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Tree of the year: *Zelkova*

Susyn Andrews
Royal Botanic Gardens Kew

More than 20 members responded to the invitation to write to me about *Zelkova*: Jelena de Belder (Arboretum Kalmthout, Belgium); John Creech (Hendersonville, North Carolina, USA); Richard Crow (Liskeard, UK); Dr John Feltwell (Battle, UK), with additional information from J.P. Ferrari (Jardin Botanique, Montpellier); Dr Thomas Hall (Bicester, UK); H.B. Hay (Tadworth, Surrey, UK); Jan de Langhe (Eeklo, Belgium), who also passed on comments from Theo Houthoff (Hortus Botanicus, Leiden); Geoff Locke (Berkeley, Glos., UK); Thierry Lamant (Arboretum des Barres, France); Sir Bernard Lovell (Swettenham, Cheshire, UK); John Mortimer (Hamilton, New Zealand); Alan Mitchell and Vicky Schilling (Tree Register of the British Isles); Dr Moya Naunton Davies (Canterbury, UK); Catherine Olver (Reading, UK); Karel Otten (Plantentuin Rijksuniversiteit, Gent, Belgium); Sir Peter Smithers (Vico Morcote, Switzerland); Vicomte Philippe de Spoelberch (Herkenrode, Belgium), who also passed on comments from Dr Stephen Spongberg (Arnold Arboretum, USA) and Dick van Hoey Smith (Arboretum Trompenburg, Rotterdam); C.J. Wingfield (Shrewsbury, UK) and Barry Yinger (Lewisberry, Pennsylvania, USA). I am grateful to all these correspondents for much useful information, which I have woven into the following systematic survey of the genus. I hope it will stimulate further comments from members for a follow-up article in a future Yearbook.

Introduction

Zelkova belongs to the Elm family (Ulmaceae) and comprises some six species which range from Crete and Sicily in Europe to parts of western and eastern Asia. Identification of the taxa is not easy and has been made more difficult by errors and contradictions in the literature. By looking at herbarium collections of both wild and cultivated *Zelkova* and also at the living specimens at Kew, I have assembled what I hope are key features for recognizing each of the six principal taxa in cultivation. Additionally, Jan de Langhe has provided comparative drawings of the leaves of these taxa (fig. 1), as they are known to him.

Recognition

The genus is divisible into two distinct geographical groups, one in Europe and W Asia and the other in E Asia. The first group consists of *Z. abelicea*, *Z. sicula* (not yet in cultivation?) and *Z. carpinifolia*.

Z. abelicea. Bark and branches grey, smooth, rarely flaking; leaves thick, ovate or ovate-oblong, 1.5–3(–4.5) × 8–11 cm; apex acute; 4–6(–7) teeth/veins per side (of leaf); leaves pubescent beneath.

Z. carpinifolia. Bark and branches grey, smooth, rarely flaking; leaves thick, ovate, oval or oblong-ovate, (3.5–)4–10(–11.5) × (1–)2.5–6(–7.5) cm; apex acute; (6–)7–12(–13) teeth/veins per side; leaves with soft white pubescence on midrib beneath.

***Z. carpinifolia* 'Verschaffeltii'**. Bark and branches grey, somewhat smooth, rarely flaking; leaves thick, oblanceolate or ovate, 3.5–7.8 × 1.3–6.6 cm; apex acute to semi-acuminate; (5–)6–10 teeth per side; 6–8 veins per side; leaves pubescent below, especially on the midrib.

The second group includes the eastern Asiatic species *Z. serrata, Z. sinica* and *Z. schneideriana*. The area of greatest confusion is mainland China, where further study is needed as all three species are said to occur there.

Z. serrata. Bark with spectacular flaking to expose orange patches, especially in winter; branches grey-black with fairly prominent *Prunus*-like lenticels; leaves thin, ovate or ovate-lanceolate, rarely broadly-ovate, 3.5–11.2 × 1.3–7.2 cm; apex acuminate; 8–13(–16) teeth per side; 8–13(–20) veins per side; midrib and veins below practically glabrous, rarely pubescent.

Z. sinica. Bark with superb flaking to expose orange patches, especially in winter; branches grey-black with fairly prominent *Prunus*-like lenticels, leaves thin, ovate or broadly ovate, 2.5–6.3(–9.3) × 1.5–5 cm; apex acute [in cultivation], rarely acuminate; 5–10 teeth per side above the usually entire basal one-third; 8–10 veins per side; midrib and veins mostly glabrous beneath.

Z. schneideriana. Bark flaking? (the oldest specimen seen was planted in 1979); branches black with extremely prominent *Prunus*-like lenticels; leaves thick, ovate-elliptic, 3–9.5 × (1–)3–5.5 cm; apex acuminate; teeth/veins 7–14 per side; midrib and veins pubescent below.

Notes on the individual taxa

Zelkova abelicea (Lamarck) Boissier (*Quercus abelicea* Lamarck; *Abelicea cretica* Smith, *Z. cretica* (Smith) Spach).

This species is endemic to Crete and grows between 1000–1700 m on limestone but it will also tolerate acid, sandy soil. Although usually described as a shrub to 8 m in height, it can form a tree in cultivation, given time. Elwes & Henry (1909) mentioned that the species also occurred in Cyprus but Meikle (1985) doubts if it ever occurred there. The Austrian collector and explorer K.G.T. Kotschy (1813-66) is said to have collected it on 19 April 1862 during the last of his three extensive trips to Cyprus. No one has seen or collected it on the island since then, nor has the specimen *Kotschy* 503 ever been located.

In Crete the wood is used for walking sticks and shepherd's crooks, while the branches are dried and stored as part of the winter fodder for

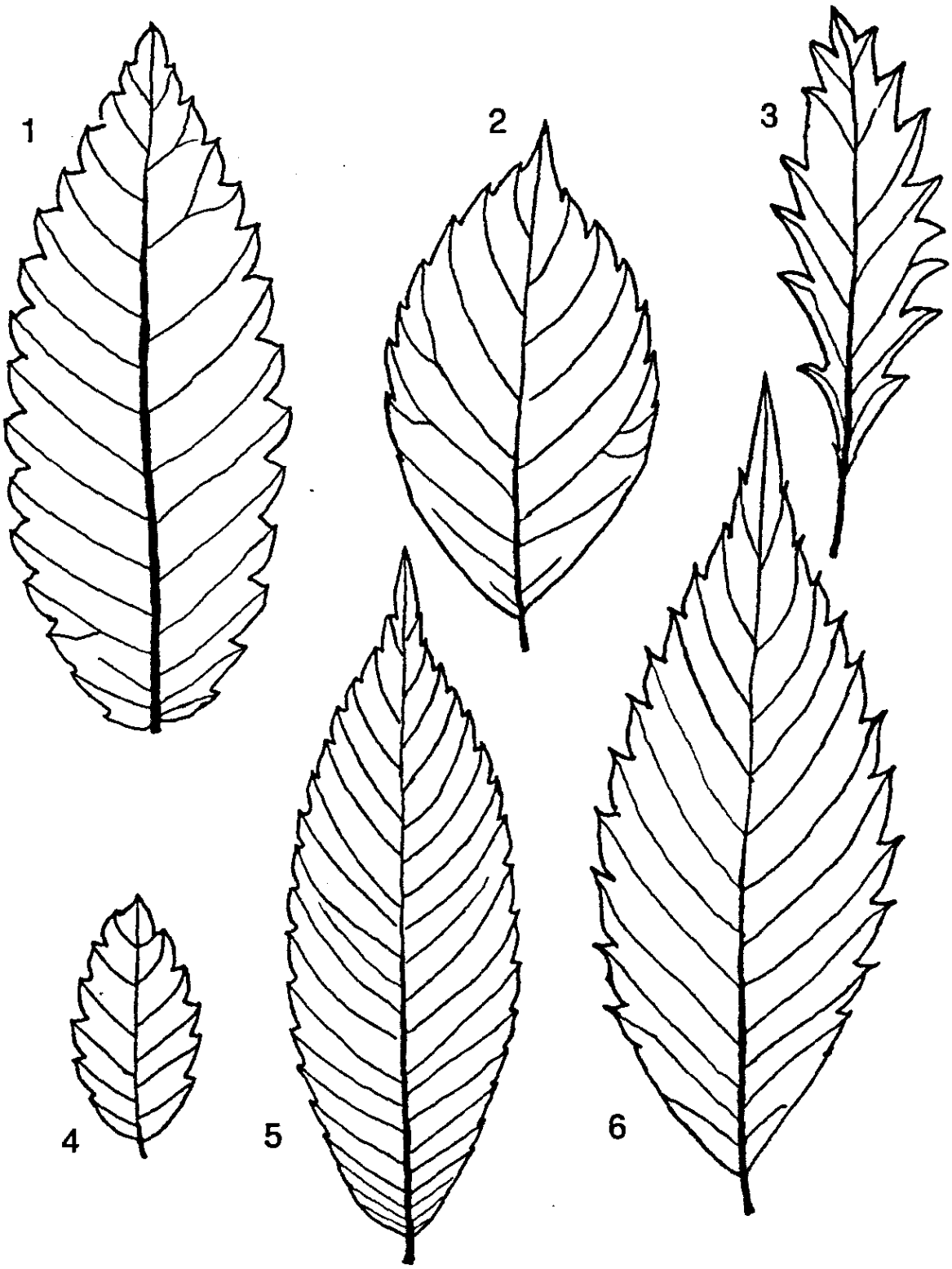
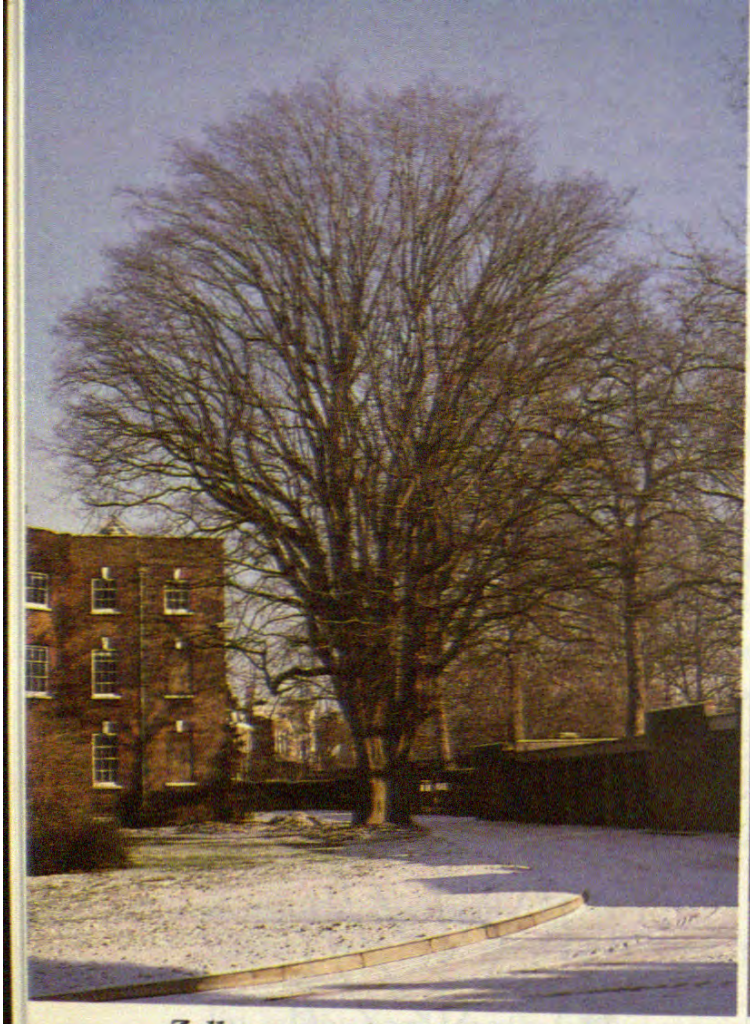
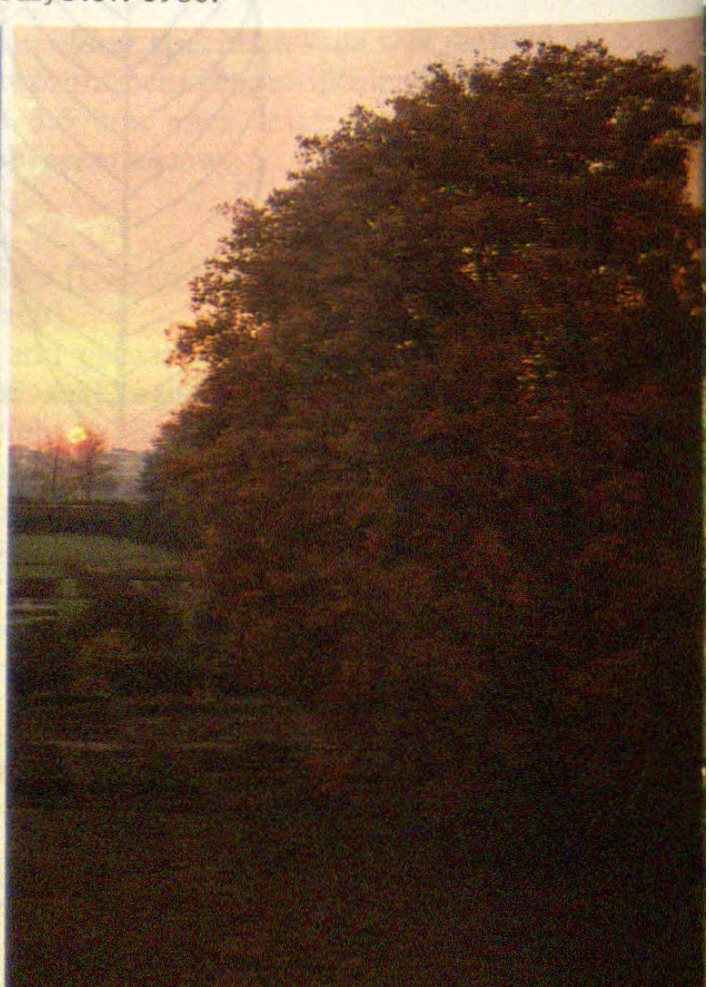


Fig. 1. Leaves of *Zelkova*, drawn by Jan de Langhe: 1. *Z. carpinifolia*; 2. *Z. sinica*: 3. *Z. carpinifolia* 'Verschaffeltii'; 4. *Z. abelicea*; 5. *Z. schneideriana*; 6. *Z. serrata*. All × 0.9.



Zelkova carpinifolia. Ancient trees at Kew. 2. Outside the Herbarium, January 1987 (top left). The tree fell in Oct. 1987. 3. Near the Brentford Gate, April 1994 (top right. 4. and 5. Herbarium paddock, March 1994 and in autumn colour, Nov. 1980.



Z. carpinifolia. **6**. At the National Botanic Garden, Glasnevin, Ireland, May 1993 (top left). **7**. The same, March 1994 (top right). **8**. Bole of Glasnevin tree, May 1993 (bottom left). **9**. At the Jardin Botanique, Marseilles, pl. 1922 (bottom right).

livestock. Survival of *Z. abelicea* is threatened by heavy grazing, and the species currently has the IUCN conservation rating *Vulnerable.*

Loudon (1844) knew this tree as *Planera abelicea* but said it was not yet in cultivation. Lavallée (1877) lists it as growing at the Arboretum Segrez outside Paris but it does not appear to have been introduced to Britain until 1929 when G.P. Baker of Sevenoaks, Kent, a founder member and sometime President of the Alpine Garden Society, arranged for the seed to be flown to Britain. Moya Naunton Davies tells me the first *Z. abelicea* in this country was in Baker's garden at Hillside, Oakhill Road, Sevenoaks, but that the property had been split up and built upon and she doubted if the tree still survived.

Kew has another of Baker's plants and, according to Alan Mitchell, there is one at the RHS Garden, Wisley. Is this the one that grows near the Round Pond on Seven Acres? It was labelled *Z. cretica* for many years and has two trunks, one of which is split less than a foot from the ground so that there appears to be three trunks. It has recently been relabelled as *Z. carpinifolia*! If this is not the Baker introduction, is that tree still at Wisley?

The small trees at Wisley and Kew are currently the largest on record. John Feltwell recently saw several much larger trees so labelled at the Jardin des Plantes at Montpellier, France, but from his photographs I suspect they are actually all *Z. carpinifolia*!

Z. abelicea does not appear to be available commercially. Does it ever produce suckers?

Zelkova carpinifolia (Pallas) Dippel (*Z. crenata* Spach) [2–14]
The Caucasian Elm or Ironwood is native to the Transcaucasian forests of Russia and of bordering Iran and Turkey (NE Anatolia). During a visit to Georgia, Richard Crow was told that it grows in two distinct areas there, one in the southwest, near Turkey, and a smaller area in the northeast, but unfortunately he was unable to get to either of them.

A slow-growing and long-lived tree, *Z. carpinifolia* can reach 30 m. The smooth, beech-like trunk can become buttressed with age, but is generally quite short (3–6 m) and then divides into a number of erect, crowded branches. It is said that there is enough wood in a mature tree to keep a family supplied with firewood for the rest of their lives. Some trees produce considerable sucker growth. In Turkey it has been given the conservation rating *Endangered*; its status elsewhere is uncertain.

The timber is renowned locally for its excellent quality but is not exported. It is very tough and durable and is used for the construction of houses, door and window frames, chairs, tables, etc. Notes on a herbarium sheet at the Natural History Museum, London (BM), prepared by Dr M.P. English record that when collecting in Kazakhistan in 1988 she was told that the species removes dust from the atmosphere [a benefit provided by many trees; see the notes by Signe Nyhuus on *The tree as an ecological factor* in IDS Newsletter, January 1994, page 8 – *Ed.*].

The Caucasian Elm was introduced to France in 1760 and probably came to Britain around the same time, but it was definitely here by the 1780's. Loudon (1844) notes that plantings at Kew and Syon were among the first in the country. Alan Mitchell and Vicky Schilling (Tree Register of the British Isles) sent in a number of measurements (see table), some assumed to be from the original introduction. Mr Mitchell mentioned that all the recorded large trees in England are on deep fertile soil or on London or Oxford clays. *Z. carpinifolia* is the best known species in the British Isles as it grows to an immense size here, but unfortunately it has a 'rather poor record for stability' and several large specimens were lost in the hurricane of October 1987, including two at Kew, one by the Main Gate and the other in front of the Herbarium [2]. The latter was a magnificent and much-loved specimen which keeled over gracefully without damaging the building, coming to rest with its uppermost branches inches from the windows of the Keeper's office.

In IDS Yearbook for 1987, Philippe de Spoelberch (1988) remarked on a spreading form of *Z carpinifolia* which he had seen at the Bonn Botanic Garden. The identification of this tree had been in some doubt, but the presence of suckers was confirmed by de Spoelberch in October 1993, and having seen a specimen, and in spite of its habit, I feel sure that this is *Z. carpinifolia* and not *Z. serrata*. Philippe also mentioned a spreading Caucasian Elm at the Vilmorin Arboretum near Paris; and so perhaps IDS members could look out for other such examples. Is this species usually erect in the wild, and if it is, should the spreading form be recognized as a variety or *forma*?

The species was reintroduced to Kew from the Elburz Mts of Iran in 1977 by John Simmons and Hans Fliegner. The collection was made on 9 October 1977, SE of Chalus, between Pul-i-Zaghal and Veisar, growing with species of *Ulmus* and *Alnus* at an altitude of 500 m, *Fliegner & Simmons* 43 and 385 [**11, 13**]. As can be seen from the illustrations, a young tree from this collection appears to be taking on a different habit from that of the older plantings (see also page 35).

Geoff Locke comments on how difficult it is to obtain *Z. carpinifolia* commercially. The seed is often of poor quality and the seedlings are much slower growing than *Z. serrata*. He has found that after the first year there is a tendency to grow sideways, rather like *Cotoneaster horizontalis* on a short stem. He has found it impossible to grow any to a saleable standard and perhaps this is the reason that it not often planted or seen. Elwes (1909) stated that he was unable to find fertile seed in Britain, while trees in France drop their fruits too early. Thus cuttings were struck from suckers and then grafted on to the roots of an elm.

There are only six suppliers listed in the 1993/94 edition of *The Plant Finder*, but it appears to be more widely available in France. C.J. Wingfield wrote that when the IDS Tour of East Anglia visited Cambridge Botanic Garden in May 1992, they were offered plants for sale.

***Z. carpinifolia*. 10–13.** Young trees at Kew. *Left* (above and below), tree of uncertain origin, with short bole and fastigiate habit; *right* (above and below), the *Fliegner & Simmons* introduction from Iran, pl. 1978. Note its incipient likeness to the great Geneva tree, **14.** (facing page, April 1993).

Cultivars of *Z. carpinifolia*

'Verschaffeltii' (*Z. verschaffeltii* (Dipp.) Nichols., *Z.* × *verschaffeltii* (Dipp.) Nichols. *(Z. carpinifolia* × *Z. serrata)*, *Ulmus verschaffeltii* hort. ex Dipp., *Ulmus campestris* L. var. *werschaffeltii* Lavallée). A small tree or large shrub of unknown origin which was long thought to be an *Ulmus*, until a plant finally fruited in Paris in 1908. The status of this taxon has long been in dispute but S. Czerepanov (1957) in his monograph on *Zelkova* and *Hemiptelea* clearly stated that in his view it was not a hybrid but near to *Z. carpinifolia*. I agree with him and therefore have placed it as a cultivar of this species. Has anyone noticed any suckers on this plant?

'Verschaffeltii' is said to have been cultivated at Kew since 1886 and collected by the Curator George Nicholson from the Belgium nursery of van Houtte at Gent in August the previous year. It was grafted on to an elm and by 1958 it was 5.5 m high and fruiting freely. Only recently, the second of two plants presented to Kew in 1900 by Simon-Louis of Metz, Belgium died. It stood at 107 cm × 13 m (1986). A specimen 122 cm × 8 m (1985) stands on North Drive at Wakehurst Place, and perhaps this is the plant mentioned by Sir Henry Price in his 1942 Catalogue. A young plant was given to Wakehurst in 1993 by Maurice Foster and it was propagated from a plant belonging to the late Maurice Mason.

From the measurements submitted (see table) the current 'champion' is at Crathes Castle, Grampian, Scotland (129 cm × 11 m in 1988).

Zelkova serrata (Thunberg) Makino (*Z. acuminata* (Lindley) Planchon; *Z. keaki* (Siebold) Maximowicz; *Z. hirta* (Thunberg) Schneider; *Z. formosana* Hayata; *Z. stipulacea* Franchet & Savatier) **[15, 16, 20–24]**

Japanese Zelkova, Keaki, and Keyaki, are all common names for one of the most important forest and street trees in Japan. It occurs throughout Kyushu, Shikoku and Honshu as well as in southern Korea and Taiwan. In mainland China, its distribution has been confused with that of *Z. sinica* and *Z. schneideriana*. Czerepanov (1957) mentions Tsingtao in Shandong Province but all those specimens were cultivated in First Park! Does *Z. serrata* occur naturally in China at all? A sterile specimen in the Kew Herbarium, *F.N. Meyer* 1444, was collected near Nanking (Sargent 1917: 286) and identified as *Z. sinica*! Is this a *Zelkova* or could it be an *Ulmus*?

Some old trees can reach over 30 m in height but these are normally protected trees in temples or shrines or along ancient roads. In the wild they rarely reach this height as they have been felled for timber.

The habit of *Z. serrata* varies considerably, from vase-shaped to more spreading or with a rounded crown. The main trunk is short and then divides into many branches. Suckering does not occur in *Z. serrata*.

The wood is golden brown, lustrous, hard, tough, elastic, durable and very strong for its weight. As well as uses in structural work, shipbuilding etc, it is easily wrought and much prized for cabinet and decorative work (Corkhill 1979: 279).

In Japan, *Z. serrata* owes its popularity as a street tree to its tolerance of poor soil, wind and smog. It also transplants well and is now becoming an important street tree in the United States too. It has the added advantages of not suckering and having good autumn colour.

Z. serrata was introduced into England by J.G. Veitch in 1861–62, when he sent the seeds from Japan. It had already been grown on the mainland of Europe for several years and perhaps this is one of the reasons why it is more popular there than *Z. carpinifolia*. Some years ago at Versailles, Jelena de Belder noted a magnificent specimen in the Grand Trianon Park, the oldest and biggest she had seen (later brutally cut back – is it still alive?) but the oldest dated trees reported to me are at the Hortus Botanicus, Leiden, Holland, introduced by P. von Siebold in 1830.

The finest specimen in the British Isles is at Kilmacurragh, Co. Wicklow, Ireland and there are other big specimens at Endsleigh, Devon, and Horsted Keynes, Sussex. Kew has young trees from seed obtained by an expedition to South Korea in 1977. The seed came from Chungchong Nam da Province, 215 km from Seoul, in Gaeroyong sa National Park, below Gafsa temple, alt. 100 m, 12 Oct 1982, *Beyer, Erskine & Cowley* 263. The fieldnotes add that the species was a common perennial tree, to 12 m tall, growing in full sun in acid gravelly loam.

In North America, according to Alan Mitchell, *Z. serrata* is becoming more frequent in new plantings from Ontario down to Washington DC, but is scarcer south down to Georgia, over to Salt Lake City, Utah and up to Vancouver, BC. The largest specimen he noted was at the Ardmore Church, Philadelphia, 550 cm (at 1 m) × 29 m.

In New Zealand, John Mortimer noted even larger specimens at the Agricultural Research Station at Ruakura, the largest now 791 cm (at 0.5 m) × 31 m. In 1980 it had a spread of 24.4 m. The trees, four in all, were brought from Japan in c. mid-1920s. They stand at the edge of a very old peat swamp, where the soil is free draining from volcanic alluvium with 60 cm of friable silt loam on loose gravelly sand.

Geoff Locke says that seed of *Z. serrata* is readily available and germinates easily. The seedlings can grow to c. 60 cm in their first season and to 150 cm in their second season. Young plants can be damaged by spring frosts and have a very droopy habit, so they become more difficult for nurserymen to keep presentable after a second or third season. They sell quite well, especially as seedlings for bonsai.

Kalmthout has two mature trees which set seed in large quanities, but not all are fertile. However, self-sown seedlings have been found there.

Z. serrata var. *tarokoensis* (Hayata) Li (*Z. formosana* Hayata; *Z. tarokoensis* Hayata) appears to be a distinct and localized variety in Taiwan and differs from typical *Z. serrata* in having smaller leaves, with fewer lateral veins and serrulate margins. It occurs in the central and eastern parts of the island. John Creech tells me he saw it several times during his collecting trip to Mt Morrison in 1967.

15. and **16.** ***Zelkova serrata***. Young tree at Kew, from seed collected in South Korea (*Beyer Erskine & Cowley* 263), photographed in April 1994 on the same day as the trees in pls. 3 and 10–13. Development of the attractive young foliage is a week or more ahead of *Z. carpinifolia*.

17–19. *Zelkova schneideriana*. *Above*, a young tree at Kew (77.06615), photographed on the same day as the other young trees at Kew. It was raised in 1977 from seed from Nanjing Botanic Garden. *Below*, foliage of a specimen at the Arnold Arboretum, photographed in October 1988.

Cultivars of *Z. serrata*

'Goblin' is a miniature bush of congested branches bearing normal sized leaves. The rate of growth is much slower and there is no noticeable autumn colour. It is listed in The 1993/94 Plant Finder.

'Goshiki' is one of three selections acquired by Barry Yinger from the Shibamichi Nursery Co. in Saitama, Japan, and introduced by him to the USA. He writes that the name of this one means "five colours" and it has the normal growth habit, but the foliage is margined white, cream or pale yellow, depending on the growing conditions. The leaves are often tinted pink in spring, becoming green, grey-green and cream in summer and turning orange red with a cream margin in autumn. 'The appearance of the foliage is highly variable, depending on the climate and growing conditions, but every variegated zelkova I have seen is this cultivar. It is vigorous and completely stable.'

'Green Vase' is a tall, vase-shaped, fast-growing tree. The large, bright green leaves turn bronze in autumn. It can be rooted from cuttings, but bud-grafted trees develop more quickly. A selection from Princeton Nurseries, New Jersey.

'Green Veil' is a name given by Barry Yinger to a vigorous form with normal foliage and pendent branches which he obtained in Japan.

'Iruma Sango' is the third of the fast-growing and vigorous Japanese selections introduced to the USA by Barry Yinger. It is a fastigiate selection with the shape of a whisk broom at maturity, also known as 'Musashino' and used as a street tree because of its narrow habit.

'Pulverulenta' has very small, yellow variegated leaves. It was introduced from Japan by Lefeber Nurseries, Boskoop.

'Pygmaea Angustifolia' (var. *pygmaea* f. *angustifolia*). Sir Peter Smithers received a plant from Dr T. Rokujo in Japan. It is now 48 cm tall and appears to have long, slender green leaves. This is not a bonsai.

'Spring Grove' is said to be like *Ulmus americana* but much smaller.

'Variegata' is available in France.

'Village Green' is a fast-growing, vase-shaped tree, 10–12 × 5–6 m, with a straight trunk. The leaves are dark green, turning red in autumn. This is another selection from Princeton Nurseries and it was introduced in the early 1960's. Propagate as for 'Green Vase'. Alan Mitchell noted four trees 3–4 m tall (1986) at Castle Howard (Yorkshire) and there is a 2 m plant at Westonbirt, Gloucestershire (1992). This cultivar is available in France.

'Urban Ruby' has bronze green foliage in spring, turning green in summer and coppery red in autumn. It is being distributed from the Netherlands and is listed in the 1993/94 edition of *The Plant Finder* (as 'Yrban Ruby', a misprint).

Kalmthout also have a variegated form ('Fuiri Keaki'), a compact form ('Nire Keaki') and a pendulous form (no name).

Zelkova schneideriana Handel-Mazzetti (*Z. sinica* Schneider var. *australis* Handel-Mazzetti) [17–19]
This species is said to be related to *Z. sinica* but differs in that the larger, many-veined leaves have an acuminate apex and pubescent venation beneath. It grows to 8-15 m in height. It was first described from specimens collected from Yunnan and Hunan in 1929 and is now known to occur in Hubei-Sichuan, Guizhou, Zhejiang, Jiangsu, Anhui and Henan/ Shanxi. Czerepanov (1957) stated that his geographical data for *Z. schneideriana* and *Z. sinica* were mainly taken from the literature as he had seen so few specimens and therefore the information could not be totally trusted. In the Kew Herbarium, the specimens *Hers* 1782 from Henan/ Shanxi and *Merrill* 1025 from Anhui were named as *Z. sinica* but the leaves are strongly pubescent beneath and perhaps should be better placed here.

Les Barres has ten specimens, three of which are undated and the rest date from 1965 to 1985. H.B. Hay obtained seed in 1977. It germinated the following year and 5 young trees were planted out in 1979. By late summer 1981/82 when they were 1.8 m in height on a single stem, all died back. In spring the next year, all grew away very slowly as multistemmed plants from about 30 cm above ground level. The five trees are now 6 m in height. Kew and Wakehurst Place received plants from China in 1979. Richard Crow was given a young plant by Keith Rushforth in 1983. It is now some 3.6 m tall. According to Muir (1991), the species has been put into commerce by Mallet Court Nursery, Taunton, U.K.

Zelkova sicula G. Di Pasquale, G. Garfi & P. Quezel (1992)
This recently described species was found in SE Sicily and is said to be close to *Z. abelicea*. The population of about 200 individuals is heavily degraded by human and animal activity.

Zelkova sinica Schneider
A native of central and E China, *Z. sinica*, also known as the Chinese zelkova, was first described in 1916 from western Hubei, Shaanxi, Zhejiang and Jiangsu. It has since been found in Henan, Sichuan, Shensi and Gansu.

This is a smaller tree than *Z. serrata*, reaching 18 m, with a short, stout trunk, which rarely reaches 3 m in height and up to 2 m in girth. The trunk divides into a multitude of smaller branches that ascend only to cascade down again, giving a weeping effect (Ainsworth 1989). The smooth grey bark flakes superbly with age and is most noticeable after leaf-fall. Alan Mitchell says his 'spot indicator' is that the leaves are entire in the basal 2 cm, before the first tooth, but I find this does not always work. Other less reliable features mentioned by Alan are the 'pubescent young shoot; crimson tinge to petiole and veins; no aristate tips'.

Captions for coloured plates on pages 26 and 27. **20. *Zelkova serrata*** at Winterthur, U.S.A., April 1991. **21. *Z. serrata*** at Hergest Croft, U.K., May 1991.

Z. sinica was introduced into cultivation at the Arnold Arboretum in 1908 by E.H. Wilson and it came to Kew in 1920 via Messrs Vilmorin of Les Barres, France, in the form of seeds collected by the Belgian botanist J. Hers. The largest trees recorded in the British Isles are at Kew (from the 1920 seed) and at Woburn Park, Bedfordshire. Of 10 specimens at Les Barres today, three originate from seed collected by Hers in 1920, 1923 and 1929. John Creech reports a fine specimen with beautiful pearl-grey bark at the old Savannah Plant Introduction Centre, USA.

Pests and diseases

Both *Z. sinica* and *Z. serrata* appear to be prone to a bacterial canker and in most cases this proves fatal if not detected early on (Ainsworth 1989). I have been unable to verify the above statement and any information on this canker would be welcome.

Although there are reports to the contrary, Dutch Elm Disease (*Ceratocystis ulmi*) has killed *Z. carpinifolia* in Europe, America and Iran. *Z. carpinifolia* 'Verschaffeltii' was killed in 1989 in Trompenburg (van Hoey Smith, pers. comm.). *Z. carpinifolia* died at Les Barres and in Holland. By contrast in 1978, *Z. serrata* was infected at Les Barres but did not succumb, and many water shoots were produced. In the United States, *Z. serrata* is regarded as a good substitute for the dying American elm (*Ulmus americana*). It is said to be free of Dutch Elm Disease because the transmitting beetles (*Scolytus scolytus* and *S. multistriatus*) do not feed on this species (Creech 1985). Is this still true today?

At Kew the *Zelkova* collection is sited beside what was the *Ulmus* collection, before the latter was ravaged by Dutch Elm Disease by the mid 1970's. Although none of the *Zelkova* specimens have been killed to date, all carry symptoms of the disease.

In the mid-1980s Thomas Hall had to cut down one of the large trees of *Z. carpinifolia* in the strip of woodland on the northern edge of the University Parks at Oxford, because it was infected with Dutch Elm Disease. He believes that this was the specimen measured by Alan Mitchell and mentioned in 'Bean' (1980: 778). There was considerable sucker growth from the base of this tree and care was taken during the felling operation that there was minimum damage to the suckers.

The five mature *Zelkova* trees nearest the Brentford Gate at Kew show recent signs of infection from the Horse-Chestnut Scale (*Pulvinaria regalis*). This disfiguring pest has become established in southern England since 1960 and is more usually seen on *Aesculus, Tilia* and *Acer pseudoplatanus.*

Tailpiece

Sir Peter Smithers recalls that many years ago 'there was a house in the neighbourhood of Frimley Park, where my grandfather lived, which instead of putting up a notice "Beware of the Dog" put up a notice which read "*BEWARE OF THE ZELKOVA*". But perhaps this information has limited taxonomic value...!'

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Zelkova: More questions than answers!

Philippe de Spoelberch
Herkenrode, Vijverbos 6, B-3150 Haacht/Wespelaar, Belgium

Although 'Bean' declares that *Z. carpinifolia* is the "best known of them" I have found on the continent that *Z. serrata* is far more common than *Z. carpinifolia*. Bean does comment further that "*Z. serrata* does not do as well as *Z. carpinifolia* in the British Isles". Is this a consequence of the more maritime climate? Is this also why *Z. carpinifolia* is less frequent on the continent?

Crown and branching

Z. carpinifolia is generally described as a tree with a short stem, soon dividing into a ***crowded*** crown of ***erect*** branches. In fact there seem to be two rather distinct shapes. There is the V-shape, exemplified by the specimens at Glasnevin [6–8] and Kew [2–5, 10, 12], which have a great 'brush' of relatively thin branches; I have a ten-year old plant at Herkenrode which is this crowded V-shape. In contrast, there is the U-shape, with fewer, stouter branches arising horizontally, low on the trunk, which then curve sharply upwards, becoming more or less erect, as at Geneva [14], Hergest Croft and the Vilmorin Arboretum at Verrières-le-Buisson near Paris. The tree at Bonn (not illustrated) has a huge basal branch and generally irregular branching which puzzled us all when IDS visited the garden (see IDS Yearbook 1987: 96).

Is the V-shape, described by Ainsworth (1989) as 'a symmetrical broom-like head of thousands of ascending branches and twiggy growth', the natural one? Or are we looking at a clone propagated vegetatively or a form selected for its upright habit? Has anyone seen *Z. carpinifolia* in the wild?