72	4x	D. M. Zhang (1998)
<i>O. japonicus</i> Ker Gawl.	YN: Weixi, 2500 m		108	6x	D. M. Zhang (1998)
<i>Paris bashanensis</i> F. T. Wang & T. Tang	YN: Dali		10	2x	Gu & Na (1986)
<i>P. dulongensis</i> H. Li & S. Kurita	YN: Gongshan, 1320 m		10	2x	Gu et al. (1992)
<i>P. fargesii</i> Franch.	SC: Mt. Emei	5		2x	Tang et al. (1984)
<i>P. forrestii</i> (Takht.) H. Li	YN: Tengchong		10	2x	Miyamoto et al. (1992)
	YN: Gongshan, 2350 m		10	2x	Gu et al. (1992)
	YN: Dali		10	2x	Gu & Na (1986)
<i>P. mairei</i> H. Lév.	YN: Dali		10	2x	Miyamoto et al. (1992)
	YN: Gongshan, 1700 m		10	2x	Gu et al. (1992)
	YN: Dali		10	2x	Gu & Na (1986)
<i>P. marmorata</i> Stearn	YN: Dali		10	2x	Gu & Na (1986)
<i>P. polyphylla</i> Sm.	SC: Wenchuan		10	2x	Hong & Zhu (1987)
	SC: Mt. Emei		20	4x	S. F. Wang & Xu (1989)
<i>P. rugosa</i> H. Li & S. Kurita	YN: Gongshan, 1500 m		10	2x	Gu et al. (1992)
<i>P. tibetica</i> Franch.	YN: Dali		10	2x	Miyamoto et al. (1992)
	YN: Dali		10	2x	Gu & Na (1986)
<i>P. tibetica</i> Franch. var. <i>apetala</i> Hand.-Mazz.	YN: Gongshan, 2300 m		10	2x	Gu et al. (1992)
<i>Polygonatum alternicirrhosum</i> Hand.-Mazz.	SC: Luding, 2800 m		32	2x	S. F. Chen (1989)
<i>P. cathcartii</i> Baker	YN: Gongshan, 2600 m		32	2x	L. Wang et al. (1993)
<i>P. cirrhifolium</i> Royle	XZ: Bomi, 3000 m		52	4x	Gu et al. (1993b)
	SC: Kangding, 3300 m		56	4x	S. F. Chen (1989)
	YN: Yunlong, 2900 m		30	2x	L. Wang et al. (1993)
<i>P. curvistylum</i> Hua	YN: Dali, 3000 m		78	6x	L. Wang et al. (1993)
<i>P. griffithii</i> Baker	XZ: Motuo, 1900 m		36	4x	Gu & Sun (1998)
<i>P. odoratum</i> Druce	SC: Mt. Emei, 800 m		22	2x	Fang (1989)
<i>P. oppositifolium</i> Royle	XZ: Motuo, 2100 m		30	2x	Gu & Sun (1998)
<i>P. prattii</i> Baker	YN: Dali		28	2x	J. Yang et al. (1992)
<i>P. sibiricum</i> Redouté	SC: Nanping, 3200 m		24	2x	S. F. Chen (1989)
<i>Reineckea carnea</i> (Andr.) Kunth	SC: Mt. Emei		38	2x	Tang et al. (1984)
<i>Scilla sinensis</i> (Lour.) Merr.	YN: Eryuan, Lijiang		16	2x	K. Y. Ding et al. (1998)
<i>Smilacina atropurpurea</i> (Franch.) Wang & Tang	YN: Yunlong, 2800 m		36	2x	L. Wang et al. (1993)
	YN: Zhongdian, 3800 m		72	4x	Meng et al. (2005)
<i>S. forrestii</i> (W. W. Sm.) Hand.-Mazz.	YN: Lushui, 3100 m		36	2x	Meng et al. (2005)
<i>S. fusca</i> Wall.	XZ: Motuo, 1600 m		54	3x	Gu & Sun (1998)
	YN: Yunlong, 2800 m		36	2x	L. Wang et al. (1993)
	YN: Gongshan, 1300 m		72	4x	Gu et al. (1992)
<i>S. henryi</i> (Baker) Hara	YN: Dali, 3200 m		36	2x	L. Wang et al. (1993)
<i>S. lichiangense</i> (W. W. Sm.) W. W. Sm.	YN: Zhongdian, 3700 m		36	2x	Meng et al. (2005)
<i>S. purpurea</i> Wall.	YN: Gongshan, 3300 m		36	2x	Meng et al. (2005)
<i>S. tatsienensis</i> (Franch.) Wehrh.	YN: Dali, 3200 m		36	2x	L. Wang et al. (1993)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>Streptopus simplex</i> D. Don	XZ: Motuo, 1700 m		32	4x	Gu & Sun (1998)
<i>Trillium tschonoskii</i> Maxim.	SC: Mt. Emei		10	2x	S. F. Wang (1989)
	SC: Mt. Emei		20	4x	S. F. Wang & Xu (1989)
ONAGRACEAE					
<i>Circaea alpina</i> L. subsp. <i>angustifolia</i> (Hand.-Mazz.) D. E. Boufford	YN: Hengduan Mts.		22	2x	Seavey & Boufford (1983)
ORCHIDACEAE					
<i>Cymbidium hookerianum</i> Rchb. f.	YN: Tengchong		40		Y. G. Li et al. (2003)
<i>C. eburneum</i> Lindl.	YN: Baoshan		40		Y. G. Li et al. (2003)
PAEONIACEAE					
<i>Paeonia delavayi</i> Franch.	YN: Lijiang, 2400 m		10	2x	D. Q. Yang & Zhu (1989)
<i>P. delavayi</i> Franch. f. <i>lutea</i> (Delavay ex Franch.) S. G. Haw	YN: Dali, 2910 m		10	2x	Gong et al. (1999)
	YN: Zhongdian, 3200 m		10	2x	Gong et al. (1991)
	YN: Dali, 3000 m		10	2x	D. Q. Yang & Zhu (1989)
<i>P. obovata</i> Maxim.	SC: Wolong Nat. Res.		20	4x	Hong et al. (2001)
PAPAVERACEAE					
<i>Meconopsis integrifolia</i> Franch.	YN: Zhangdian, 4150 m		76	4x	Meng et al. (in prep.)
<i>M. horridula</i> Hook. f. & Thomson	YN: Weixi, 4100 m		56	4x	Meng et al. (in prep.)
<i>M. racemosa</i> Maxim.	YN: Zhongdian, 4100 m		56	4x	Meng et al. (in prep.)
<i>M. pseudovenusta</i> G. Taylor	YN: Zhongdian, 4400 m		56	4x	Meng et al. (in prep.)
PLANTAGINACEAE					
<i>Plantago erosa</i> Wall.	SC: Baoxing, 1850 m	12		4x	Hong & Zhang (1990)
POACEAE					
<i>Elymus anthosachnoides</i> (Keng) Á. Löve	SC: Batang		28	4x	W. J. Li et al. (1996)
<i>E. atratus</i> (Nevski) Hand.-Mazz.	SC: Hongyuan		42	6x	Y. H. Liu (1985)
	SC: Rourgai		28	4x	B. R. Lu et al. (1990)
<i>E. cylindricus</i> Honda	SC: Ganzi		42	6x	Y. H. Liu (1985)
	SC: Hongyuan		42	6x	B. R. Lu et al. (1990)
<i>E. dahuricus</i> Turcz.	SC: Kangding		42	6x	Y. H. Liu (1985)
<i>E. nutans</i> Griseb.	SC: Ruoergai		42	6x	Y. H. Liu (1985)
<i>E. sibiricus</i> L.	SC: Kangding		28	4x	Y. H. Liu (1985)
	SC: Rourgai		28	4x	B. R. Lu et al. (1990)
	SC: Nanping		42	6x	B. R. Lu et al. (1990)
<i>E. submuticus</i> Keng ex Keng f.	SC		42	6x	L. B. Cai & Feng (1997)
<i>E. tangutorum</i> (Nevski) Hand.-Mazz.	SC: Shiqu		42	6x	Y. H. Liu (1985)
	SC: Maowen		42	6x	B. R. Lu et al. (1990)
<i>Kengyilia laxiflora</i> (Keng) S. L. Chen	SC: Ganzi		42	6x	X. Q. Zhang et al. (1998)
<i>K. melanthera</i> (Keng) S. L. Chen	SC: Ruoergai		42	6x	Y. H. Zhou (1994)
<i>Poa attenuata</i> Trin. ex Bunge var. <i>vipara</i> Rendl	QH: BayanHarashan, 5200 m	ca. 21		3x	Huang et al. (1996a)
<i>Roegneria altissima</i> Keng ex Y. L. Keng & S. L. Chen	SC: Batang		28	4x	Y. H. Zhou et al. (1993)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>R. breviglumis</i> Keng ex Y. L. Keng & S. L. Chen	SC: Ruoergai		28	4x	B. R. Lu et al. (1990)
<i>R. ciliaris</i> (Trin.) Nevski	SC: Wenchuan SC: Yaan		28 28	4x 4x	B. R. Lu et al. (1990) G. L. Sun et al. (1993b)
<i>R. dolichathera</i> Keng ex Y. L. Keng & S. L. Chen	SC: Nanping SC: Wenchuan		14 28	2x 4x	G. L. Sun et al. (1992) Y. H. Zhou et al. (1993)
<i>R. elytrigoides</i> C. Yen & J. L. Yang	XZ: Chuangdu		28	4x	C. B. Ding et al. (2004)
<i>R. gmelini</i> (Griseb.) Kitag.	SC: Ruoergai		28	4x	B. R. Lu et al. (1990)
<i>R. kamoji</i> (Ohwi) Ohwi	SC: Lixian SC: Yaan		42 42	6x 6x	B. R. Lu et al. (1990) X. Q. Zhang et al. (1998)
<i>R. nutans</i> (Keng) Keng ex Y. L. Keng & S. L. Chen	SC: Ruoergai SC: Hongyuan		42 28	6x 4x	B. R. Lu et al. (1990) G. L. Sun et al. (1993a)
<i>R. parvigluma</i> Keng ex Y. L. Keng & S. L. Chen	SC: Hongyuan SC: Maerkang		42 28	6x 4x	B. R. Lu et al. (1990) B. R. Lu et al. (1990)
<i>R. pendulina</i> Nevski	SC: Lixian SC: Nanping		42 28	6x 4x	B. R. Lu et al. (1990) B. R. Lu et al. (1990)
<i>R. sinica</i> Keng ex Y. L. Chen & S. L. Chen	SC: Aba		28	4x	B. R. Lu et al. (1990)
<i>R. stricta</i> Keng ex Y. L. Keng & S. L. Chen	SC: Maowen		28	4x	B. R. Lu et al. (1990)
PRIMULACEAE					
<i>Androsace bulleyana</i> Forrest	YN: Zhongdian, 3400 m		20	2x	Nakata et al. (1997)
<i>A. spinulifera</i> Knuth	YN: Lijiang, 3200 m		20	2x	Nakata et al. (1997)
<i>A. yargongensis</i> Petitm.	QH: Maduo, 4600 m		40	4x	Huang (2001)
<i>Pomatosace filicula</i> Maxim.	QH: Maqin		20	2x	Kong & Liu (1999)
<i>Primula aurantiaca</i> W. W. Sm.	YN: Jianchuan, 3100 m		22	2x	H. F. Zhu et al. (2001)
<i>P. beesiana</i> Forrest	YN: Lijiang, 2800 m YN: Lijiang, 2500 m		22 22	2x 2x	H. F. Zhu et al. (2001) Nakata et al. (1997)
<i>P. bulleyana</i> Forrest	YN: Lijiang, 2800 m		22	2x	H. F. Zhu et al. (2001)
<i>P. forrestii</i> Balf. f.	YN: Lijiang, 2700 m		24	2x	Nakata et al. (1997)
<i>P. malacoides</i> Franch.	YN: Zhongdian, 3200 m		18	2x	Nakata et al. (1997)
<i>P. monticola</i> (Hand.-Mazz.) F. H. Chen & C. M. Hu	SC: Wenchuan, 3700 m		16	2x	H. F. Zhu et al. (2001)
<i>P. poissonii</i> Franch.	YN: Zhongdian, 3300 m YN: Zhongdian, 3300 m		22 22	2x 2x	H. F. Zhu et al. (2001) Nakata et al. (1997)
<i>P. pulchella</i> Franch.	YN: Lijiang, 2800 m		16	2x	Nakata et al. (1997)
<i>P. pulverulenta</i> Duthie	SC: Kangdian, 2500 m		22	2x	H. F. Zhu et al. (2001)
<i>P. secundiflora</i> Franch.	YN: Deqin, 4300 m YN: Zhongdian, 3100 m		22 22	2x 2x	H. F. Zhu et al. (2001) Nakata et al. (1997)
<i>P. sikkimensis</i> Hook.	YN: Deqin, 4300 m		20	2x	H. F. Zhu et al. (2001)
<i>P. sinolisteri</i> Balf. f.	YN: Luquan, 2500 m YN: Zhongdian, 3100 m		24 22	2x 2x	Nakata et al. (1997) Nakata et al. (1997)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	2 <i>n</i>	Ploidy	Reference
<i>P. vialii</i> Delavay ex Franch.	YN: Zhongdian, 4050 m		22	2 <i>x</i>	H. F. Zhu et al. (2001)
RANUNCULACEAE					
<i>Aconitum brachypodium</i> Diels	YN: Lijiang, 3700 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
<i>A. brachypodium</i> Diels var. <i>laxiflorum</i> H. R. Fletcher & Lauener	YN: Zhongdian, 3200 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
<i>A. brevicaratum</i> Diels	YN: Heqing, 3700 m		32	4 <i>x</i>	Q. E. Yang et al. (1994)
	YN: Lijiang		32	4 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. brevicaratum</i> (Finet & Gagnep.) Diels var. <i>parviflorum</i> Chen & Liu	YN: Lijiang, 4000 m		32	4 <i>x</i>	Q. E. Yang et al. (1994)
<i>A. brunneum</i> Hand.-Mazz.	SC: Songpan		16	2 <i>x</i>	Q. E. Yang (1996)
<i>A. bulleyanum</i> Diels	YN: Heqing		16	2 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. carmichaelii</i> Debeaux	YN: Dali		64	8 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. contortum</i> Finet & Gagnep.	YN: Yunlong, 3400 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Dali		16	2 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. crassiflorum</i> Hand.-Mazz.	YN: Zhongdian, 3700 m		32	4 <i>x</i>	Q. E. Yang et al. (1994)
	SC: Yajiang		32	4 <i>x</i>	Q. E. Yang (2001a)
<i>A. delavayi</i> Franch.	YN: Lijiang, 2900 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Dali		16	2 <i>x</i>	Q. E. Yang (2001a)
<i>A. episcopale</i> H. Lév.	YN: Dali		16	2 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. fengii</i> W. T. Wang	YN: Zhongdian, 3700 m		32	4 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Zhongdian, 3970 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Weixi		16	2 <i>x</i>	Q. E. Yang (2001a)
<i>A. forrestii</i> Stapf	YN: Lijiang		16	2 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. georgei</i> Comber	YN: Lijiang, 3200 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
<i>A. gymnandrum</i> Maxim.	QH: Dari, 4050 m		16	2 <i>x</i>	J. Q. Liu (2002)
<i>A. hemsleyanum</i> E. Pritz. ex Diels	YN: Deqin, 3200 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Weixi		16	2 <i>x</i>	Q. E. Yang (2001a)
<i>A. hemsleyanum</i> E. Pritz. var. <i>circinatum</i> W. T. Wang	SC: Mt. Emei, 2100 m		16	2 <i>x</i>	Shang & Li (1984)
<i>A. legendrei</i> Hand.-Mazz.	SC: Shimian		16	2 <i>x</i>	Q. E. Yang (2001a)
<i>A. liljestradii</i> Hand.-Mazz.	SC: Yajiang		16	2 <i>x</i>	Q. E. Yang (2001a)
<i>A. nagarum</i> Stapf	YN: Yunlong		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
<i>A. nagarum</i> Stapf var. <i>heterotrichum</i> H. R. Fletcher & Lauener	YN: Weixi, 3600 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
<i>A. nagarum</i> Stapf var. <i>dielsianum</i> (Airy Shaw) W. T. Wang	YN: Tengchong		16	2 <i>x</i>	Q. E. Yang et al. (1989)
<i>A. owrardianum</i> Hand.-Mazz.	YN: Deqin, 3600– 4000 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)
	YN: Deqin, 4200 m		16	2 <i>x</i>	Q. E. Yang et al. (1993a)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>A. pendulicarpum</i> Chang ex W. T. Wang	YN: Deqin		16	2x	Q. E. Yang et al. (1989)
<i>A. pendulum</i> Busch	YN: Zhongdian, 3200 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. piepunense</i> Hand.-Mazz.	YN: Zhongdian, 3200 m		32	4x	Q. E. Yang et al. (1993a)
	YN: Zhongdian, 3400 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. piepunense</i> Hand.-Mazz. var. <i>pilosum</i> H. F. Comber	YN: Zhongdian, 3700 m		16	2x	Q. E. Yang (2001a) Q. E. Yang et al. (1993a)
<i>A. pulchellum</i> Hand.-Mazz.	YN: Deqin, 4200 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. rockii</i> Fletcher & Lauener	YN: Zhongdian, 3750 m		16	2x	Q. E. Yang et al. (1993a)
	YN: Zhongdian, 3970 m		32	4x	Q. E. Yang et al. (1993a)
<i>A. scaposum</i> Franch.	YN: Dali		16	2x	Q. E. Yang (2001a)
<i>A. sessiliflorum</i> (Finet & Gagnep.) Hand.-Mazz.	SC: Ruergai		16	2x	Q. E. Yang (1996)
<i>A. sinomontanum</i> Nakai	SC: Nanping		16	2x	Q. E. Yang (1996)
<i>A. souliei</i> Finet & Gagnep.	YN: Deqin, 4300 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. spathulatum</i> W. T. Wang	YN: Heqing,		16	2x	Q. E. Yang et al. (1989)
<i>A. stapfianum</i> Hand.-Mazz.	YN: Lijiang		16	2x	Q. E. Yang et al. (1989)
<i>A. stramineiflorum</i> Chang ex W. T. Wang	YN: Weixi		16	2x	Q. E. Yang et al. (1993a)
<i>A. tanguticum</i> (Maxim.) Stapf	QH: Yushu, 3500 m		16	2x	J. Q. Liu (2002)
<i>A. tongolense</i> Ulbr.	SC: Lixian		16	2x	Q. E. Yang (2001a)
<i>A. transsectum</i> Diels	YN: Lijiang, 3600 m		16	2x	Q. E. Yang et al. (1993a)
	YN: Lijiang, Yulong		16	2x	Q. E. Yang et al. (1989)
<i>A. tsaii</i> W. T. Wang	YN: Lushui, 3200–3800 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. tuguanuncunense</i> Q. E. Yang	YN: Zhongdian, 2800 m		16	2x	Q. E. Yang et al. (1993a)
	YN: Zhongdian		16	2x	Q. E. Yang & Gong (1995)
<i>A. wangii</i> Q. E. Yang	YN: Lijiang, 3200 m		16	2x	Q. E. Yang et al. (1993a)
<i>A. wardii</i> Fletcher & Lauener	YN: Deqin		32	4x	Q. E. Yang et al. (1994)
<i>Actaea asiatica</i> Hara	YN: Dali		16	2x	Q. E. Yang (1998)
	YN: Zhongdian		16	2x	Q. E. Yang (2002a)
<i>Adonis brevistyla</i> Franch.	YN: Zhongdian		16	2x	Q. E. Yang (2001b)
<i>Anemoclema glaucifolium</i> (Franch.) W. T. Wang	YN: Lijiang		16	2x	Q. E. Yang (2002b)
	YN: Ninglang		16	2x	G. L. Zhang & Gong (2002)
<i>Anemone davidii</i> Franch.	YN: Weixi		32	4x	Q. E. Yang (2002b)
<i>A. begoniifolia</i> H. Lév. & Vaniot	SC: Nanchuan		16	2x	Q. E. Yang (2002b)
<i>A. demissa</i> Hook. f. & Thomson	YN: Zhongdian		14	2x	Q. E. Yang (2002b)
<i>A. flaccida</i> Fr. Schmidt	YN: Weixi		14	2x	Q. E. Yang (2002b)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>A. hupehensis</i> Hort. ex Boynton f. <i>alba</i> W. T. Wang	YN: Zhongdian		16	2x	Q. E. Yang (2002b)
<i>A. rivularis</i> Wall.	YN: Lijiang		16	2x	Q. E. Yang (2002b)
<i>A. rupestris</i> Wall.	YN: Zhongdian		14	2x	Q. E. Yang (2002b)
<i>A. stolonifera</i> Maxim.	YN: Zhongdian		16	2x	Q. E. Yang (2002b)
<i>A. trullifolia</i> Hook. f. & Thomson var. <i>colestina</i> (Franch.) Finet & Gagnep.	YN: Dali		14	2x	Q. E. Yang (2002b)
<i>A. trullifolia</i> Hook. f. & Thomson var. <i>holophylla</i> Diels	YN: Zhongdian		14	2x	Q. E. Yang (2002b)
<i>Asteropyrum peltatum</i> J. R. Drumm. & Hutchinson	YN: Gongshan		16	2x	Q. E. Yang et al. (1993b)
	SC: Mt. Emei, 2000 m		16	2x	Z. Y. Zhang (1982)
<i>Batrachium bungei</i> (Steud.) L. Liu	YN: Zhongdian		24	3x	Q. E. Yang (2001b)
	YN: Zhongdian		16	2x	Q. E. Yang (2001b)
<i>Beesia calthifolia</i> Ulbr.	SC: Mt. Emei		16	2x	Shang (1985)
	YN: Dali		32	4x	Q. E. Yang (1999a)
	YN: Weixi		16	2x	Q. E. Yang (2002a)
<i>B. deltophylla</i> C. Y. Wu	XZ: Motuo		16	2x	Q. E. Yang et al. (1995)
<i>Calathodes oxycarpa</i> Sprague	YN: Dali, 2800 m		16	2x	Q. E. Yang (1995)
	SC: Mt. Emei, 2400 m		16	2x	Z. Y. Zhang (1982)
	YN: Dali		16	2x	Q. E. Yang (2002a)
<i>Callianthemum pimpinelloides</i> (D. Don) Hook. f. & Thomson	YN: Zhongdian		32	4x	Q. E. Yang (2001b)
<i>Caltha palustris</i> L.	YN: Dali		32	4x	Q. E. Yang (2002a)
	YN: Zhongdian		48	6x	Q. E. Yang (2002a)
	YN: Deqin		64	8x	Q. E. Yang (2002a)
<i>Cimicifuga foetida</i> L.	YN: Zhongdian		16	2x	Q. E. Yang (1999b)
	YN: Dali		32	4x	Q. E. Yang (1999b)
	YN: Zhongdian		16	2x	Q. E. Yang et al. (1993b)
<i>C. foetida</i> L. var. <i>velutina</i> Franch. ex Finet & Gagnep.	YN: Lijiang		16	2x	Q. E. Yang (1999b)
<i>C. simplex</i> Wormsk. ex DC.	SC: Muli		16	2x	Q. E. Yang (1999b)
<i>C. yunnanensis</i> Hsiao	YN: Lijiang		16	2x	Q. E. Yang (1999b)
	YN: Deqin		16	2x	Q. E. Yang (2002a)
<i>Circaeaster agrestis</i> Maxim.	QH: Datong		30	2x	Kong & Yang (1997)
<i>Clematis brevicaudata</i> DC.	YN: Deqin		16	2x	Q. E. Yang (2002b)
<i>C. chrysocoma</i> Franch.	YN: Lijiang		16	2x	Q. E. Yang (2002b)
<i>C. kockiana</i> C. K. Schneid.	YN: Yunlong		16	2x	Q. E. Yang (2002b)
<i>C. puberula</i> Hook. f. & Thomson var. <i>ganpiniana</i> (H. Lév. & Vaniot) W. T. Wang	YN: Lijiang		16	2x	Q. E. Yang (2002b)
<i>C. ranunculoides</i> Franch.	YN: Zhongdian		16	2x	Q. E. Yang (2002b)
<i>C. rehderiana</i> Craib	YN: Deqin		16	2x	Q. E. Yang (2002b)
<i>Coptis teeta</i> Wall.	YN: Gongshan		18	2x	Q. E. Yang et al. (1993b)
<i>Delphinium beesianum</i> W. W. Sm.	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. bonvalotii</i> Franch.	SC: Muli		16	2x	Q. E. Yang (2001a)
<i>D. bulleyanum</i> Forrest ex Diels	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. caeruleum</i> Jacquem.	SC: Ruoergai		16	2x	Q. E. Yang (1996)
<i>D. candelabrum</i> Ostenf. var. <i>monanthum</i> (Hand.-Mazz.) W. T. Wang	QH: Yushu, 4650 m		16	2x	J. Q. Liu & He (1999)
<i>D. ceratophorum</i> Franch.	YN: Weixi		16	2x	Q. E. Yang (2001a)
<i>D. coleopodium</i> Hand.-Mazz.	YN: Lijiang		16	2x	Q. E. Yang (2001a)
<i>D. delavayi</i> Franch.	YN: Lijiang		16	2x	Q. E. Yang (2001a)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>D. delavayi</i> Franch. var. <i>pogonanthum</i> (Hand.-Mazz.) W. T. Wang	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. forrestii</i> Diels	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. grandiflorum</i> L.	SC: Lixian		16	2x	Q. E. Yang (2001a)
<i>D. kamaonense</i> Huth	SC: Nanping		16	2x	Q. E. Yang (1996)
<i>D. kamaonense</i> var. <i>glabrescens</i> (W. T. Wang) W. T. Wang	QH: Yushu, 4020 m		16	2x	J. Q. Liu & He (1999)
<i>D. likiangense</i> Franch.	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. nangchienense</i> W. T. Wang	QH: Yushu, 3540 m		16	2x	J. Q. Liu & He (1999)
<i>D. oxycentrum</i> W. T. Wang	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. pylzowi</i> Maxim.	QH: Yushu, 4000 m		16	2x	J. Q. Liu & He (1999)
<i>D. smithianum</i> Hand.-Mazz.	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. spirocentrum</i> Hand.-Mazz.	YN: Dali		16	2x	Q. E. Yang (2001a)
<i>D. tangkulaense</i> W. T. Wang	QH: Maduo, 4430 m		16	2x	J. Q. Liu & He (1999)
<i>D. tenui</i> H. Lév.	YN: Zhongdian		16	2x	Q. E. Yang (2001a)
<i>D. trichophorum</i> Franch.	QH: Yushu, 3850 m		16	2x	Liu & He (1999)
<i>D. umbrosum</i> Hand.-Mazz.	YN: Weixi		16	2x	Q. E. Yang (2001a)
<i>Halerpestes sarmentosa</i> (Adams) Komarov	YN: Zhongdian		32	4x	Q. E. Yang (2001b)
<i>Kingdonia uniflora</i> Balf. f. & W. W. Sm.	SC: Mt. Emei, 2750 m		18	2x	Z. Y. Zhang (1982)
<i>Oxygraphis delavayi</i> Franch.	YN: Weixi, 3900 m		16	2x	Q. E. Yang (2000a)
<i>O. glacialis</i> Bunge	YN: Deqin, 3900 m		16	2x	Q. E. Yang (2000a)
<i>O. tenuifolia</i> W. E. Evans	YN: Zhongdian, 4100 m		16	2x	Q. E. Yang (2000a)
<i>Ranunculus felixii</i> H. Lév.	YN: Lijiang, 3600 m		32	4x	Q. E. Yang (2000b)
<i>R. ficariifolia</i> H. Lév. & Vaniot	YN: Weixi		32	4x	Q. E. Yang (2001b)
<i>R. involucratus</i> Maxim.	QH: Maduo, 4840 m	ca.	42	6x	Huang et al. (1996a)
<i>R. japonicus</i> Thunb.	SC: Yaan		14	2x	Q. E. Yang (2001b)
<i>R. laetus</i> Wall.	YN: Dali		14	2x	Q. E. Yang (2001b)
<i>R. nematolobus</i> Hand.-Mazz.	YN: Dali		16	2x	Q. E. Yang (2001b)
<i>R. potanini</i> Komarov	YN: Zhongdian		32	4x	Q. E. Yang (2001b)
<i>R. sinovaginatatus</i> W. T. Wang	YN: Deqin		32	4x	Q. E. Yang (2001b)
<i>R. tanguticus</i> (Finet & Gagnep.) Hao	SC: Lixian		32	4x	Q. E. Yang (2001b)
<i>R. trigonus</i> Hand.-Mazz.	YN: Lijiang		16	2x	Q. E. Yang (2001b)
<i>R. wangianus</i> Q. E. Yang	YN: Weixi		48	6x	Q. E. Yang (2000b)
<i>R. yunnanensis</i> Franch.	YN: Dali, 3400 m		16	2x	Q. E. Yang (2000b)
<i>Souliea vaginata</i> Franch.	YN: Zhongdian		16	2x	Q. E. Yang (2002a)
<i>Trollius yunnanensis</i> Ulbr.	YN: Lijiang		16	2x	Q. E. Yang (2002a)
ROSACEAE					
<i>Dichotomanthes tristaniaecarpa</i> Kurz	YN: Tengchong		34	2x	L. H. Zhou et al. (2000)
<i>Malus asiatica</i> Nakai	SC: Baxian		68	4x	G. L. Liang (1987)
<i>M. halliana</i> Koehne	SC: Zhaojiao		34	2x	G. L. Liang (1987)
	SC: Zhaojiao		34	2x	G. L. Liang & Li (1993)
<i>M. hupehensis</i> (Pamp.) Rehder	SC: Maerkang		51	3x	G. L. Liang (1987)
	SC: Yanyuan		68	4x	G. L. Liang (1987)
<i>M. kansuensis</i> (Batalin) C. K. Schneid.	SC: Xiaojin		34	2x	G. L. Liang (1987)
<i>M. ombrophila</i> Hand.-Mazz.	SC: Yanyuan		34	2x	G. L. Liang (1987)
	SC: Yanyuan		34	2x	G. L. Liang & Li (1993)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>M. rockii</i> Rehder	SC: Yanyuan		34	2x	G. L. Liang (1987)
	SC: Zhaojiao		51	3x	G. L. Liang (1987)
	SC: Zhaojiao		51	3x	G. L. Liang & Li (1993)
	SC: Yanyuan		34	2x	G. L. Liang & Li (1993)
<i>M. sikkimensis</i> (Wenzig) Koehne ex C. K. Schneid.	SC: Yanyuan		34	2x	G. L. Liang & Li (1993)
<i>M. toringoides</i> (Rehd.) Hughes	SC: Maerkang		51	3x	G. L. Liang (1987)
	SC: Aba		34	2x	G. L. Liang & Li (1993)
	SC: Maerkang		51	3x	G. L. Liang & Li (1993)
	SC: Aba		68	4x	G. L. Liang & Li (1993)
<i>M. xiaojinensis</i> M. H. Cheng & N. G. Jiang	SC: Xiaojin		68	4x	G. L. Liang & Li (1993)
<i>M. yunnanensis</i> C. K. Schneid.	SC: Yanyuan		34	2x	G. L. Liang (1987)
	SC: Yanyuan		34	2x	G. L. Liang & Li (1993)
<i>Rubus ichangensis</i> Hemsl. & Kuntze	SC: Mt. Emei		28	4x	Iwatsubo & Naruhashi (1992)
RUBIACEAE					
<i>Kelloggia chinensis</i> Franch.	YN: Zhongdian		22	2x	Tu et al. (in prep.)
SABIACEAE					
<i>Sabia yunnanensis</i> Franch.	SC: Baoxing, 2600 m	12		2x	Hong & Zhang (1990)
SAXIFRAGACEAE					
<i>Chrysosplenium griffithii</i> Hook. f. & Thomson	SC: Kangding, 3560 m		18	2x	Funamoto et al. (1997b)
	SC: Songpan, 3400 m		36	4x	Funamoto et al. (2000b)
<i>C. lanuginosum</i> Hook. f. & Thomson	SC: Dujianyan, 1900 m		16	2x	Funamoto et al. (2000b)
<i>C. aff. lixianense</i> Jien ex J. T. Pan	SC: Nanping, 3050 m		12	2x	Funamoto et al. (2000b)
<i>C. pillosum</i> Maxim. var. <i>valdipilosum</i> Ohwi	SC: Songpan, 3400 m		36	4x	Funamoto et al. (2000b)
<i>C. qinlingense</i> Jien ex J. T. Pan	SC: Nanping, 3050 m		52	4x	Funamoto et al. (2000b)
<i>Parnassia</i> aff. <i>cacuminum</i> Hand.-Mazz. f. <i>yushuensis</i> T. C. Ku	SC: Songpan, 3850 m		18	2x	Funamoto et al. (2001a)
<i>P. brevistyla</i> (Brieg.) Hand.-Mazz.	SC: Songpan, 3420 m		14	2x	Funamoto et al. (2001a)
<i>P. delavayi</i> Franch.	SC: Nanping, 3050 m		14	2x	Funamoto et al. (2001a)
<i>P. viridifolia</i> Batalin	SC: Nanping, 3050 m		36	4x	Funamoto et al. (2001a)
<i>P. yunnanensis</i> Franch. var. <i>longistipitata</i> Z. P. Jien	SC: Kangdin, 3750 m		32	4x	Funamoto et al. (1997a)
<i>Rodgersia aesculifolia</i> Batalin	SC: Aba, Maoxian		30	2x	Funamoto et al. (2000a)
<i>R. pinnata</i> Franch.	YN: Lijiang		60	4x	Akiyama et al. (1990)
	YN: Lijiang		ca. 75	5x	Akiyama et al. (1990)
<i>Saxifraga aculeate</i> Balf. f.	SC: Kangdin, 2400 m		28	4x	Funamoto et al. (1998)

Appendix 1. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>S. aurantiana</i> Franch.			16	2x	Funamoto et al. (2001b)
<i>S. cardiophylla</i> Franch.	SC: Kangdin, 3620 m		32	4x	Funamoto et al. (1998)
<i>S. divaricata</i> Engl. & Irmischer	SC: Kangdin, 3750 m		22	2x	Funamoto et al. (1998)
<i>S. egregia</i> Engl.	SC: Songpan, 3500 m		16	2x	Funamoto et al. (2001b)
<i>S. heleonastes</i> Harry Sm.	SC: Songpan, 3350 m		16	2x	Funamoto et al. (2001b)
<i>S. hirculus</i> L.	SC: Songpan, 3850 m		32	4x	Funamoto et al. (2001b)
<i>S. aff. melanocentra</i> Franch.	SC: Songpan, 3850 m		22, 23	2x	Funamoto et al. (2001b)
<i>S. montana</i> Harry Sm.	SC: Kangdin, 3540 m		32	4x	Funamoto et al. (1998)
<i>Tiarella polyphylla</i> D. Don	SC: Mt. Emei		14	2x	Soltis & Bohm (1984)
SCROPHULARIACEAE					
<i>Pedicularis densispica</i> Franch. ex Maxim.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. dichotoma</i> Bonati	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. dolichocymba</i> Hand.-Mazz.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. integrifolia</i> Hook. f. subsp. <i>integerrima</i> (Pennell & Li) Tsoong	YN: Zhongdian		14	2x	J. Cai et al. (2004)
<i>P. longiflora</i> Rudolph var. <i>tubiformis</i> (Klotzsch) Tsoong	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. oxycarpa</i> Franch. ex Maxim.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. rex</i> C. B. Clarke ex Maxim.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. siphonantha</i> D. Don var. <i>delavayi</i> (Franch. ex Maxim.) Tsoong	YN: Zhongdian		14	2x	J. Cai et al. (2004)
<i>P. strobilacea</i> Franch. ex Hemsl.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. trichoglossa</i> Hook. f.	YN: Deqin		16	2x	J. Cai et al. (2004)
<i>P. tricolor</i> Hand.-Mazz.	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. tsekouensis</i> Bonati	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>P. umbelliformis</i> Li	YN: Zhongdian		16	2x	J. Cai et al. (2004)
<i>Veronica henryi</i> T. Yamaz.	SC: Mt. Emei, 1700 m	16		4x	Hong & Zhang (1990)
<i>V. javanica</i> Blume	SC: Mt. Emei, 1000 m		16	2x	Hong & Zhang (1990)
<i>V. laxa</i> Benth.	SC: Baoxing, 1600 m		16	2x	Hong & Zhang (1990)
<i>V. serpyllifolia</i> L.	SC: Baoxing, 2500 m	7		2x	Hong & Zhang (1990)
SMILACACEAE					
<i>Heterosmilax yunnanensis</i> Gagnep.	SC: Mt. Emei, 1700 m		32	2x	Fu et al. (1995a, 1995b)
<i>Smilax chapaensis</i> Gagnep.	SC: Mt. Emei		32	2x	Fu et al. (1993)
	SC: Mt. Emei		32	2x	Fu et al. (1992)
<i>S. menispermoidea</i> A. DC.	SC: Mt. Emei		32	2x	Fu et al. (1995a, 1995b)
<i>S. tsingchengshanensis</i> Wang	SC: Mt. Emei, 1500 m		32	2x	Fu et al. (1993)
SOLANACEAE					
<i>Anisodus acutangulus</i> C. Y. Wu & C. Chen	YN: Lijiang, 3100 m		48	4x	Tu et al. (2005)
	SC: Daocheng, 3750 m		48	4x	Tu et al. (2005)
<i>A. carniolicoides</i> (C. Y. Wu & C. Chen) D'Arcy & Zhi Y. Zhang	YN: Zhongdian, 3370 m		48	4x	Tu et al. (2005)
<i>A. luridus</i> Link & Otto	YN: Heqing, 2390 m		48	4x	Tu et al. (2005)
<i>A. sinensis</i> Pascher	SC: Shizhu, 2900 m		48	4x	Tu et al. (2005)
<i>A. tanguticus</i> Pascher	SC: Daocheng, 3750 m		48	4x	Tu et al. (2005)
<i>Hyoscyamus niger</i> L.	SC: Ganzi, 3400 m		34	2x	Tu et al. (2005)

Appendix I. Continued.

Taxon	Locality	<i>n</i>	<i>2n</i>	Ploidy	Reference
<i>Mandragora caulescens</i> C. B. Clarke	YN: Zhongdian, 3700 m		48	4x	Tu et al. (2005)
<i>Przewalskia tangutica</i> Maxim.	QH: Maduo, 4000 m		44	4x	Huang et al. (1996a)
	SC: Shiqu, 4320 m		44	4x	Tu et al. (2005)
<i>Solanum spirale</i> Roxb.	XZ: Motuo, 900 m		48	4x	Gu & Sun (1998)
THEACEAE					
<i>Camellia pitardii</i> Cohen Stuart	SC: Huili, 2150 m	15	30	2x	Gu (1997)
<i>C. reticulata</i> Lindl.	SC: Yanbian, 1650 m	30	60	4x	Gu (1997)
	SC: Miyi, 1850 m	45	90	6x	Gu (1997)
	YN: Tengchong		90	6x	Gu et al. (1988)
	YN: Tengchong	45		6x	T. J. Xiao et al. (1993)
	SC: Yanbian	15	30	2x	Xia et al. (1994)
	YN: Tengchong	45		6x	Gu et al. (1988)
	SC: Panzihua, 1700 m	45		6x	Gu (1997)
	SC: Dukou, 2000 m		90	6x	T. J. Xiao et al. (1996)
	SC: Huili, 2650– 2900 m		30	2x	T. J. Xiao et al. (1996)
	SC: Huili, 2650– 2900 m		60	4x	T. J. Xiao et al. (1996)
	SC: Yanbian, 2600 m	15	30	2x	Gu (1997)
	YN: Huaping, 1900 m	45	90	6x	Gu (1997)
<i>C. saluenensis</i> Stapf ex Bean	YN: Baoshan	15		2x	T. J. Xiao et al. (1993)
	SC: Huili, 1650– 1900 m	15	30	2x	Gu (1997)
VALERIANACEAE					
<i>Valeriana hardwickii</i> Wall. subsp. <i>la-</i> <i>tifolia</i> (Rehd. & Wils.) Y. F. Wu	SC: Mt. Emei, 1600 m	8		2x	Hong & Zhang (1990)
VELLOZIACEAE					
<i>Acanthochlamys bracteata</i> P. C. Kao	SC: Daofu, 2700– 3400 m		38	2x	Kao et al. (1993)
ZINGIBERACEAE					
<i>Caulokaempferia yunnanensis</i> (Gag- nep.) R. M. Sm.	SC: Dukou		42	2x	Z. Y. Chen et al. (1988)
<i>Globba emeiensis</i> Z. Y. Zhu	SC: Mt. Emei		24	2x	Z. Y. Chen et al. (1988)
<i>Roscoea tibetica</i> Batalin	YN: Lijiang		24	2x	Z. Y. Chen et al. (1988)