

## Prize-winners to pariahs - A history of Japanese Knotweed *s.l.* (Polygonaceae) in the British Isles

J. P. BAILEY and A. P. CONOLLY

*Biology Department, University of Leicester, Leicester, LE1 7RH*

### ABSTRACT

The early history of the discovery and introduction to the British Isles of the alien invasive perennials belonging to *Fallopia* section *Reynoutria* (hereafter referred to as Japanese Knotweed *s.l.*) are described from a study of documentary evidence and herbarium material. The role of the various agencies involved in the dispersal of these plants is discussed, as is the influence that contemporaneous gardening trends had on the ornamental use of Japanese Knotweed *s. l.*

**KEYWORDS:** *Fallopia japonica*, *Fallopia* × *bohemica*, *Fallopia sachalinensis*, invasive plants, garden escapes, plant collectors.

### INTRODUCTION

The group of plants referred to here as Japanese Knotweed *sensu lato* needs little introduction. Details of reproductive biology, cytology and distribution are given in Conolly (1977), Bailey & Conolly (1985, 1991), Bailey (1989, 1994), Bailey & Stace (1992), Beerling *et al.* (1994) and Bailey *et al.* (1996). The term Japanese Knotweed *s.l.*, may need further explanation. Since the amalgamation of *Reynoutria* and *Fallopia* there is no convenient way of referring to the complex of taxa formerly circumscribed by the name *Reynoutria*, which comprises *F. japonica* var. *japonica*, *F. japonica* var. *compacta*, *F. sachalinensis*, the hybrids between *F. japonica* and *F. sachalinensis* (*F.* × *bohemica*) and between var. *japonica* and var. *compacta* as well as any backcrosses between the hybrids and their parents.

It is generally known that these plants were originally garden plants, but it is not so well appreciated just how valuable an addition to the garden they were once considered to be. This paper seeks to build on the initial contribution by Conolly (1977), by giving a more detailed examination of just those taxa transferred from *Reynoutria* to *Fallopia* and using the year 1914 as a general cut-off point.

It is our intention to deal with each taxon in turn, to detail its original discovery and the most probable source of the accessions that were introduced to Europe, and to try and unravel the somewhat bewildering array of synonyms that litter the scientific and horticultural literature. Using a combination of type and other early herbarium specimens, archive material, scientific and horticultural literature, nursery garden catalogues and accounts of plant collecting expeditions, the discovery and spread of each taxon is given in as much detail as possible. There follows a consideration of the gardening movements that contributed to the dissemination of Japanese Knotweeds to every corner of the British Isles. Since we are dealing with long-lived perennials spreading primarily by vegetative means, and easily outliving gardener and garden alike, it is important to have records of where these plants were once grown or available for sale. Large private gardens or estates, nursery gardens and botanic gardens are likely to constitute the initial loci from which further dispersal by exchange, gift, sale or disposal took place.

With regard to the hybrid *F.* × *bohemica*, it is useful to know where both parental taxa were grown together, especially where the *F. sachalinensis* involved is male-fertile. We will now consider in detail, by taxon and in chronological order, the early history of these plants as aliens in the British Isles, as we track the riotous career of *F. japonica* from gold medal holder in 1847 to proscription in the 1981 Wildlife & Countryside Act.

## A MOST PROMISING START

*Fallopia japonica* was awarded a gold medal in 1847 by the Society of Agriculture & Horticulture at Utrecht for the most interesting new ornamental plant of the year, according to the 1848 catalogue of Von Siebold & Company of Leiden, the specialist importers of plants from the East (Siebold 1848). An accompanying seven line foot-note in this price-list extols its great vigour, its combination of ornamental and medicinal use, its value in protecting young plantations from wind and sun, its edible young stems and leaves and a rhizome highly valued in Japanese and Chinese medicine. Such a plant, newly imported from Japan, would obviously command a high price. 500 francs would purchase a "mother" plant and 25 strong plants. In order to put this sum into perspective, the same catalogue offered 250 plants of *Hydrangea japonica* or 500 plants of *Wisteria sinensis* for the same amount! If, by the time of Siebold's 1856 catalogue, the price had plummeted (100 plants for 25 francs), the rhetoric certainly had not. In addition to the benefits listed above were added stabilisation of sand dunes, gracious flowers suitable for bouquets, a forage which cattle loved to eat, melliferous flowers which gave bees their winter sustenance and, last but not least, dead stems that could be used to make matches! There was, however, no element of exaggeration in the claim that the plant was "inextirpable".

## SIEBOLD, HIS EXPEDITION AND HIS COMPANY

Phillipe von Siebold had for his time absolutely unparalleled access to the then closed country of Japan. Appointed as doctor in residence to the Dutch trading settlement in Japan, he stayed there from 1823–1829. His medical knowledge gained him many friends and high level contacts in Japan. Siebold used every opportunity to collect plant and animal specimens, and had friends and students collecting material from all over Japan. After a series of fascinating peregrinations (shipwrecks, imprisonment and civil war), he was not finally reunited with all his live Japanese plant specimens back in Leiden until 1841 (Kimura & Kitamura 1977). Here he founded, in 1842, a Royal Society for Encouragement of Horticulture (Anderson 1951) - apparently just a respectable cover for the commercial activities of his Von Siebold & Co. The horticultural company owned not only the specimens brought back from his sojourn in Japan but also a governmental monopoly on any subsequent introductions from Japan and Java. By 1847 this Royal Society had severed its connections with Von Siebold & Co. Fortuitously, this connection allowed the survival of a more-or-less complete collection of sales lists in the pages of their journal: *Jaarboek van de Koninklijke Nederlandsche Maatschappij tot Aanmoediging van den Tuinbouw*. From a study of these lists it is possible to reconstruct the very early days of this plant in Europe. The name *Polygonum sieboldii* Reinw. first appears in 1848, and this name is given as a synonym of *Polygonum cuspidatum* Sieb. & Zucc. by De Vriese (1849) (see Table 1). Von Siebold & Co. presumably considered the eponymous *P. sieboldii* to be a better advertisement than the name given to it by Siebold and Zuccarini in 1846. In the 19th century gardening literature the plant is generally known as *P. sieboldii*.

## UNTANGLING THE KNOTWEED NOMENCLATURE

The history of *Fallopia japonica* really begins in the 18th century, when it was described as *Reynoutria japonica* by Houttuyn (1777), presumably from dried material brought back from Japan by Thunberg. Considering that both Houttuyn and Thunberg wrote substantial botanical books, it is surprising that the world in general was unaware of the plant until it was described by Siebold & Zuccarini in 1846. Even as late as 1895 the first edition of *Index Kewensis* lists *Reynoutria* as *incertae sedis*. It was not until 1901 that Makino realised that *Reynoutria japonica* of Houttuyn and *Polygonum cuspidatum* of Siebold and Zuccarini were one and the same; on these grounds he made the new combination *Polygonum reynoutria*, but without sufficient grounds for replacing *P. cuspidatum*.

There are various reasons why this important taxon was lost to science for seven decades; one was that Houttuyn's *Natuurlijke Historie* (1777) was written in Dutch, not the most accessible of languages. He also erroneously described the plant as having ten stamens, thus putting *Reynoutria* under "Decandria Trigyna", isolated from the other *Polygonums*. However, Houttuyn does have a good clear illustration of the plant in his work. Thunberg (1784) does not recognise *Reynoutria* in

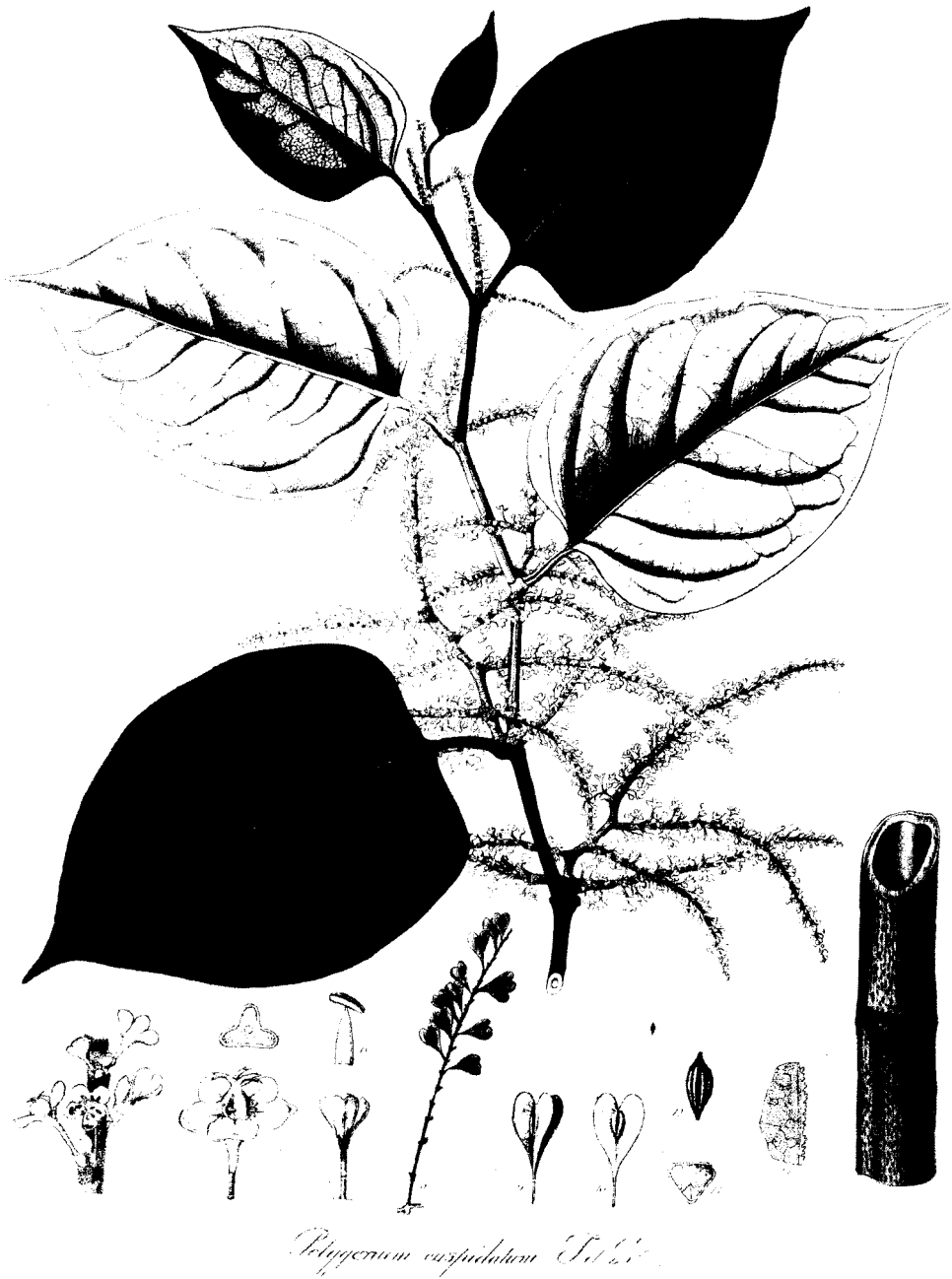


FIGURE 1. Engraving from De Vriese (1849) of Siebold's plant.

TABLE 1. EARLY SYNONYMY OF *FALLOPIA JAPONICA*

Name	Authority/user	Current name
<i>Reynoutria japonica</i>	Houttuyn 1777	<i>Fallopia japonica</i>
<i>Polygonum multiflorum</i> $\alpha$	Thunberg 1784	<i>Fallopia japonica</i>
<i>P. pictum</i>	Siebold 1841	= <i>F. japonica</i> var. <i>compacta</i> ?
<i>P. cuspidatum</i>	Siebold & Zuccarini 1846	<i>F. japonica</i> var. <i>japonica</i>
<i>P. sieboldii</i>	used by de Vriese 1849	<i>F. japonica</i> var. <i>japonica</i>
<i>P. reynoutria</i>	Makino 1901	<i>F. japonica</i>

his Flora Japonica, but has his own taxon, *Polygonum multiflorum* (Thunb.), which is obviously not in *Natuurlijke Historie*. This is a perfectly good species, now known as *Fallopia multiflora*, and one of the link species between the climbing and non-climbing members of the genus *Fallopia*. Photocopies of some of the Thunberg specimens from Uppsala (UPS) have been seen. *Herb. Thunberg* 9706 is labelled *Polygonum multiflorum* (probably in Thunberg's hand) and is indeed that taxon. However, specimen 9705 bears the label "*Polygonum multiflorum*  $\alpha$ ", but is clearly a specimen of *Fallopia japonica*. Ironically, the Houttuyn specimen of *F. multiflora* (*Herb. Delessert* collection *Burman* s.n., G) is labelled "*Polygonum* (Helxine) *Japonicum* Mihi. Vid Nat His. VIII Pl. 49 Fig 3" in Houttuyn's hand (?). However, the name does not tally with the text reference, which refers to the "Japansch" version of *Polygonum chinense* L., whereas the figure depicts *F. multiflora*. In summary, although Houttuyn and Thunberg both handled specimens of *F. japonica* and *F. multiflora*, the former regarded *F. multiflora* as the Japanese form of *P. chinense*, whilst the latter regarded *F. japonica* as a variant of *F. multiflora*. Further, it was only possible to appreciate Thunberg's circumscription of *P. multiflorum* by reference to his herbarium specimens!

Since there is no evidence of live *F. japonica* being in Europe in the 18th century, in order to find the source of the live introductions to Europe, we need to look at the Siebold's collections. The Rijksherbarium at Leiden sent us four specimens; the one labelled "Herb. Lugd. Batav. No. 908.174 826 *Polygonum cuspidatum* S. & Z. Legit v.S." is probably the holotype of *P. cuspidatum*. The specimen is male-sterile and very similar to our British plants. Further evidence that this is the source of our plants is provided by De Vriese (1849) and the excellent detailed engraving (see Fig. 1). De Vriese heaps praises upon the plant and states that it is the sole property of Siebold who has had it growing for many years [at Leiden]. The red spotted stem and the zig-zag appearance of the stem are also mentioned. The figure (Fig. 1), drawn from life from Siebold's plant, shows leaves with truncate bases closely matching the appearance of our plants. It is interesting to note that it is also male-sterile and bears good seed with embryos; this raises the question of what could have pollinated it in the absence of *F. sachalinensis*? The most likely source is *Polygonum pictum* (= *F. japonica* var. *compacta*?) which had been in cultivation at Leiden for some time.

#### THE ARRIVAL OF *FALLOPIA JAPONICA* IN BRITAIN

Although the first date that the plant was commercially available in Europe is undeniably 1848, the date that it actually crossed the Channel to Britain was not known until now. The literature contains two conflicting dates: 1825 (Conolly 1977 ex Syngé 1956) and the late 1840s (Bailey 1994). It appears that in a sense, both dates are correct! Morren (1849) gives a résumé of the DeVriese paper of 1849 which describes *Polygonum cuspidatum* Sieb. & Zucc., and says that it was introduced by Phillipe von Siebold and that it was his sole property. Lindley & Paxton (1850), however, in reply to the Morren article, declare that the plant was actually introduced by the Horticultural Society of London around 1825. The plant had been thought to be *Houttuynia cordata*, and had been planted in an artificial swamp at their Chiswick garden; not surprisingly, it had failed to thrive, though an illustration is provided of the one time that it did manage to flower. Lindley & Paxton ended with the comment that they considered it unlikely that such a plant would bind blowing sand together in the manner described by Dr Siebold. Significantly, they record that the Chiswick plant came from China and indeed their illustration shows quite clearly the acuminate leaf base so characteristic of Chinese accessions of *F. japonica*. This was not the end of

the cross-channel dialogue. Groenland (1858) writing in *La Revue Horticole* (Paris), expresses surprise that "*Fallopia japonica*" could remain unnoticed for 20 years in the garden at Chiswick, without even flowering, adding that in Japan the plant is used to bind sand-dunes.

With the knowledge that *F. japonica* had no name in 1825, since this predates the Sieb. & Zucc. name, and the earlier *Reynoutria* combination had been lost until 1901, one of the authors (J.P.B.) had severe reservations regarding an introduction date of 1825. In the event, the mis-identification of the Chiswick plant as *Houttuynia* neatly side-stepped this objection; (that it should have been confounded with a Houttuyn eponym is rather a nice irony!).

So, although the earliest recorded live plant of *F. japonica* in Europe was in the Chiswick garden of the Horticultural Society, this was a Chinese accession. Chinese plants are morphologically distinguishable from the Siebold clone of *F. japonica*, and, even if the Chiswick plant was ever distributed to any extent, it is doubtful that any has survived; it has had no discernible role in the Japanese Knotweed invasion of Europe. Siebold's nursery at Leiden, where the plant was actively sold and heavily promoted, even to the extent of offering a 25% discount to botanical gardens, is considered the initial locus of the *F. japonica* clone that has so effectively invaded much of Europe.

The manuscript "Inwards Book" 1848–1858 at the Royal Botanic Gardens Kew records that *Polygonum sieboldii* was received on 9 August 1850 as part of a large batch of plants from M. Siebold of Leyden. There is appended the following note: "*They are intended to be in exchange for new China and Japan plants. But on account of the bad selection he is written to, telling him that only 6 of them are probably new to us*". The plants were probably sent unsolicited in the hope of receiving further novelties in return. The Kew herbarium has a male-sterile *F. japonica* var. *japonica* specimen labelled "Hort, Kew 1857", which is presumably the Siebold introduction. The Kew archive also contains sets of "outward Books" which record a commerce absolutely unimaginable to modern-day gardeners attempting to obtain plants from the Kew collection. Collections and cabinets of plants were being dispatched alike to Honourables, military men and commercial nursery gardens apparently without distinction. However, a search of the Outward Book 1853–1856 has failed to reveal a single reference to Japanese Knotweed. This does not mean that Kew took no further role in the distribution of *F. japonica*, but that only the choicer plants were listed individually, there being plenty of examples of collections of un-named herbaceous plants being sent out. The archive at the Royal Botanic Garden Edinburgh also has a number of manuscript accession ledgers known as "Plant Books". The 1849–55 Plant Book revealed that, on 26 April 1854, *Polygonum sieboldii* was received from Messrs Jackson & Son Nurserymen of Kingston. This, incidentally, is the earliest record of a British nurseryman offering Japanese Knotweed for sale by a very long way (see Table 2), and it is tempting to think that, with the proximity of Kew and Kingston upon Thames, the plant was supplied to Jacksons by Kew. Thus in the year 1850 began the inexorable spread of Japanese Knotweed throughout the British Isles.

Before moving on, it is worth considering the fate of Siebold's Garden of Acclimatisation at Leiden. In the year of his death, 1866, it boasted nearly a thousand different species and varieties. By the time the English horticulturists F. W. Burbidge and P. Barr visited in 1883 they found a neglected jungle, overrun by none other than - Japanese Knotweed (Sharman 1990).

#### *F. JAPONICA* VAR. *COMPACTA* (HOOK. F.) J. P. BAILEY

The 1844 catalogue of Von Siebold & Company records that a taxon called *Polygonum pictum* Sieb. was first introduced to Europe in 1841. It is thought that Siebold's *Polygonum pictum* is actually the dwarf variant of *F. japonica*. This is based on two supporting pieces of evidence. Firstly its height is given by Siebold as 60 cm, and secondly the name is given as a synonym of *P. cuspidatum* by De Vriese in 1849. That aside, little is known about the early history of var. *compacta* - it is certain that the name *P. pictum* has not yet been found in the British botanical literature. Hooker (1880) gives the taxon specific rank as *P. compactum*, but this treatment has not been widely followed. It is a decorative garden plant with a dwarf habit, crimped leathery "square shaped" leaves, and usually growing up to about one metre, but with occasional records of much shorter plants in cultivation (c. 30 cm high). Male-sterile plants often have a conspicuous red pigmentation, making them more desirable in the garden. Unlike var. *japonica*, both male-sterile and hermaphrodite individuals are found. It was recommended by Gertrude Jekyll, who included

"this dwarf Japanese Knotweed" in some of her planting schemes, such as the garden at Long Aston, Birmingham (Bisgrove 1992).

The earliest record for cultivation in the British Isles is from John Wood's garden at Kirkstall Abbey, Leeds in 1881. In 1883 it was grown in Mr Scott's garden, Denzell (Dunham Massey, near Altrincham, Cheshire). Two 1911 herbarium specimens of plants grown at Charles Bailey's garden at Cleeve Hill near Cheltenham (v.c. 33) are labelled as having been supplied by Smith's nursery. Richard Smith of Worcester was a well known nurseryman at this time (see Table 2). These latter are labelled as *P. alpinum*, but it is not clear whether this error was Bailey's or Smith's. (All these herbarium specimens are now at **MANCH**).

It is now thought that the plants we refer to as var. *compacta* are actually particular alpine variants of *F. japonica*. Shiosaka & Shibata (1993) in their transplant experiments clearly show that there is a genetic component governing both height and time of flower initiation in this taxon. As the altitude from which the plant was collected increased, so the final stature of the plant diminished and the initiation of flowering became earlier. Plants from 2,400 m on Mt Fuji only grew 10 cm tall and initiated flower buds in May. We have noted very small var. *compacta* plants in Britain at Arno's Castle, Bristol (**LTR**) and Wisley. L. H. Bailey (1949) lists "*Polygonum Reynoutria* Makino" as a ground cover plant 4–6 inches high. Syngé (1956) distinguishes "*Polygonum Reynoutria* Makino", a synonym of *P. cuspidatum*, from "*Polygonum 'Reynoutria'* of gardens, non Makino", a male-sterile var. *compactum* with red fruiting perianths. Amos Perry in 1936 received an R.H.S. Award of Merit for his "*P. Reynoutria*", 18 inches high (according to his 1937 catalogue). Its crimson fruiting sprays were much admired in the Wisley September notes in the 1940s (Anon. 1943). The "*P. Reynoutria*" at E. A. Bowles' rockery at Myddleton House, Enfield is reported as having come from this source. It is quite possible that there were multiple introductions, as these dwarf variants would be encountered by any botanical expedition to the mountains.

The earliest recorded escape was 1915 Melrose Abbey (**E**). The plant is still rather rare, and there are few instances of naturalisation; to date we have only mapped 30 records on a 10 km square basis, including garden plants. When found it is usually only in small stands and is not considered to be very invasive.

*F. SACHALINENSIS* (F. SCHMIDT EX MAXIM.) RONSE DECR.

*F. sachalinensis* is a native of Japan, Sakhalin, and possibly also the isolated Ullung-do Island between Korea and Japan. Early collections were made in the 19th century from both areas, but the exact dates and mode of entry to Europe are not always clear. Apart from the collectors own accounts, Bretschneider (1898) gives the most reliable account of expeditions to these areas. The Russian expeditions were sent from St Petersburg, and the British were sponsored by Kew, privately, or by nursery gardeners such as James Veitch & Sons (Veitch 1906).

*F. sachalinensis* was discovered on Sakhalin by Dr H. Weyrich. He was the surgeon on the *Vostok* under the command of Capt. Lieut. Rimsky-Korsakov, on the Russian Naval Expedition to eastern Asia (1852–55). [Incidentally the composer N. A. Rimsky-Korsakov was the younger brother of the commander of the *Vostok*; initially his "...heart was set not on music but on a career in the navy in emulation of his brother 22 years older than himself", (Grove, ed. Sadie 1980)]. During the survey of the west coast of Sakhalin, in early September 1853, Weyrich landed at Noto-sama, where he collected *F. sachalinensis* from damp river banks. The Russian Naval Expedition returned to St Petersburg in 1855 and Weyrich's plants went to the St. Petersburg Botanic Gardens (Bretschneider 1898); his *F. sachalinensis* was described and named by F. Schmidt in Maximowicz's *Primitiae florae amurensis* (1859). The type description records that the fruits were immature, though our examination of the type specimen (**LE**) contradicts this.

Further collections of *F. sachalinensis* (**BM**; **K**) were made from Sakhalin by P. von Glehn in 1861, who, with F. Schmidt, made the first extensive survey of the flora of Sakhalin, during 1860–1862. They arrived back at St Petersburg in early 1863 (Schmidt 1868).

Material of Japanese origin was collected by C. J. Maximowicz on his second expedition to eastern Asia 1859–64 (1861 Hakodate, Japan **BM**; **K**). He arrived back at St Petersburg in July 1864 with an enormous collection of living plants, seeds and herbarium specimens.

Regel (1864) reported that *F. sachalinensis* was growing in the Botanic Garden at St Petersburg by 1864 and that it was able to overwinter there. At this date he can only have been referring to plants of Sakhalin origin. Regel (1874) further suggested that the St Petersburg *F. sachalinensis* originated from seed collected by Schmidt, and was then distributed widely to European botanic gardens. Certainly the herbarium specimen from the Glehn and Schmidt expedition (K) has good seed. So, whilst it is certain that the first *F. sachalinensis* at St Petersburg was indeed from Sakhalin, it is not entirely clear whether it was from the collection of Weyrich or Schmidt or both. Certainly by the time of Mr Bull's importing it to Britain (see below), both Japanese and Sakhalin plants could well have been available in St Petersburg.

Edouard André (1893) claims to have been the first person to have brought *F. sachalinensis* to the notice of the horticultural world. André relates (André 1870) that when in the Garden of Acclimatisation in Moscow in 1869 he was struck by various plants with big foliage recently introduced from the most distant parts of the Russian empire. One such plant that particularly took his interest was *P. sachalinense*, which the head gardener, Monsieur Desmurs, informed him had come from Sakhalin Island (André 1893).

Concerning the introduction to Britain, Hooker (1881) recalls that it had been in cultivation at Kew for about 20 years and that it had probably come from the collections of Wilford or Oldham. This is indeed possible, as there is an 1859 Wilford specimen of *F. sachalinensis* (labelled as *P. cuspidatum*) from Hakodadi (Japan) at K. The Kew "Plants Inwards" book for 1859–67 records two sendings from Wilford in early 1860, but neither mentions *P. cuspidatum* or *P. sachalinense* by name. The same ledger records the sendings of Oldham, also from Japan, in 1862–3. These are not generally itemised, but seem to be primarily seed and spores; the April 1862 package being dismissed as "...mostly common and well known species scarcely any germinated". We have not located any Oldham herbarium specimens of *F. sachalinensis*, but he cannot be ruled out as a potential source of seed of this taxon.

Whatever the complexities and confusions of the early history of the introduction of live plants or seed from Sakhalin and Japan to the West, whether via Russia or Kew, we do have good documentary evidence of when this species was first available to the gardening public in Britain. The 1869–70 catalogue (No. 48) of William Bull of Chelsea records *P. sachalinense* under "New plants offered for the first time". It was offered at the then considerable price of 7/6d per plant, along with the assurance that "...coming from the Amoor country will be perfectly hardy". [At this period the "Amoor country" (Amur) included Sakhalin Island; *F. sachalinensis* is not known to occur on mainland Amur]. The 1871 (No 59) catalogue notes that it "...is perfectly hardy", which demonstrates that they had overwintered it in Britain. That it was available in commercial quantities to unleash on an unwary public by 1869 suggests that it had been in cultivation for a year or more by then. Charles Maries, when in Japan in 1878–9, collected further material from the central mountains of Japan, whilst employed by James Veitch & Son (Veitch 1906). We have seen a herbarium specimen dated 1880 at Kew from this collection. If live material was brought back, it would have added further to the genetic diversity of this taxon in Britain.

*F. sachalinensis* was also recommended, particularly on the continent, as a forage plant for cattle (André 1893). In Britain it was planted for this purpose on "oozy hillsides in Yorkshire" (Davies 1896), though there is no record of any such plantings surviving there. It was even introduced to Bengal for this purpose, and as a riverbank stabiliser, in the late 19th century, where it was known as Knot-grass or Machute (Christy 1893). We have recently heard that it still survives along rivercourses in Bengal (W. Griffin, pers. comm.). The Yokohama Nursery Company was in 1907 offering 100 lb of cleaned *F. sachalinensis* seed for \$100, though we have not heard of any plantings on this scale. *F. sachalinensis* also has certain pharmaceutical properties, and is used commercially in Germany for the manufacture of a fungicide (H. H. Heine, pers. comm.).

Early plantings in the British Isles are known from Mr Garnett's Penketh (near Warrington) 1892, Eastnor Castle (Herefordshire) 1886, Cosmo Melvill's garden at Brook House, Prestwich (Lancs.) 1901 and from a horticultural specimen of 1874; all Grindon (MANCH). In the 1890s Surgeon-General Cook grew both sexes of *F. sachalinensis* in his garden near Lydney (Gloucs.) (K).

*F. sachalinensis* plants in Europe possess much more genetic diversity than *F. japonica* var. *japonica* (Hollingsworth 1998). This could be the result of multiple introductions from widely separated areas or the introduction of seed rather than rhizomes, or a combination of the two.

*F. × bohemica* is the name given to hybrids between *F. sachalinensis* and *F. japonica* var. *japonica* or *F. japonica* var. *compacta*. It was first described in 1983 in a Czechoslovakian wildlife magazine (Chrtek & Chrtková 1983). It was not until 1986 that, at Leicester University, we became aware of this; we had been independently describing the hybrids on morphological and cytological grounds since the early 1980s (Bailey & Conolly 1985). A.P.C. had, however, earlier been suspicious of certain specimens from Par (Cornwall) and Marston (near Oxford), the determinations of which had over the years alternated between *F. sachalinensis* and *F. japonica*. These suspicions were heightened by plants grown from seed sent by European botanic gardens, which morphologically did not match the taxon they were sent as, and which were subsequently found to be hybrids. Concentration on plants previously thought to be male-fertile *F. japonica* var. *japonica*, and which were also subsequently found to be hybrids, highlighted the morphological features of the hybrid to us. Bailey *et al.* (1996) summarise the current knowledge of the hybrid's history and distribution in the British Isles. None of the locations listed there predates the South Wylam, Co. Durham (v.c. 66) plant which has been established since at least 1954 (Sowerby, B. BM). For the earliest British record, 100 years prior to its description, we are again indebted to the Grindon Collection at MANCH. Here there are two collections (dated October 1872 and September 1876) from Manchester Botanic Garden, on a single sheet labelled *P. sieboldii*, both of which we have determined as *F. × bohemica*. A 1911 male-fertile specimen of *F. × bohemica* from Charles Bailey's garden "Haymesgarth" at Cleeve Hill near Cheltenham (v.c. 33) is especially interesting as it came as a root from Smith's Nursery, Worcester (see var. *compacta* section). This is direct evidence that a nursery garden was supplying this taxon at an early date. The initial hybridisation could also have occurred there, and such nursery establishments are likely origins of the hybrid in general. The plants certainly had plenty of opportunity for hybridisation, as the parental taxa had been growing together there since at least 1880 (Table 2). If Smith's were sending out *F. × bohemica* widely, one would expect that the same male-fertile clone could be well-established in widely separated geographical locations; this is being tested by molecular work currently underway at Leicester. Hybridisation must have occurred on a number of occasions, whether in nursery, botanic or private gardens or even spontaneously from naturalised plants. This is borne out by the fact that there are at least five genotypes of *F. × bohemica* known from Britain, 4x, 6x and 8x male-fertile plants and 4x and 6x male-sterile plants (Bailey *et al.* 1996).

#### THE "COOK MAMMOTH" ENIGMA

Catalogues of V. N. Gauntlett & Co. at Redruth from the early 20th century proudly announce:

"*Polygonum 'cooki'* - new mammoth species, introduced by Surgeon-General Henry Cook, from North America some years ago, who writes us that this variety has formed an enormous clump in his garden in Gloucestershire, of quite tropical appearance, with culms 16 feet high and 5 inches in circumference. It is perfectly hardy and, like the species, spreads rapidly, making a splendid plant for the wild garden or woodland drives, etc. We have secured the whole stock of this plant. 7/6d." (Gauntlett's *Hardy Plants Worth Growing*, Cat. 88 p. 61).

This is the earliest record that we have located. Catalogue 88 is the earliest from the Japanese Nurseries, Redruth which lists this taxon, and it predates the move of the company to Chiddingfold, Surrey in 1906/7 (Willson 1988). Catalogue 88 cannot be earlier than 1901 since it refers to His Majesty's Government. At Chiddingfold they advertised their "*P. Cookii*" up to the late 1920s/early 30s. From 1909 onwards, a photograph of "*P. Cookii*" is added. This photograph is taken from some distance and is not very clear, but depicts either *F. sachalinensis* or *F. × bohemica*. Were this plant actually to be *F. × bohemica* we have the fascinating possibility that the catalogue entry constitutes valid publication of an earlier name for *F. × bohemica*! Perry's of Enfield were also selling *P. "Cookii"* between 1935 and 1937.

Henry Cook, in *A Gloucestershire Wild Garden* (1903), describes his garden "Priors Mesne", near Lydney. Here he grew four large "*Polygonums*" in several places, including both male and female *Polygonum sachalinense* on either side of a pond, with *P. cuspidatum/sieboldii* close by. Thus there was potential here for on-site hybridisation and production of *F. × bohemica*. Cook also notes that Kew had told him that they did not have the male *P. sachalinense* at the time of writing



(1899); he swiftly rectified this by sending them a specimen the same year. This was followed in 1901 by a specimen (**K**) that we have now determined as *F. × bohemica*.

Whilst we have established that Cook had both *F. sachalinensis* and *F. × bohemica* in his garden prior to 1904, when Gauntlett's would have collected their mammoth *Polygonum*, there is unfortunately nothing to link either taxon to the *Polygonum* being distributed by Gauntlett's as "Cookii". Thus it is not known whether the plant taken by Gauntlett's from Cook's garden was *F. × bohemica* or just a large clone of *F. sachalinensis*. In any case the herbarium specimen (**K**) is good evidence of *F. × bohemica* being a valued garden plant. Whether it originated in his garden, spontaneously or from deliberate planting of seed, or even in North America may never be known.

#### PROMOTERS AND PERPETRATORS

Having once established the probable date and place of arrival of these taxa in the British Isles, we are then set the task of explaining the current widespread distributions of *F. japonica* var. *japonica*, *F. sachalinensis* and *F. × bohemica*. For this we must turn our attention to the enthusiastic gardeners of the time, the commercial nurseries that pandered to their insatiable demand for novelty and the botanic gardens which were involved in widespread exchange with the former.

#### THE ROLE OF COMMERCIAL AND BOTANIC GARDENS

When looking at the dispersal of a garden plant an obvious place to start is the gardening literature. When available, herbarium specimens are of course direct evidence. The Nursery garden catalogues themselves are good primary sources of data. Although some catalogues were quite substantial publications (e.g. Gauntlett's, Veitch's), they are quintessentially ephemeral items, and interest would generally be restricted to the current issue. Hence it is not unusual to come across undated and unnumbered catalogues. Another difficulty is, of course, that few people had the foresight to save them. The Royal Botanic Gardens at Kew and Edinburgh and the Royal Horticultural Society's Lindley Library have substantial collections, but few other than the most famous nurseries are represented in any quantity, and complete runs appear virtually unknown. This is hardly surprising when considering the vast numbers of nurseries in business in the Victorian period. Even scarcer are catalogues from the 1850s and 60s - the period of the initial dispersal. Apart from those of Von Siebold & Co., which were fortuitously republished in a contemporary journal, we have seen no catalogues dated earlier than 1869. However, in spite of the fragmentary nature of the resources available, we have gained evidence of a substantial nationwide trade in these plants (Table 2). Nurseries offering them are well distributed throughout the British Isles - not that this was a prerequisite for effective dispersal, since a highly efficient postal service existed during the period under consideration. This list also provides a historic record of where and when *F. japonica* and *F. sachalinensis* were being grown together, giving the potential for hybridization.

The prices generally follow a similar pattern, a high price for novelty followed by a sharp drop, as illustrated by *F. sachalinensis* in the Bull catalogues and Cook's mysterious *Polygonum* offered for over 30 years by Gauntlett's. Another point of interest is the scale of the trade in these plants: Siebold, for instance, giving a price per hundred *F. japonica* plants and the Yokohama nursery offering *F. sachalinensis* seed in 100 lb lots. Gauntlett's and others were offering *F. sachalinensis* by the dozen - clearly not aimed at the ordinary suburban garden. Another point is the sheer length of time that these plants were retained on sales lists in spite of their true nature being known. Though we have not been searching actively for latest dates, Table 2 shows that *F. japonica* was on sale for at least 87 years! Indeed, the mottled variant of *F. japonica*, "*P. spectabile*", was still in Beth Chatto's list in the 1980s.

#### GARDEN NOMENCLATURE

Due to the mixed usage of horticultural and scientific names and the idiosyncratic application of some epithets, a certain amount of botanical licence has been employed in the interpretation of these taxa in the Nursery catalogues. Although Siebold was one of the authorities for *P. cuspidatum*, he used the eponymous *P. sieboldii* Reinw. in his catalogues, and it is under this combination that all the earliest references occur. As the *compacta* epithet was not published until 1880, another name was needed to differentiate the two varieties of *F. japonica* in the earlier catalogues. One way of doing this was by keeping *sieboldii* for the normal plant and using

TABLE 2. LIST OF NURSERY GARDENS INVOLVED IN DISSEMINATION OF JAPANESE KNOTWEED *S.L.*

Nursery	Locality	date or catalogue Number	<i>japonica</i>	<i>compactum</i>	<i>sachalinensis</i>	"cookii"	Comments
Backhouse, James & Son	York	1895	1/- each	-	1/6d each	-	
Backhouse, James & Son	York	1898	1/-	1/- each	1/6d each	-	
Beckham, James, & Son		1899	1/-	1/-	1/6d	-	
Bull, William	Chelsea	1869-70 No. 48	-	-	7/6d	-	
Bunyard, Geo.	Maidstone	1897	1/- each	-	-	-	
Cheal, J. & Sons	Crawley	No date/number	9d each	9d each	-	-	Lowfield Nurseries
Cocker, James	Aberdeen	1901	-	5/- per dozen	-	-	syn. <i>japonicum</i>
Cunningham, Fraser & Co.	Edinburgh	No date/number	+	-	+	-	Comely Bank Nurseries
Dickson's Nurseries	Chester	1901	6d each	9d each	6d each	-	suitable for covers and undergrowth
Gauntlett, V. N.	Redruth	No. 88 (c 1902-4)	1/- each	-	9d each	7/6 each	Japanese Nurseries
Gauntlett, V. N.	Chiddingfold	No. 101 (1930s)	1/-	-	1/-	5/-	Japanese Nurseries
Haage & Schmidt	Erfurt	1878	15pf each	40pf each	-	-	
Jackson, T. & Son	Kingston upon Thames	†† (1854)	+				Supplied RBG Edinburgh with <i>F. japonica</i>
Methven, Thomas & Sons	Edinburgh	1891	9d each	-	1/9d each	-	
Parker, Robert	Tooting	1879	9d - 1/6 each	1/- to 1/6	1/- to 2/6 each	-	listed as 'marsh plants'
Perry, Amos	Enfield	1936/7	9d each	5/- each	9d each	1/6d each	Supplied <i>compacta</i> to E.A. Bowles, Myddleton House, Enfield as <i>P. reynoutria</i>
Prichard, Maurice	Christchurch	1898	4d each	9d each	1/- each	-	Riverslea Nursery
Siebold & Co., von P.F.	Leiden	1848	26 plants/500F	2F each	-	-	Supplied RBG Kew with <i>F. japonica</i> 1850
Siebold & Co., von P.F.	Leiden	1856	100 plants 25F	1F each	-	-	
Standish & Co.	Ascot	†† (pre 1900)	+				Supplied C.Wolley- Dod, Edge Hall Malpas
Smith, Richard	Worcester	1880-81	9d each	9d each	1/- each		
Smith, T.	Newry	1891 (No.6)	9d each	1/- each	1/- each	-	Daisy Hill Nurseries
Veitch, Robert & Sons	Exeter	undated, but between 1879 & 1926	9d each	9d each	1/6d each		
Wallace & Co.	Colchester	1897	-	-	6d each	-	Kilnfield Gardens
Wood, J.	Kirkstall, Leeds	Pre 1902?	6d each	6d each	9d each	-	Wood's Hardy Plant Club
Yokohama Nursery, Co. Ltd.	Yokohama, Japan	1907			100lb cleaned seed \$100		

†† Catalogue not seen

*cuspidatum* for the dwarf, as was done in Smith's catalogue 1880/81. The name *P. reynoutria* was also applied to a dwarf variant earlier this century. The Giant Knotweed did not provide any such problems, as it was always listed under its correct name (even though spelt in a number of creative ways).

There is considerable evidence from the literature and herbarium specimens that plants were sent out under incorrect names. C. Wolley-Dod noted that Standish's nursery (Ascot) were sending out *F. japonica* var. *japonica* under the name *P. japonicum*. The Grindon collection at Manchester Museum (MANCH) has an impressive collection of early Japanese Knotweed specimens, with interesting comments and press-cuttings attached. One such specimen implies that Smith's of Worcester may have been sending out var. *compacta* labelled as *P. alpinum*. Another specimen cultivated at the gardens of the Royal Botanic Society London in 1867 is labelled *P. sibericum*. These names are not synonyms. A sheet with specimens of *F. japonica* var. *japonica* and *F. sachalinensis* (1878) (MANCH) has an 1894 letter attached from a seed company to Leo Grindon requesting "the specific name of the enclosed *Polygonum*".

Such errors are perhaps inevitable during a period of rapid expansion of the exotic taxa available to gardeners. Difficulties of identification of naturalised alien taxa are to be expected, as there is inevitably a time lag between naturalisation and the incorporation of adequate accounts in the local Floras. Even up to the first edition of Clapham *et al.* (1952), *P. polystachyum* and *F. sachalinensis* were not readily separable.

#### THE WILD GARDEN MOVEMENT

It was William Robinson (1838–1935), one of the most influential of the late Victorian gardeners, who advocated replacing the regimented "carpet-bedding" of High Victorian practice (cf. Carter 1984; Thacker 1994) by a more informal "lay-out" and a more natural setting enhanced by the "new" exotic species then becoming available. He promoted his ideas through articles in *The Gardeners' Chronicle* and other journals, culminating with the publication in 1870 of the highly influential book *The Wild Garden*. This book was subtitled "Our Groves and Shrubberies made beautiful by the Naturalisation of hardy exotic plants". He described *Polygonum sieboldii* enthusiastically, and recommended *P. cuspidatum* under "Plants with large or graceful foliage suitable for naturalization". The enormous influence of Robinson's writings led, for example, Surgeon-General Henry Cook, whilst in Bombay with the Indian Medical Service, to dream of making just such a garden of his own when he retired. The resultant Gloucestershire garden, where he grew many of the alien species of *Polygonum*, is described by Cook (1903) and is an important record of early plantings.

In *The English Flower Garden* (1898), Robinson states that "the great Japan Knotworts (*Polygonum*) are handsome in rough places in the wild garden", and that there is "no better plant for semi-wild places, or for association with vigorous things on the turf in the pleasure ground" than *Polygonum sachalinense*.

The influence of Gertrude Jekyll (1843–1932) was just as far-ranging, abroad as well as in England, though less concerned with naturalisation and woodland. However, in *A Gardener's Testament* (Jekyll, F. & Taylor 1982) she is quoted as envisaging a woodland-walk flanked by groups of "plants of rather large stature ... bamboos and the great Knotweeds of Japan". In *Home and Garden* (1900) "we ought not forget the quick growing ways of the great Japan Knotweeds (*Polygonum*) growing fast and tall". At least two of her garden plans include *Fallopia japonica* var. *compacta*: the wild garden at Little Aston, Birmingham, and Drayton Wood, Norfolk (Bisgrove 1992). Mrs C. W. Earle, a Surrey enthusiast of the "wild garden" (1897), is ecstatic in her praise of her "favourite *Polygonum cuspidatum*" - the "...handsomest, easiest-grown, hardiest, most useful plant for London gardens". *F. sachalinensis* is also recommended, but said to lack the "...beautiful up-standing and yet graceful growth." of *F. japonica*.

#### THE ROLE OF PRIVATE GARDENS AND THE KNOTWEED CIRCLES

Canon Ellacombe of Bitton (Gloucs.), Miss Gertrude Jekyll in west Surrey, E. A. Bowles and Miss Ellen Willmott in Essex, and the Rev. C. Wolley-Dod in Cheshire formed a "circle" of specialist gardeners who corresponded, visited each other and exchanged plants, ideas and expertise. They all had exceptionally rich gardens: Ellacombe's one and a half acres contained a "unique gathering of out of the way plants" (see Hill 1919). Apart from British nursery gardens they could have also

ordered from continental nursery gardens such as Von Siebold & Co. or Haage & Schmidt, both early suppliers of *F. japonica* (Table 2). At least some were also in regular receipt of plants from the major botanic gardens including those on the continent. There was regular two-way traffic in new plants between Kew Gardens and these wealthy amateurs - Ellacombe was recorded as supplying Kew with some 20 species for description in *Curtis's Botanical Magazine*. He was also in correspondence with Kew directors from J. D. Hooker onwards: the 1881-95 Kew "Plants Outward" book recording 49 dispatches of plants to him.

An 1882 specimen of *F. japonica* from Ellacombe's garden is now in the Grindon collection (MANCH). Leo Grindon was a botanist and field naturalist interested in alien plants; he was an avid collector, and maintained a wide circle of correspondents. In addition to Ellacombe's, specimens of Japanese Knotweed *s.l.* in his collection come from Charles Bailey at Cleve Hill (Cheltenham), Mr. Garnett of Penketh (near Warrington), John Wood of Kirkstall (Leeds), J. Cosmo Melvill at Prestwich, Mr Scott at Denzell (near Altrincham) and from Eastnor Castle (Herefordshire). There were also specimens from Manchester Botanic Garden and the Garden of the Royal Botanical Society, London (see Appendix 1).

Exchanges within and between these two groups could well have included one or more of the Japanese knotweeds they were known to have grown. Further dissemination beyond these immediate circles could have followed later.

#### CLUSTERS AND ASSOCIATIONS

In consideration of the subsequent history of the escape and naturalisation of these *Fallopia* taxa (Conolly 1977; Bailey *et al.* 1996) we need to distinguish between *F. japonica* and the two taxa of greater stature, *F. sachalinensis* and *F. × bohemica*. Since *F. japonica* var. *japonica* is now of almost ubiquitous occurrence, it is in a sense too late to deduce anything from the absence or presence of this taxon in any particular area. The other two taxa on the other hand have a much less "mature" pattern of distribution, and are much more restricted in occurrence and habitat. There are also important differences in the history of their introduction - *F. sachalinensis* having been recommended as a forage plant. There is also evidence of its being used on large estates for scenic plantings and cover for shoots. It is certainly true that *F. sachalinensis* is found more often than *F. japonica* well off the beaten track on old estates, as if it had originally been deliberately planted.

The case of the hybrid *F. × bohemica* is a little more complex; in addition to vegetative spread, it can also arise from seed in locations where *F. japonica* occurs with male-fertile *F. sachalinensis*. This is most likely to occur in nursery and botanic gardens and in private gardens extensive enough to accommodate such large plants. The association of *F. sachalinensis* and *F. × bohemica* with large estates and nursery gardens will be explored to see to what extent current stands of these two taxa can be related to such estates either as residuals or escapes. We also examine in more detail those areas where there are several adjacent spots on the B.R.C. 10-km recording scheme map, which we refer to as clusters.

By far the largest cluster of *F. × bohemica* in the British Isles is in West Surrey (v.c. 17), where there are more than 35 stands, some dozen of which are associated with *F. sachalinensis*. They occur in the area bordered by Dorking, Guildford, Godalming and Haslemere - more specifically the "Surrey Hills". This is the heart of Gertrude Jekyll country, and it is tempting to see a direct link with the fact that her house, "Munstead Wood", was in the centre of this area with its numerous large estates and expensive country houses. Many of these houses were designed by Lutyens, with Jekyll designing the gardens. Many of the present stands are close to such properties, and the abundance of stands of both taxa in and around Holmbury St. Mary, close to a group of Jekyll gardens, is surely significant. But proof of a direct recommendation by Jekyll and/or of supply by, for example, Gauntlett's at nearby Chiddingfold is more difficult to establish; and in any case there were many other nursery gardens in the vicinity. Gauntlett's did, however, offer *Polygonum sieboldii*, *P. sachalinense* and the "mammoth" *P. "Cookii"* for many years. Moreover, stands, possibly relics, of *F. × bohemica* grow today a short distance downstream from the former Gauntlett site (Mrs J. Smith, pers.comm.).

In another cluster of this kind, in West Cornwall, there are a number of associations between well known gardens and the occurrence of *Fallopia* taxa. Buryas Bridge, Penzance, where the unusual *F. japonica* var. *japonica* × *F. japonica* var. *compacta* hybrid grows (Bailey & Conolly 1991), is near the Trewidden estate (formerly the property of T. Bolitho) where over 450 species

of plants were grown at the end of the last century (Pett 1998). A former nursery garden is also nearby. *F. × bohemica* persists at Lanarth on the Lizard peninsula, where P. D. Williams (1865–1935), R.H.S. medallist and one of the greatest Cornish gardeners, had his estate. His relatives had nursery gardens close to Redruth, where Gauntlett's, prior to their 1906 move to Surrey, sold a range of Japanese Knotweed taxa.

In South Wales, concentrated in Glamorgan, there is a further such cluster of *F. × bohemica* or *F. sachalinensis* sites associated with estates of "landed gentry". Clearly derived from or residual are those at Black Pill near Clyne Castle (v.c. 41), former estate of the Vivians (Lord Swansea); Tredegar Park (v.c. 35, Lord Tredegar); Cyfarthfa, Merthyr Tydfil (Crawshays estate); Craig-y-nos, (once the home of Adeline Patti); Gabalfa House, Cardiff and Velindre, Whitchurch (now a mental hospital).

In Scotland too, there are further such clusters of *F. × bohemica* sites, for example in the Glasgow area, mainly along the River Kelvin, possibly relating to the Botanic Garden. Further north, on the Morayshire coast (v.c. 95) around Forres is another *Fallopia* cluster. Here, in the gardens at Kellas House to the east of Forres, both *F. sachalinensis* and the hybrid occur, and along the Muckleburn downstream of Dalvey House (west of Forres) *F. sachalinensis* is abundant. Further downstream, where the Muckleburn approaches the river Findhorn up to a 100 ha of *F. × bohemica* are found. The three taxa also occur at a number of other sites in the area. Kellas House and Dalvey House are probably responsible for much of these introductions, but Brodie Castle, home in the last century to the Brodie of Brodie - a noted horticulturist - is also a possibility (v.c. 95 information from I. Green, pers.comm.).

In England and Wales a high proportion of those stands which occur as solitary (non-clustered) 10-km entries are also associated with local estates and gardens. These include *F. sachalinensis* at Edwinstord (Carms.); Falcondale (Cards.), by a lake; Nant-y-Frith, Flintshire (abandoned garden); Easney, Ware (Herts.), a pheasant shoot cover; and at Leigh near Tonbridge (Kent) - all of which are on or close to an estate. In the east of England *F. sachalinensis* has long out-lived the nursery garden of R. Wallace at Kilnfield Gardens, Colchester, that once cultivated it (*vide* J. Heath) (Table 2).

There are, of course, many other isolated stands of these taxa, in quite other habitats, not associated with estates but naturalised on roadsides, railway tracksides or banks, for which some other explanation is called for.

#### THE FALL FROM GRACE

The "hype" of the early Siebold introductions, coupled with its high price and gold medal status, leaves little doubt of the initial desirability of *F. japonica* to the Victorian gardener. It was undoubtedly a spectacular plant, reliable and hardy even in the far north of the country; and of course there was a much more limited range of exotic garden plants available then.

John Wood of Kirkstall (1884, p. 208) heaps unqualified praise on *F. japonica* var. *japonica* for its "...gracefully arching stems" and declares var. *compactum* to be a handsome bush. He unaccountably declares *F. japonica* var. *japonica* to be "a capital plant for the small town garden". He could, however, be accused of having a vested interest, since he was later to go into the nursery business (Table 2), selling these selfsame plants at 6 pence to 9 pence each!

By the time of Robinson (1898) qualifications were beginning to creep in. Whereas *F. sachalinensis* and var. *compacta* are still both recommended, var. *japonica*, we are warned "...is weedy, and in light soils springs up everywhere". Similarly, Gertrude Jekyll (1899) cautions that "*P. compactum* must be reduced" and "*P. sieboldii* planted with caution". Walters (1887), in his account of the flora of Alexandra Park in Oldham, noted that *F. japonica* var. *japonica* "...turns up unexpectedly in nearly every piece of cultivated ground".

Japanese Knotweed was not long content to remain in gardens and, from the beginning of the century, increasing numbers of escapes were reported (Conolly 1977). By the 1930s *F. japonica* was known in East Cornwall by the picturesque name of "Hancock's Curse", and its presence reputedly reduced the price of a house there by £100 (Conolly *op. cit.*). It is tempting to link this with Hancock's nursery at Liskeard which is known to have been in business for at least the period 1897–1906 (Kelly 1897, 1902). In spite of its invasive proclivities now being well-known, Japanese Knotweed was still being offered in the mid-1930s by nursery catalogues such as Gauntlett's of Chiddingfold (Table 2).

Today *F. japonica* var. *japonica* poses very serious problems for river authorities, amenity areas and nature reserves alike, and a great deal of money is spent annually on surveying and control measures. *F. sachalinensis* is not such a problem, but can nonetheless occupy considerable areas (e.g. Amroth v.c. 45); *F. × bohemica* is a very invasive taxon, and its great stature makes its occurrence even more intrusive. These taxa are a particular problem in South Wales; the 1998 survey of 400 km<sup>2</sup> of the Swansea city and county found that *F. japonica* var. *japonica* occupied approximately 99 hectares, spread across a variety of habitats (S. Hathaway, pers. comm.). Its frequent escape in Glamorganshire as early as 1907 was noted by Conolly (1977).

In 1981 the Wildlife and Countryside Act proscribed two land plants, Giant Hogweed and Japanese Knotweed, making it an offence to introduce these species to the wild. This has implications in terms of the redevelopment of sites infested with *F. japonica* since earth movement and tipping are major factors in spreading the plant further. Duty of care obligations can add considerably to the cost of site development, and contractors are becoming increasingly cautious of taking on infected sites because of the costs of excavation and deep tipping of infested soil. Hancock's Curse is still with us!

#### FUTURE PROSPECTS

This paper leaves quite a few unresolved points and, although on first sight these might appear to be insoluble, there are modern techniques that may be able to shed some light on these historic matters. The main unresolved points are:

- Has our *F. sachalinensis* come from Sakhalin or Japan or both and on how many occasions?
- How many times has *F. × bohemica* arisen in Britain?
- What are the relative roles of vegetative reproduction and seed production in the current distribution of *F. × bohemica*?
- Was *P. "Cookii"* really *F. × bohemica*?
- Where in Japan did the atypical British clone of *F. japonica* var. *japonica* originate?

The work of Hollingsworth & Bailey (2000) has indicated that it is possible to use DNA techniques both to identify particular clones and to extract information on the native region of origin of such plants. Work at Leicester University is currently underway on a number of these problems, helped by B.S.B.I. funding.

#### POSTSCRIPT

Looking back at the original importers of Japanese Knotweed *s.l.*, little did Siebold realize what was in store for the West, when he eventually got his precious Japanese plants back to Leiden, and thus in 1850 despatched that fateful package to Kew Gardens. The role of Kew in subsequent events may not be inconsiderable!

We admire rather than deplore the efforts of the early explorers from Russia who first collected *F. sachalinensis* from Sakhalin and Japan: the naval surgeon Weyrich who "profited by every stay of the vessel to botanize" (Bretschneider 1898, p. 618), and later Maximovitch travelling back from Japan with his enormous living collections. Their specimens were not collected primarily as novelties for gardeners, but for their taxonomic value.

Nor should we blame the early English collectors of *F. sachalinensis*, such as Maries sent by Veitch, and Oldham and Wilford from Kew, sent to gather potential horticultural jewels, who, in spite of appalling conditions and risks, still managed to discover and bring back living new species. For they could not have guessed that their collections might include potential invaders. Indeed, this handsome Giant Knotweed has rarely if ever been a menace here. Nevertheless, with the introduction of male-fertile plants came the potential for crossing with the male-sterile *F. japonica* to produce our third taxon, the highly invasive *F. × bohemica*. A warning maybe of a menace to come!

At this point we recall the debt we owe to the efforts and encouragement of Duggie Kent and his generosity in sharing his superior Knotweed knowledge, without which we would not now be attempting to fit further pieces into the intriguing Japanese Knotweed jigsaw puzzle.

## ACKNOWLEDGMENTS

The authors are indebted to David McClintock for generously sharing his years of Knotweed experience. We thank the staff at Herbaria at the Natural History Museum (BM), Manchester (MANCH), Kew (K) and Edinburgh (E) for assistance and loans. We are particularly grateful to the Royal Botanic Gardens at Kew and Edinburgh and the National Botanic Gardens, Glasnevin for access to their plant accession archives and Victorian nursery garden catalogue collections. We gratefully acknowledge the assistance of The R.H.S. Lindley library, the Natural History Museum botanical library, the Linnean Society's library and in particular the Society's librarian, Gina Douglas. We also thank our many botanical collaborators and correspondents, Ann Boucher, Arthur Chater, Lois Child, John Franks, Ian Green, W. Griffin, Shaun Hathaway, J. Heath, the late H. H. Heine, George Hutchinson, Alan Leslie, Rose Murphy, Kevin Pyne, Joyce Smith, Clive Stace and Roy Vickery. Finally, we acknowledge the assistance of the Herbaria at Uppsala (UPS), Geneva (G), Leiden (L) and Leningrad (LE) for loan of herbarium specimens.

## REFERENCES

- ANDERSON, A. W. (1951). Dr. F. P. von Siebold. *Gardeners' Chronicle* **Feb. 17 1951**: 52.
- ANDRÉ, M. E. (1870). *Un mois en Russie*. Masson & Sons, Paris.
- ANDRÉ, M. E. (1893). La Sacaline. *Revue Horticole* **64**: 326–327.
- ANON. (1943). Wisley in September. *Journal of the Royal Horticultural Society* **68**: 251–253.
- BAILEY, J. P. (1989). *Cytology and breeding behaviour of giant alien Polygonum species*. Ph.D. Thesis, University of Leicester.
- BAILEY, J. P. (1994). The reproductive biology and fertility of *Fallopia japonica* (Japanese Knotweed) and its hybrids in the British Isles, in WAAL, C. DE, CHILD, L. E., WADE, P. M. & BROCK, J. H., eds. *Ecology and management of invasive riparian plants*, pp. 141–158. John Wiley and Sons, Chichester.
- BAILEY, J. P., CHILD, L. E. & CONOLLY, A. P. (1996). A survey of the distribution of *Fallopia* × *bohemica* (Chrtek & Chrtková) J. P. Bailey (Polygonaceae) in the British Isles. *Watsonia* **21**: 187–198.
- BAILEY, J. P. & CONOLLY, A. P. (1985). Chromosome numbers of some alien *Reynoutria* species in the British Isles. *Watsonia* **15**: 270–271.
- BAILEY, J. P. & CONOLLY, A. P. (1991). Alien species of *Polygonum* and *Reynoutria* in Cornwall 1989–1990. *Botanical Cornwall Newsletter* **5**: 33–46.
- BAILEY, J. P. & STACE, C. A. (1992). Chromosome number, morphology, pairing, and DNA values of species and hybrids in the genus *Fallopia* (Polygonaceae). *Plant systematics and evolution* **180**: 29–52.
- BAILEY, L. H. (1949). *Manual of cultivated plants*. MacMillan, New York.
- BEERLING, D. J., BAILEY, J. P. & CONOLLY, A. P. (1994). Biological Flora of the British Isles No. 183 *Fallopia japonica*. *Journal of ecology* **82**: 959–979.
- BISGROVE, R. (1992). *The gardens of Gertrude Jekyll*. Frances Lincoln, London.
- BRETSCHNEIDER, E. (1898). *History of European botanical discoveries in China*. Sampson Low, Marston & Co., London.
- CARTER, T. (1984). *The Victorian garden*. Bell & Hyman Ltd., London.
- CHRISTY, T. (1893). *Gardeners' Chronicle*. **July 29, 1893**: 132.
- CHRTEK, J. & CHRTKOVÁ, A. (1983). *Reynoutria* × *bohemica*, nový křinzec z cedi rdesnových. *Casopis národního muzea v Praze r. prir.* **152**: 120.
- CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. (1952). *Flora of the British Isles*. Cambridge University Press, Cambridge.
- CONOLLY, A. P. (1977). The distribution and history in the British Isles of some alien species of *Polygonum* and *Reynoutria*. *Watsonia* **11**: 291–311.
- [COOK, H.]. (1903). *A Gloucestershire wild garden*, by "The Curator". Elliot Stock, London.
- DAVIES, J. H. (1896). Notes on some Casuals in County Antrim. *The Irish naturalist* **5**: 309–312.
- EARLE, C. W. (1897). *Pot-pourri from a Surrey garden*. Smith Elder & Co., London.
- GROENLAND, J. (1858). *Polygonum cuspidatum*. *La Revue Horticole* **7**: 630–633.
- HILL, A. W., ed. (1919). *Henry Nicholson Ellacombe 1822–1916. A Memoir*. Country Life & George Newnes Ltd, London.
- HOLLINGSWORTH, M. L. (1998). *Clonal growth and hybridisation in some invasive Fallopia spp.* Ph.D. Thesis, University of Leicester.

- HOLLINGSWORTH, M. L. & BAILEY, J. P., (2000). Hybridisation and clonal diversity in some introduced *Fallopia* species (Polygonaceae). *Watsonia* **23**: 111–121.
- HOOKE, J. D. (1880). *Polygonum compactum*. *Curtis's Botanical Magazine* **106**: 6476.
- HOOKE, J. D. (1881). *Polygonum sachalinense*. *Curtis's Botanical Magazine* **107**: 6540.
- HOUTTUYN, F. (1777). *Natuurlijke Historie* **8**. De Erven van F. Houttuyn, Amsterdam.
- JACKSON, B. D. (1895). *Index Kewensis*. Clarendon Press, Oxford.
- JEKYLL, F. & TAYLOR, G. C., eds. (1982). *A Gardener's Testament. A selection of articles and notes by Gertrude Jekyll*. Antique Collectors' Club, Woodbridge, Suffolk.
- JEKYLL, G. (1899). *Wood and garden*. Longmans, Green & Co., London.
- JEKYLL, G. (1900). *Home and garden*. Longmans, Green & Co., London.
- KELLY'S (1897). *Directory of Devonshire & Cornwall*.
- KELLY'S (1902). *Directory of Devonshire & Cornwall*.
- KIMURA, Y. & KITAMURA, S. (1977). *A guide to Flora Japonica of P. F. Siebold*. Johnson Reprint Corp., New York.
- LINDLEY, J. & PAXTON, J. (1850). Gleanings and original memoranda. No. 185 *Polygonum cuspidatum*. *Paxton's Flower Garden*. **1**: 137–138.
- MAKINO, T. (1901). *Polygonum reynoutria* (Houtt.) Makino. *Botanical magazine Tokyo* **15**: 84.
- MAXIMOWICZ, C. J. (1859). *Primitiae florum amurensis. Mémoires présentés à L'Académie Impériale des Sciences de St. Pétersbourg* **9**: 233.
- MORREN, C. (1849). *Plantes Nouvelles; Polygonum cuspidatum*. *Annales de Gand* **5**: 461–462.
- PETT, D. E. (1998). *The Parks and gardens of Cornwall*. Alison Hodge, Penzance.
- REGEL, E. (1864). *Polygonum sachalinense* F. Schmidt. *Gartenflora* **13**: 68.
- REGEL, E. (1874). Neue oder empfehlenswerthe Zierpflanzen, 19) *Polygonum sachalinense*. *Gartenflora* **23**: 87–88.
- ROBINSON, W. (1870). *The wild garden*. John Murray, London.
- ROBINSON, W. (1898). *The English flower garden*, 6th ed. John Murray, London.
- SADIE, S., ed. (1980). *The new Grove dictionary of music and musicians*, **16**. Macmillan, London.
- SCHMIDT, F. (1868). *Reisen im Amur-lande und auf der Insel Sachalin*. Botanische Theil, *Mémoires présentés à L'Académie Impériale des Sciences de St. Pétersbourg* **12** (2).
- SHARMAN, F. (1990). A pioneer in Japan. *Garden, journal of the Royal Horticultural Society* **115**: 350–354.
- SHIOSAKA, H. & SHIBATA, O. (1993). Morphological changes in *Polygonum cuspidatum* Sieb. et Zucc. reciprocally transplanted among different altitudes. *Japanese journal of ecology* **43**: 31–37.
- SIEBOLD, P. F. (1844). Kruidkundige naamlijst van oud en nieuw ingevoerde Japansche en Chineesche Planten. *Jaarboek van de Koninklijke Nederlandsche Maatschappij tot Aanmoediging van den Tuinbouw*, pp. 23–39.
- SIEBOLD, P. F. (1848). Extrait du catalogue et du prix-courant des plantes du Japon et des Indes-Orientales et Occidentales Néerlandaises. *Jaarboek van de Koninklijke Nederlandsche Maatschappij tot Aanmoediging van den Tuinbouw*, pp. 38–49.
- SIEBOLD, P. F. (1856). *Catalogue Raisonné prix-courant des plantes et graines du Japon cultivées dans l'établissement de von Siebold & Company*. Henry & Cohen, Leiden.
- SIEBOLD, P. F. & ZUCCARINI, J. G. (1846). *Polygonum cuspidatum*. *Abhandlungen der Mathematisch-Physikalischen Classe der Königlich Bayerischen Akademie der Wissenschaften* **4**(2): 208 (Fl. Jap. Fam. Nat., 2:84).
- STAFLEU, F. A. & COWAN, R. S. (1986). *Taxonomic literature*, 2nd ed., **6**: Regnum Vegetabile 115. Utrecht/Antwerp.
- SYNGE, P. M., ed. (1956). *The R.H.S. supplement to the dictionary of gardening*. Oxford University Press, Oxford.
- THACKER, C. (1994). *The genius of gardening*. Weidenfield and Nelson, London.
- THUNBERG, C. P. (1784). *Flora Japonica*. J. G. Muller, Leipzig.
- VEITCH, J. H. (1906). *Hortus Veitchii*. James Veitch, Royal Exotic Nurseries, Chelsea.
- VEITCH, J. H. (1896). *A traveller's notes*. James Veitch, Royal Exotic Nurseries, Chelsea.
- VRIESE, W. H. DE (1849). *Polygonum cuspidatum*. *Jaarboek van de Koninklijke Nederlandsche Maatschappij tot Aanmoediging van den Tuinbouw*, pp. 30–32 + plate.
- WALTERS, C. ("Sylvio"). (1887). The Park Flora. *Journal of the Oldham Microscopical Society and Field Club* **1** (4).
- WILLSON, E. J. (1889). *Nurserymen to the World*. E. J. Willson, London.
- WOOD, J. (1884). *Hardy perennials & old-fashioned garden flowers*. L. Upcott Gill, London.

## BIBLIOGRAPHY

- ALLAN, M. (1982). *William Robinson 1838–1935*. Faber & Faber, London.
- COATES, A. M. (1969). *The quest for plants*. Studio Vista, London.
- DESMOND, R. (1977). *A dictionary of British and Irish botanists & horticulturists*. Taylor & Francis, London.
- FLETCHER, H. R. (1969). *The story of the Royal Horticultural Society 1804–1968*. Oxford University Press, London.
- KELLY'S *Directory of Cornwall* (1889, 1906, 1914)
- KELLY'S *Directory of Hampshire* (1903, 1911)
- KELLY'S *Directory of Surrey* (1882, 1899, 1924, 1938)
- KELLY'S *Directory of Gloucestershire* (1885, 1894, 1897, 1914)
- WHITTLE, E. (1992). *The historic gardens of Wales*, C.A.D.W. H.M.S.O., London.

(Accepted October 1999)



## APPENDIX 1 HERBARIUM SPECIMENS CITED

*F. JAPONICA* VAR. *JAPONICA*

[*Polygonum multiflorum* α], Herb Thunberg 9705 **UPS**

*Polygonum cuspidatum* S. & Z. Legit v.S, Herb. Lugd. Batav. No. 908.174 826 **L**

*P. cuspidatum* Sieb. Hort, Kew 1857, Herbarium Hookerianum **K**

*P. cuspidatum* coll. R. Oldham, Japan No. 235 10/1861. Note saying “..up to 8ft high usually one stemmed but sometimes branching near base”. Good seed set 2 sheets - male and female. **K**

*P. cuspidatum* coll. R. Oldham, Japan No.337 with seed **K**

*P. cuspidatum* coll. R. Oldham, Nagasaki Japan No 235 1862 female. **K**

*P. cuspidatum* coll. Maximowicz Yokohama 1862. (Lvs crinkled like *compacta*.) **K**

*P. cuspidatum* coll. Maximowicz iter Secundum, Yokohama 1862 (exserted stamens).

*P. cuspidatum* var. *humilis rubiflora* coll. Maximowicz Yokohama 1862 “cult Yedo” labelled female **K**

*P. cuspidatum* coll. Maximowicz Nagasaki 1863, male and female (- *compacta*-like) **K**

[*P. sibericum*] cult. R.Bot. Soc. London Garden, 1867 (male-sterile) **MANCH**

*P. cuspidatum* Mr. Ellacombe's, Bitton, Oct. 9 1882 (abundant good fruits) **MANCH**

*F. JAPONICA* VAR. *COMPACTA*

*P. cuspidatum* var. *compactum*, Mr. John Wood's, Kirkstall, Leeds, July 16 1881 **MANCH**

*P. cuspidatum* var. *compactum*, Mr. Scott's Denzel, (Altrincham), Aug 31 1883 only 3ft high **MANCH**

[*P.alpinum*] Herb Charles Bailey, Cult. Cleeve Hill 13 Oct 1911 ex Smith's nursery **MANCH**

[*P.alpinum*] Herb Charles Bailey, Cult. Cleeve Hill 30 July 1911 ex Smith's nursery **MANCH**

*P. cuspidatum* var. *compactum*, Melrose Abbey 1915, coll. I.M. Haywood det. Thellung. **E**

*P. cuspidatum* var. *compactum* Bowles' Garden Myddleton House, Bulls Cross. W.T. Stearn 3 September 1954. **BM**

*F. SACHALINENSIS*

*Polygonum sachalinense* F. Schmidt, Ins. Sachalin. Weyrich 1853 **LE**

[*P. cuspidatum*] Hakodadi Japan, 1859 coll. C. Wilford. **K**

*P. sachalinense* Sachalin Island, P. von Glehn 1861 **K, BM**

*P. sachalinense* Hakodate 1861, Maximowicz iter Secundum. Ex Herb horti bot Petropolitani **K**

*P. sachalinense* coll. Maxim 2nd Japan, Hakodate Japan 1861 **BM**

*P. sachalinense* F. Sch. “Siberia” Hort. [cf. **K**] 23/9/1874 8–9ft fine foliage **MANCH**

[*P. sachalinense*] dated July 2 1878 Kew (*F. japonica* leaves on same sheet). 7 Sept. 1894 letter from Dickson Brown & Tait attached. **MANCH**

*P. sachalinense* central mountains of Japan Aug1880, coll Mr. Maries and presented by Messrs Veitch. Labelled male plant Hort Kew **K**

*P. sachalinense* Sent from Eastnor Castle, Herefordshire, Sept. 10 1886 **MANCH**

*P. sachalinense* Mr. Garnett's Penketh, (nr Warrington) Sept. 1892 **MANCH**

*P. sachalinense* male-fertile specimen labelled from “Surgeon General ‘Cobbs’ (Cook's) Garden Lydney” Sept 1899 **K**

*P. sachalinense* Cult Kew Sept 1899. (In same hand as “Cobbs” (Cook's) specimens, female) **K**

*P. sachalinense* Brook House, Prestwich, (Lancs.) J. Cosmo Melvill cult in hort herbaceo ex Insula Saghalin, Aug. 1901 **MANCH**

*F. × BOHEMICA*

[*P. sieboldii*] Manchester Botanic Garden, Two specimens on one sheet; Oct. 1872 & Sept. 23 1876 **MANCH**

[*P. sachalinense*] Sent by Mr Cook, Lydney Gloucester 13.9.1901 **K**

[*P. cuspidatum*] Charles Bailey, Haymesgarth, Cleeve Hill, near Cheltenham 22/9/1911. (Male-fertile) root from Smith's nursery **MANCH**

[*P. sachalinense*] Marston, Oxford Sept 1922 coll. Claridge Druce (male-sterile) **MANCH**

*FALLOPIA MULTIFLORA*

*Polygonum multiflorum* Herb Thunberg 9706 **UPS**

[*Polygonum* (Helxine) Japonicum] Mihi. Vid Nat His. VIII Pl. 49 Fig 3, Herb Delessert collection  
Burman unnumbered **G**