Japanese walnut (*Juglans ailantifolia*), and notes on other trees of the family Juglandaceae, growing in New Zealand

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I have on four occasions seen *Juglans ailantifolia* naturalising very freely. The first was on 10 November 2000 along the Nukuhou River between Whakatane and Taneatua, and also on the back road (Ohiwa) to Ohope, where it has formed extensive colonies in swamps along the Nukuhou River and lining streams in Cheddar Valley. The second was on 17 June 2001 on Auckland's North Shore in Eskdale Reserve, Birkdale, where it was growing alongside a stream. The third was on 16 March 2004 along Wech Access Road, off the Warkworth-West Coast Road, where it was much naturalised along the Araparera River. The fourth was on 7 March 2015 in the Karangahake Gorge, especially eastwards from Waikino, where it grows in quantity along the banks of the Ohinemuri River (Figs. 1–2). Russell Squire of Newmont Waihi Gold has observed that nuts are produced on surprisingly small, young trees in the Ohinemuri catchment, and that they can travel long distances downstream, especially during floods.

Based on Auckland Museum herbarium specimens, other Auckland sites where it has been recorded naturalising include Swanson Stream (Don Buck Rd), and beside Motions Creek between Western Springs and the Zoo. In addition there are amenity specimen trees in Fowlds Park, St Lukes; AUT campus, Manukau (Figs. 3–4); and Victoria Park, Freemans Bay (Fig. 5), and plantings at the Howarth Memorial Wetland, Te Aroha (Fig. 6).

This tree clearly has a liking for river banks, though this is not mentioned in Webb et al. (1988). Its naturalisation in Auckland is comparatively recent, Esler (1987) indicating it was first recorded as an escape from cultivation in the 1970s. The large fruits are borne in racemes and float in water. Thus when a watercourse is in flood, the nuts are readily dispersed downstream. It also suckers after felling or damage, sending up offsets some distance from the parent tree. It is regarded as an environmental weed requiring control in the Ohiwa Harbour catchment (MacKenzie 2013), and is mentioned and illustrated by Popay et al. (2010).

Juglans ailantifolia Carrière is native to Japan and Sakhalin (Russia). It has also gone under the name *Juglans sieboldiana* Maxim., and its general similarity with Manchurian walnut (*Juglans mandshurica Maxim.*) from China, North and South Korea and the mainland Russian Far East, is reflected in another synonym, *Juglans mandshurica* var. *sachalinensis* (Miyabe & Kudo) Kitamura, the name used by Ohba (2006), though Ohwi (1965) used *J. ailantifolia*. Both belong to section *Cardiocaryon,* Asian butternuts (Grimshaw 2004; Aradhya et al. 2005). Lu et al. (1999) include *J. cathayana* from southern and central China in *J. mandshurica*. Apart from its obvious weediness, Japanese walnut is not noted in New Zealand either as a potential timber tree or as an edible nut (the common walnut being much preferred).

The hairy fruits (10-20) are erect at first (Fig. 6), but hang down at maturity (Fig. 2). They are borne in long bunches, a feature distinguishing this species from the other walnuts cultivated in New Zealand, which are: (in section *Juglans*), common walnut (*Juglans regia* L.) with nuts in clusters of 1-3, but sometimes more; and (in section *Rhysocaryon*, American black walnuts) black walnut *(Juglans nigra*) with nuts solitary or paired, Andean walnut (*Juglans neotropica* Diels), Californian walnut (*Juglans californica*) and northern Californian walnut (*J. hindsii*). The American butternut (*Juglans cinerea*) from North America is the only member of section *Trachycaryon*, and is most similar and closely related to the Asian butternuts.

As for these other species of *Juglans*, well-grown examples include *Juglans californica* – Eastwoodhill Arboretum. *Juglans cinerea* – Eastwoodhill Arboretum; Centennial Drive, Matamata (Figs. 7, 8); Omokoroa Reserve, Tauranga. *Juglans hindsii* – Eastwoodhill Arboretum; Christchurch Botanic Garden (Fig. 9). *Juglans nigra* – Van Damme's Lagoon, Mt Wellington; Kings School, Remuera (Fig. 10); Cornwall Park; old Teachers College, Epsom; Howarth Memorial Wetland, Te Aroha; Christchurch Botanic Gardens. *Juglans neotropica* – Mt Albert Research Station (Fig. 11); Landsendt, Oratia; Cornell property, Forest Hill Rd, Waiatarua. *Juglans regia* – Government House, Mountain Rd, Mt Eden; St Francis Friary, Hillsborough; Mangere Central Park, Mangere; Tadmore Park, Manurewa; South Park, Papakura (Fig. 12); Bledisloe Park, Pukekohe. Other lesser-known walnuts are Texan walnut (*Juglans microcarpa*), present in Eastwoodhill Arboretum, and Chinese iron walnut (*Juglans sigillata*), at Hackfalls Arboretum, Hawkes Bay (Grimshaw & Bayton 2009).

New Zealand's biggest and probably oldest specimen recorded as *Juglans ailantifolia* is in the Gudex Memorial Park, Maungakawa Scenic Reserve, Sanatorium Hill (Pukemako), Cambridge (Figs. 13 – 15). It is Tree No. WRK/1228 in the New Zealand Tree Register, and in August 2014 was 13.4 m high, 19.4 m crown spread, and had a diameter (at 0.5 m) of 2.2 m. It was planted by William Thornton about

1890 (Burstall & Sale 1984). Careful examination of the vegetative features and nut characteristics of this old tree indicated that it is not *J. ailantifolia*, but most likely a hybrid between *J. regia* and *J. mandshurica*, generally known as *Juglans ×sinensis* (Krüssmann 1985; Grimshaw 2004; De Langhe 2008), but also as *J. hopeiensis*, the Hebei walnut (Wang et al. 2010). It also closely resembles *J. sigillata*, the Chinese iron walnut, as discussed by Grimshaw (2004), Grimshaw and Bayton (2009), Wang et al. (2010), and Gunn et al. (2010). The Sanatorium Hill tree has pinnate leaves with 5-9 leaflets, the terminal one being the biggest (Fig. 14); leaflets broadly oblong; leaflet margins very faintly serrulate or almost entire; underside of leaflets with very sparse hairs; leaflets ending in a pronounced acuminate point; veins and midribs with numerous hairs; fruit round, single or in twos or threes, smooth, splitting on ripening (as in *J.regia*); nut with prominent flanges, and much wrinkled (Fig. 15).

No authentic records have turned up of *Juglans mandshurica* in New Zealand, though a tree from near Tirau is illustrated under that name in Salmon (1999). Chris Ecroyd (pers. comm.) believes that this tree is *J. ailantifolia*. Neither Bean (1973) nor Krüssmann (1985) make a clear morphological distinction between these two species. Grimshaw (2004) concluded that the two species are very closely related (perhaps conspecific), but to add a little confusion, provided an identification key based on vegetative characters in which he distinguished these two Asian species as follows:

Leaflets ovate-elliptic, shortly acuminate, borne at right angles to rachis……*J. mandshurica*
Leaflets elliptic-lanceolate, acuminate, borne at c. 45° to rachis……*J. ailantifolia*

On this score, several trees I have examined (field and herbarium) in New Zealand would fit *Juglans mandshurica*. It is worth noting that, in observing *Juglans mandshurica* in Jilin province, north-east China, Lancaster (1989) highlighted the abundance of young trees forming thickets along streams and on the gravelly banks of rivers – just as *J. ailantifolia* does here. I saw it in similar places in Mao'ershan Forest, Harbin, and at Yabuli, Heilongjiang Province, when engaged on a forestry project in October 1998 (Fig. 16). The natural forest there had a canopy of *Fraxinus mandshurica*, *Juglans mandshurica*, *Phellodendron amurense*, *Tilia amurense*, *Quercus mongolica*, *Ulmus pumila*, *Populus davidiana*, and *Betula* species. In July 1991 I also saw the same sort of forest at Wandianzi Forest Farm, Liaoning Province.

As well as *Juglans* itself, the family Juglandaceae is represented in New Zealand by cultivated trees of the hickories (*Carya*) and the wingnuts (*Pterocarya*). The most commonly seen *Carya* is pecan (*Carya illinoinensis*) from the United States (Fig. 17). A notable pecan tree of monumental size in Avondale, Auckland, is mentioned by Wilcox (2012). More rarely recorded are water hickory (*C. aquatica*) at Matakana and Eastwoodhill; bitternut hickory (*C. cordiformis*) at Eastwoodhill; pignut hickory (*C. glabra*) at Eastwoodhill; shellbark hickory (*C. laciniosa*) at Eastwoodhill; shagbark hickory (*Carya ovata*) in Pollard Park in Blenheim, in Whanganui, at 133 Ormond Rd in Hastings (Fig. 18), and at Eastwoodhill; and mockernut hickory (*C. tomentosa*) at Eastwoodhill. Shagbark hickory and shellbark hickory grow to a large size in the eastern USA and are the main species used for making axe handles (the wood being renowned for its toughness) and for the preparation of smoked hams (Andrews 2007).

Chinese wingnut (*Pterocarya stenoptera*) is our commonest *Pterocarya*, with good specimens at McLaren Falls near Tauranga, at the Scion campus in Rotorua, and in Hickey's Reserve at Pukekohe (Fig. 19). I saw wingnut growing commonly in stream beds at the big waterfall, Loushi Forest Farm, Wengxin County, Jiangxi, China, in March 2001. Caucasian wingnut (*Pterocarya fraxinifolia*) occurs in Peat Park, Whanganui, and at Eastwoodhill where it has formed a spectacular copse from root suckers (Fig. 20). There is also *Platycarya strobilacea* at Eastwoodhill (Fig. 21). Eastwoodhill Arboretum is a good place to check out the whole Juglandaceae family (MacKay 1989), members of which characteristically have pinnate leaves.

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Thanks to Brad Cadwallader, Chris Ryan, Robyn Simcock and Russell Squire for helpful information and to Matt Buys (NZFRI) and Dhahara Ranatunga (AK) for herbarium records.

Figures 1 – 9: **1.** *Juglans ailantifolia* naturalised at Waikino on the bank of the Ohinemuri River, 7 Mar 2015. **2.** *J. ailantifolia*, Waikino, Karangahake Gorge, with fruit in hanging bunches, 7 Mar 2015. **3.** *J. ailantifolia*, AUT campus, Manukau, 25 Mar 2015. Note the seedlings coming up thickly. **4.** *J. ailantifolia*, AUT, Manukau. Left: longitudinal section through nut. Right: whole nut. 25 Mar 2015. **5.** Pointed, wrinkled fruit of *J. ailantifolia*, Victoria Park, Freemans Bay, 21 Mar 2015. **6.** *J. ailantifolia*, Howarth Memorial Wetland, Te Aroha, 24 Nov 2004. **7.** *J. cinerea*, Centennial Drive, Matamata, 4 Apr 2015. This tree produces abundant crops of nuts. They are edible, but hard to crack, and the meat is rather oily. **8.** *J. cinerea*, Centennial Drive, Matamata, 4 Apr 2015. Upper left: nuts; lower left: longitudinal section through nuts; right: bunch of fruit. **9.** *J. hindsii*, Christchurch Botanic Garden, 18 Nov 2004.

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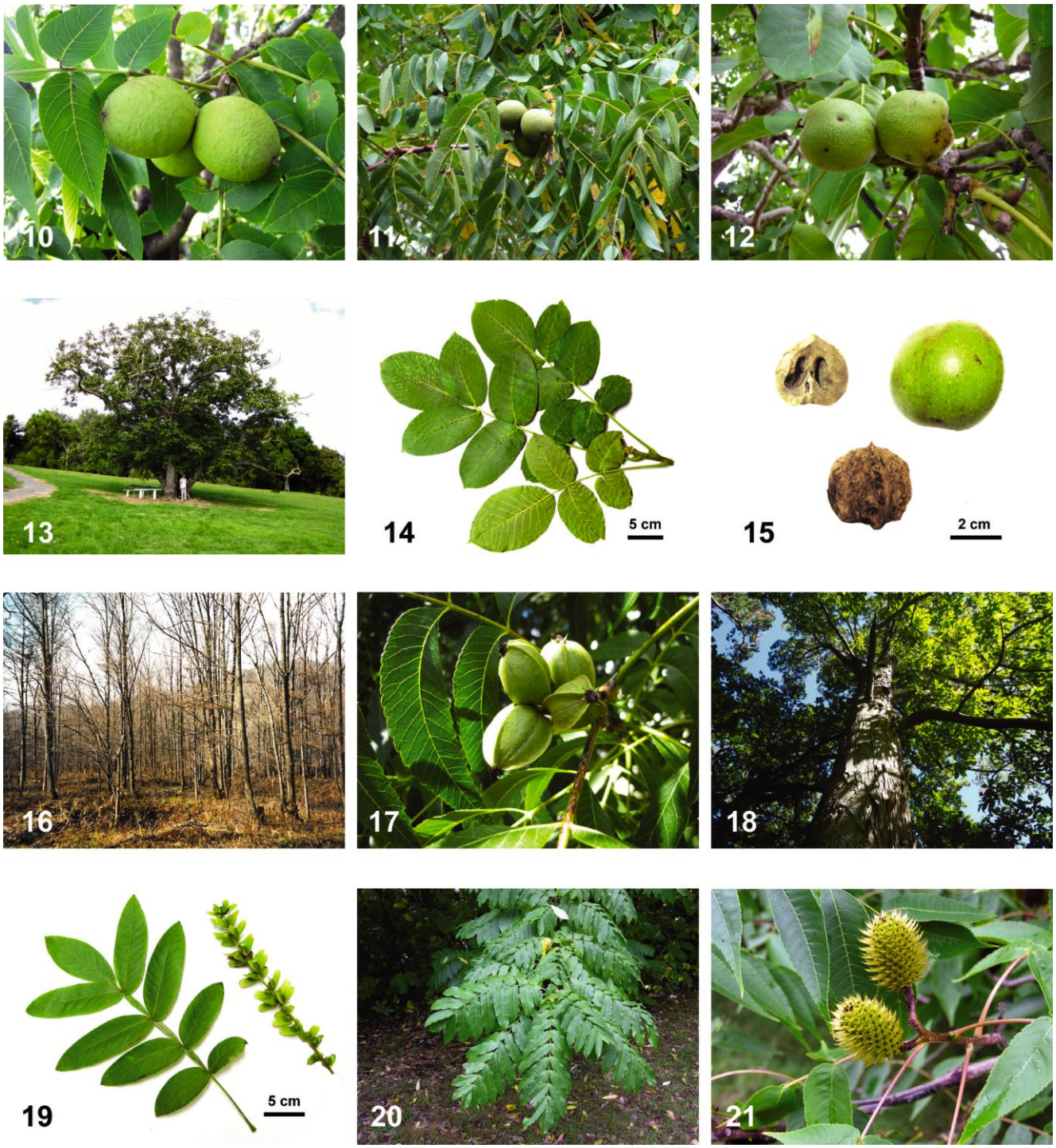

Figures 10 – 21: **10.** *Juglans nigra*, Kings School, Remuera, Auckland, 17 Mar 2011. **11.** *J. neotropica*, Mt Albert Research Station, Auckland, 16 Apr 2008. **12.** *J. regia*, South Park, Papakura, 19 Mar 2015. **13.** *Juglans* ×*sinensis*, Sanatorium Hill, Cambridge, 4 Apr 2015. **14.** Three leaves from *Juglans* ×*sinensis*, Sanatorium Hill, Cambridge, 4 Apr 2015. **15.** *Juglans* ×*sinensis*, Sanatorium Hill, Cambridge, 4 Apr 2015. Upper left: longitudinal section through nut; upper right: fruit; lower: nut. **16.** Secondary coppice forest of Manchurian ash (*Fraxinus mandshurica*) and Manchurian walnut (*J. mandshurica*), Hu Feng Forest Farm, Yabuli, Heilongjiang, China, Oct 1998. **17.** Pecan (*Carya illinoinensis*), University of Auckland, Alten Rd, 11 Mar 2011. **18.** Shagbark hickory (*C. ovata*), Karamu Homestead, 133 Ormond Rd, Hastings, 15 April 2014. The tree was planted in the 1870s by J.D. Ormond. Photo: Karola & Ian Brackenbury. **19.** Chinese wingnut, *Pterocarya stenoptera*, Hickey's Reserve, Pukekohe, 31 Mar 2015. Note the distinctly winged rachis of the leaf (left). The fruit is a 2-winged nutlet, borne in pendulous spikes (right). **20.** Caucasian wingnut (*Pterocarya fraxinifolia*), Eastwoodhill Arboretum, 16 Mar 2005. **21.** *Platycarya strobilacea*, Eastwoodhill Arboretum, 15 Mar 2005.

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Obituary: Dr David Galloway PhD, DSc (Otago), FLS, FRSNZ (1942-2014)

Dan Blanchon

The death late last year of Dr David Galloway, the father of New Zealand lichenology, was a terrible shock and loss to those of us who had the privilege of knowing him. David was a friend, colleague and mentor to me, and many others interested in lichens. If it wasn't for his encouragement and support, and of course his marvellous first *Flora of New Zealand Lichens* (Galloway 1985), I would never have embarked on my own journey through the world of lichens.

David started his career at the University of Otago, where he did an MSc and PhD in biochemistry, and worked as an assistant lecturer. David then went on to work for the Department of Scientific and Industrial Research (DSIR), before being seconded to the British Museum of Natural History in 1973, to further his knowledge of lichens. David married his wife Patricia, an opera singer, soon after and eventually left the DSIR in 1982, joining the staff of the British Museum of Natural History. From this base of operations, David had access to an enormous volume of literature, specimens and type specimens pertaining to New Zealand lichens, allowing him to complete the seminal first edition of the *Flora of New Zealand Lichens* in 1982 (published in 1985). It was at the British Museum of Natural History that I met David for the first time, when I visited him to discuss my MSc research revising the genus *Ramalina* for New Zealand. I found David to be very friendly and supportive, once I had convinced him that I REALLY wanted to study *Ramalina*, and not *Placopsis* (which in New Zealand has its greatest diversity in montane parts of the South Island, and tends to grow on large rocks!) and which David was keen that I study instead.

In 1994, David and Patricia returned to New Zealand, and in 1996 David joined Landcare Research on a part time basis to prepare a revised and updated second edition of the lichen Flora. The resulting massive two volume set