

from the newly discovered plant. She found that the average stomatal lengths were 36.1 μm for the former and 33.4 μm for the latter. These sizes were within the size range for the tetraploid *Veronica cymbalaria* as determined by Albach (2007: p.491; 32.8–38.2 μm).

Addendum – Joshua Salter

When Frances showed me the *Veronica cymbalaria* population at Tamaki Drive, I collected a few plants for closer scrutiny (I had by then read Albach (2007) and wondered if stomatal measurements might at least establish whether these plants were diploid or polyploid). An interesting feature that caught my attention was that, on the plants growing at Tamaki Drive, although the flowers faced upwards on more or less 'erect' pedicels, the pedicels of the mature capsules were elongated and turned downward, so that the capsules were held beneath the typically somewhat horizontal stems. Indeed the capsules were not generally visible until the plants were pulled out from the surrounding roadside weeds. On the growing tips of the plants where the main stems were more upright the downward pointing capsules had curved pedicels,

but where the main stem grew horizontally the downturned pedicels were 'patent' or even perpendicular to the stem. Thus in Fig. 6 (included to show the distribution of hairs on the undersides of the leafy bracts as well as on other structures) the plant was photographed upside down, with the capsules pointing uncharacteristically upwards on perpendicular pedicels.

I wondered if perhaps *Veronica cymbalaria* resembled *Cymbalaria muralis* (Plantaginaceae) in more than its leaf shape – was this habit of thrusting the capsules down towards the substrate a particular attribute of this *Veronica*? Negative phototropism of the capsules is a feature for which *C. muralis* is well-known (see for instance the UK website <https://cabinetofcuriosities-greenfingers.blogspot.com/>). However, negatively phototropic capsules are not confined to *V. cymbalaria* – from images I found online it seems that the other 'large-seed' *Veronica* species (in subgenus *Cochlidiosperma*) share this feature. Perhaps what they all have in common is a fondness for rock walls, and the need to ensure that their relatively large rounded seeds roll into the cracks.

Boston ivy (*Parthenocissus tricuspidata*) – reacting to climate change in New Zealand?

Ewen K. Cameron and Shelley Heiss-Dunlop

Introduction

Boston ivy (*Parthenocissus tricuspidata*) is a long-lived, deciduous, perennial woody vine that can fasten on to walls and buildings by the adhesive disc-like tips of the branched tendrils. As with many



Fig. 1. Boston ivy fully in leaf with fresh, apple-green leaves in spring, covering the Northern Club building, 19 Princes St, central Auckland. Photo: EKC, 16 Nov 2021.

common plant names, "Boston ivy" is misleading – it is neither from Boston, nor an ivy. It is actually native to eastern Asia (Korea, Japan, northern and eastern China) and is in the grape family, Vitaceae. It is so commonly cultivated in the USA, especially on their university buildings, that it is the "ivy" of their Ivy League. Around Auckland it is commonly cultivated in the older suburbs, usually covering walls or fences, sometimes covering buildings (Fig. 1), and occasionally climbing trees (Fig. 2). Boston ivy's leaves are usually 3-pointed or trifoliate, which separates it from its two relatives which are also in New Zealand: Virginia creeper (*P. quinquefolia*) and false Virginia creeper (*P. inserta*, syn. *P. vitacea*) that both have 5-leaflets.

Wild seedling records of Boston ivy in New Zealand (in chronological order)

In April 2019 a mystery seedling with trifoliate leaves was observed in a pot plant under an outside tree at EKC's residence in Mt Eden, Auckland. In autumn the leaves turned red and dropped off. Fortunately, it



Fig. 2. Boston ivy climbing a tree from a long-planted row of vines by the Market Road motorway off ramp, margin of Mt Hobson Road, Auckland. Photo: EKC, 14 Oct 2022.



Fig. 3. A potted-up Boston ivy seedling; a second seedling uprooted behind (now AK 385292), St Albans, Christchurch. Photo: Anthony Wright, 15 Oct 2022. Scale: pot 140 mm diam.



Fig. 4. A second seedling at Arney Crescent, Auckland, that appeared by the lawn margin and was left to grow on (only a single leaf produced after the winter). Photo: SHD, 4 Mar 2022.

sprouted new trifoliate leaves in the spring. After some time, the seedling was identified as Boston ivy (*Parthenocissus tricuspidata*) and harvested on 25 Jan 2020 (see Table 1). The closest known adult vine was some 100 m distant. EKC published an article about it claiming that it may be the first recorded wild Boston ivy seedling for New Zealand (Cameron 2021). Earlier herbarium records of “wild” Boston ivy, including those in the Flora of New Zealand vol. IV (Webb et al. 1988), were most likely based on planted records, or at least originally planted; none were of seedlings (Cameron 2021: table 1).

Three people responded with feedback to EKC about the article (Cameron 2021). The first to comment was Anthony Wright who had two

seedlings appear on his property in St Albans, Christchurch, a month or so apart during spring (Sep-Oct) 2019 in a shaded garden bed under a couple of old *Rhododendron* trees that birds commonly roost in, and under which various seedlings frequently appear. The seedlings were unknown to Anthony, so he potted them up and grew them on for identification (Fig. 3). Both produced tendrils suckers. No adult vines are known within a 0.5 km radius of the locality, but locally there have been many changes in recent years, with earthquake rebuilds and new multiple units, resulting in a decrease of gardens (Anthony Wright pers. comm. to EKC).

The second comment was from Chris Ecroyd who had a similar seedling appearing in the

Table 1. Wild Boston ivy seedling herbarium vouchers / iNaturalist observations / images.

Date first observed	Location	Person	AK herbarium no.* / iNaturalist observations
19 Apr 2019	Thames St, Mt Eden, Auckland	EKC	AK 379435 (harvested 25 Jan 2020)
Sep-Oct 2019	St Albans, Christchurch	AE Wright	AK 385292 (harvested Oct 2022) also a second seedling there
25 Mar 2020	Chelsea Ave, Richmond, Nelson	CE Ecroyd	nz/observations/40678305
2 Jan 2022	Arney Crs, Remuera, Auckland	SHD	AK 385163 (harvested Sep 2022) also a second seedling there
2 Jan 2022	Mt Hobson Rd, Remuera, Auckland	SHD	AK 385291 (harvested Oct 2022) also a second seedling there
29 Jan 2022	Pukekohe East, south Auckland	SHD	Fig. 8
Jan 2022	Thames St, Mt Eden, Auckland	EKC	AK 383745 (2 seedlings harvested 24 Feb 2022)
2 May 2022	Cornwall Park, Epsom, Auckland	SHD	AK 385162 (harvested Sep 2022)
Total	7 localities		12 wild seedlings

*= by entering the AK number (without a gap) the full details and images of the AK specimens can be seen at: <https://www.Aucklandmuseum.com/discover/collections>

shade on his Richmond, Nelson, property (see <https://inaturalist.nz/observations/40678305>, 25 Mar 2020). It now has a few tendril pads (Oct 2022) – he intends to voucher the plant as a herbarium specimen in the near future (Chris Ecroyd pers. comm. to EKC). He is not aware of it in any of the immediate neighbours' properties and there are no known vines within 100 m of the seedling (Chris Ecroyd pers. comm. to EKC).

The third comment was from SHD who had seen similar seedlings in her Remuera garden, some 4 km away from EKC's place. One of the seedlings appeared in a shady garden bed near a puriri tree (*Vitex lucens*) with an overhanging oak (*Quercus robur*). It was dug up on 2 Jan 2022 at the single true leaf stage (trifoliate) and grown on inside (did not lose leaves in winter) and was vouchered as a herbarium record on 21 Sep 2022 (AK 385163). A second wild seedling appeared in the same property in January 2022 in the lawn adjacent to a *Ficus* cv. Tuffy hedge and was left in situ where it remains (Fig. 4). Boston ivy is a common creeper on walls of the local area, the closest being 50 m distant.

Two wildings were found at 18 Mt Hobson Road, on 2 January 2022, growing in the cracks at the base of a retaining wall of a driveway margin (Figs. 5, 6). The property owner (pers. comm. to SHD) was aware of the wildings when approached and confirmed they were not planted and had recently appeared. The likely seed source was 20 m across the road where a 450-m-long Boston ivy planting grows along the southern motorway concrete retaining wall from the Market Road off-ramp to the Dilworth footbridge (Fig. 7) – perhaps the largest connected mass of Boston ivy in New Zealand? It has been here for several decades, and is still extending at the northern end. The vines have grown up and over the wall from the eastern side where it was originally planted, along the wall, and are even climbing a few nearby trees (Fig. 2). The red colour of their autumn leaves over the pale concrete wall is quite a show for the motorway commuters.

Back in Mt Eden in January, two more wild seedlings appeared at EKC's place in separate plant pots under an old grapefruit tree (*Citrus* cv. Goldfruit), both harvested 24 Feb 2022 at the trifoliate leaf stage (AK 383745).

SHD visited her mother on 29 January 2022 at Pukekohe East, some 45 km south of Auckland City, where a single juvenile Boston ivy (31 cm long) was discovered in a garden bed under a large puriri tree (Fig. 8) (yet to be harvested for a voucher). The



Fig. 5. The larger of two wild Boston ivy seedlings with spreading stems in driveway margin, 18 Mt Hobson Rd, Remuera,. Photo: SHD, 2 Jan 2022. Scale: vertical stem c.90 cm long.



Fig. 6. The smaller of two Boston ivy seedlings on driveway margin, 18 Mt Hobson Rd, Remuera, Photo: SHD, 2 Jan 2022. Scale: climbing stem c.15 cm long.



Fig. 7. Planted Boston ivy vines 450 m along concrete retaining wall, southern motorway, seen from Dilworth footbridge looking south towards the Market Road offramp Photo: SHD, 24 Oct 2022.



Fig. 8. A single wild Boston ivy (31 cm long) at Pukekohe East, c.45 km south of Auckland City, in garden bed under a large puriri tree. Photo: SHD, 29 Jan 2022.



Fig. 9. Single wild Boston ivy seedling (40 cm long), Cornwall Park, corner Puriri Drive and Campbell Cres. Photo: SHD, 29 May 2022.



Fig. 10. Uprooted seedling of Fig. 9. Only three basal leaves trifoliate, the rest are simple. Note rather swollen lower stem, possibly due to the seedling regrowing after damage. Photo: SHD, 29 May 2022.

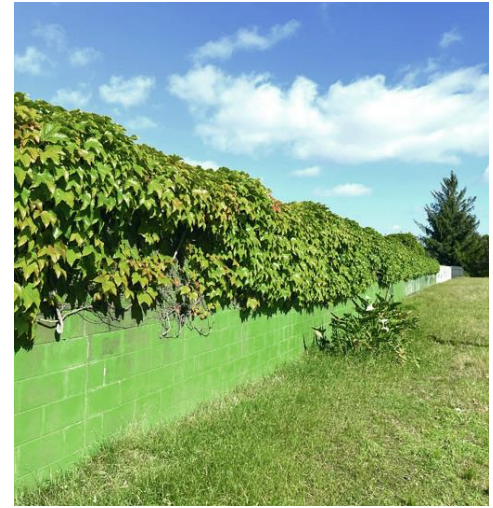


Fig. 11. A 50-m-long Boston ivy vine(s) on NE boundary wall of Cornwall Park, with green fruit hidden under the leaves. Note – lower 85 cm of the wall is bare; eaten by the sheep? Photo: SHD, 6 Jan 2022.

property is surrounded by lifestyle blocks and native bush remnants with no obvious adult Boston ivy plants in the local area.

Then in May 2022 after two years of searching Cornwall Park for different wild plants by several Auckland Botanical members, towards a botanical book coordinated by Mike Wilcox on the Park (Wilcox et al. in press), SHD found a single Boston ivy seedling, 40 cm long, at the corner of Puriri Drive and Campbell Crescent (Figs. 9, 10), which she dug up and grew on inside, and harvested

on 21 Sep 2022. Adult vines were located 230 m distant (to the west) 300 m (north) and 310 m (south) – one of these is the most likely seed source of the wildling. The only adult vine found within Cornwall Park was 1.4 km distant on the Park's NE boundary fence where a 50 m-long adult vine(s) grows (planted outside the Park). Interestingly this vine(s) doesn't grow along the lower 85 cm of the fence (Fig. 11) – presumably eaten by sheep, the main grazing animal in the Park. Perhaps the sheep also eat any seedlings within reach that manage to establish?



Fig. 12. Fifty-two seedlings at cotyledon stage, some with the start of the first true leaf to 4 mm long (Table 2), from 52 seeds sown on 22 Jul 2022. Photo: EKC 17 Oct 2022. Scale: most cotyledons 15-16 mm wide × 17-18 mm long.



Fig. 13. One seedling with first true leaf (trifoliate) (arrow) and three other seedlings with cotyledons malformed; seed from Cornwall Park boundary. Photo: EKC, 6 Aug 2022. Scale: large cotyledons: 26 mm wide × 30 mm long.

Table 2. Boston ivy seed germination trials: source, maturity, dates of sowing and germination, date of first true leaf, and vouchers.

Seed source	Fruit and seed colour	Date (No. sown) (collection date given if different)	First seedlings seen above ground	First true leaves (trifoliate)	% Germination and vouchers
Wairiki Rd, Mt Eden	Fruit green, seeds green	20 Feb 2022 (c.30)	None (8 Oct 22)	N/A	0%
Cornwall Park NE boundary fence	Fruit green with a touch of blue, seeds grey-green	3 Mar 2022 (c.30)	x3 (13 Jun 22) x6 (2 Oct 22)	3 Aug 22	c.20% AK 385075
Wairiki Rd, Mt Eden	Fruit blue-black, seeds grey	Collected 22 Apr 2022 and cleaned, sown 22 Jul 2022 (52)	x9 (26 Sep 22) x37 (2 Oct 22) x52 (17 Oct 22)	12 with leaf 2-4 mm long (17 Oct 22)	100% AK 385293

The leaves (based on Auckland plants)

The two cotyledons (embryonic leaves) are broadly ovate, sometimes with a hint of a lobe, and mainly measuring 13-16(-26) mm across by 15-18(-30) mm long, enlarging with age (Fig. 12). However, they occasionally get partly trapped in the seedcase and can appear malformed (Fig. 13). The first true leaves are trifoliate (Fig. 13, arrow) and when germinated and grown outside in the shade, they first appeared within three weeks after the cotyledons (Table 2). As the stem extended the characteristic adhesive tendril pads developed in the first (Arney Crs seedling) or second (Thames St seedling) year when the leaves were still trifoliate on juvenile plants (see AK 379435). By the second or third year, simple, toothed, cordate leaves with drawn out tips are produced on the running stems (Fig. 14). The familiar 3-pointed, larger, simple adult leaves are the last leaf-type produced and they usually arise directly from the last year's, or older, stems (Fig. 15). Running stems produced in the spring from existing vines usually have the simple, 1-pointed leaves (Fig. 16), or sometimes adult 3-pointed leaves or more rarely trifoliate leaves (Fig. 17). In April-June all leaves turn red (Fig. 18) and finally drop off. In Auckland, at least, it is not uncommon to see patches of the leaves turning red while others on the same vine remain green for a while. By July the vines are usually leafless. The new, bronze-green leaves start appearing by mid-late August, and are not totally out, expanded and apple green for another two months (Fig. 15) – and another annual cycle begins.

Flowers, fruit and seeds (based on Auckland plants)

The green flowers (Fig. 19, AK 383671) are hidden from sight under the leaves, but they are not hidden from the bees, wasps and flies that visit them in

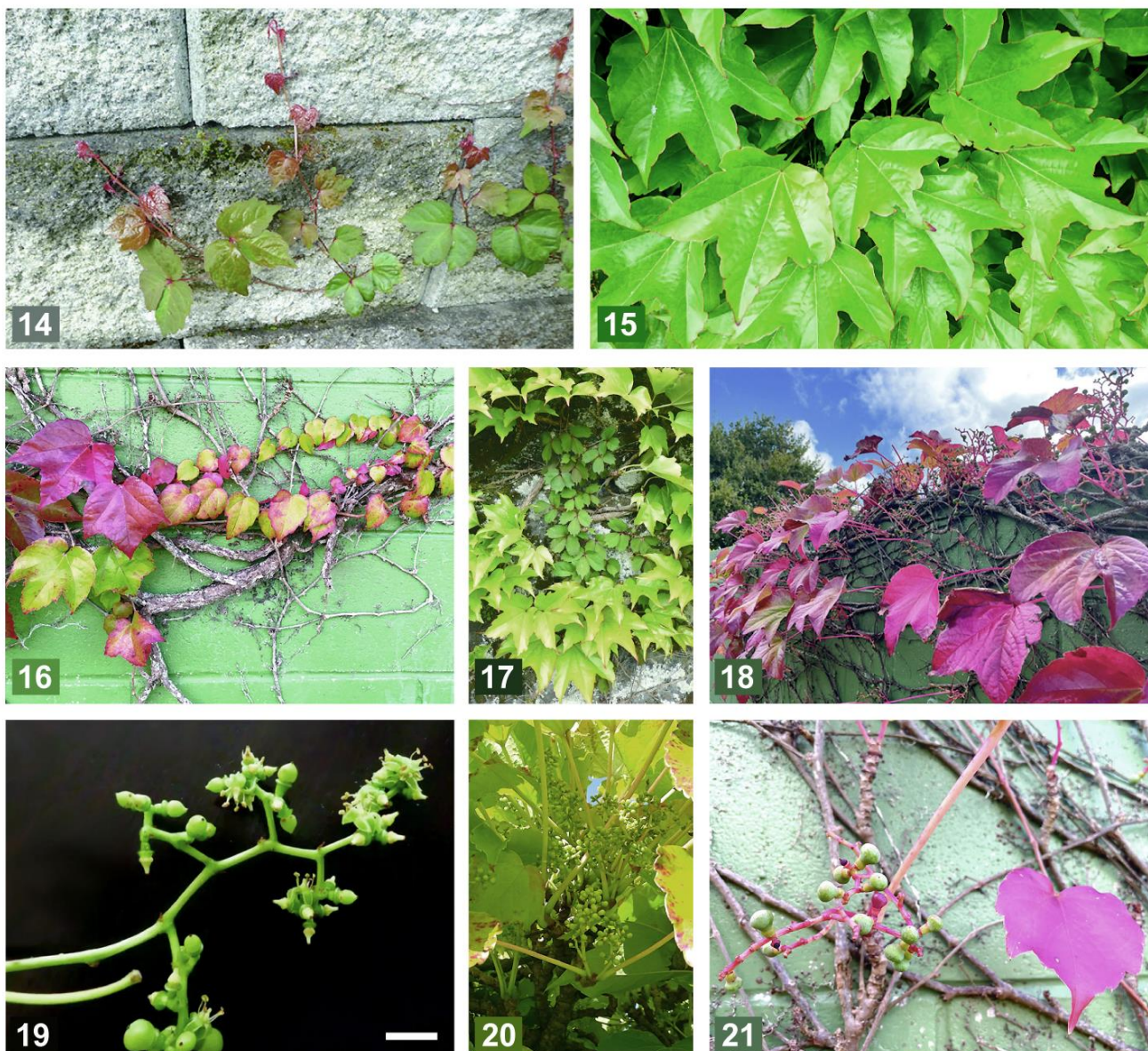
large numbers during December-January. The green fruit are also hidden under the leaves (Fig. 20), but the plants have it well worked out because as the fruit matures the leaves start turning red and soon drop off, leaving the fruit fully exposed on long peduncles which age to pink (Fig. 21), obvious to frugivorous birds that devour the fleshy fruit as soon as it turns blue-black. Each fruit measured (6-)7-8(-9) mm wide by 5-6 mm long and contained 2-3 seeds. The globular individual seeds measured 2.8-3.5 mm long by 2.6-2.8 mm wide, and each had a flat face where it had contact with neighbouring seeds (Fig. 22 a, b)

Germination of Boston ivy seeds

The next step was to see how easily the seeds germinated. Three lots were sown outside in the shade at different times from two different sources. The seed that was collected ripe, allowed to dry for three months and then sown in the winter had a 100% germination (Fig. 12), whereas green seed immediately sown in summer failed to germinate, and the intermediate ripe seed had c.20% germination (Table 2).

Discussion

The initial wild seedling, which appeared in Auckland in April 2019 (AK 379435) does appear to be the first wild seedling vouchered or recorded in New Zealand, followed closely by 11 more seedlings from: Auckland (9), Nelson (1) and Christchurch (2) (Table 1). What has changed that these long-established Boston ivy vines appear to be now producing wild seedlings for the first time in New Zealand? Is this just a short-term event, or is it part of a long-term climate change – are we about to see wild Boston ivy seedlings becoming abundant near established plantings, and spreading? In Auckland we're not yet seeing many seedlings



Figs. 14–21: **14.** Transition of trifoliate leaves to simple 1-pointed leaves towards the end of a 90-cm-long seedling stem, 18 Mt Hobson Road (AK 385291). EKC, 14 Oct 2022. Scale: main stem in photo 40 cm long. **15.** Adult simple, 3-pointed leaves mostly produced from older wood. Northern Club building, 19 Princes St, central Auckland. Photo: EKC, 16 Nov 2021. **16.** Single-pointed, toothed, simple leaves typically produced on annual running stems from adult vines in spring; the adjacent larger 3-pointed leaves were on older stems. NE boundary Cornwall Park, in autumn. Photo: SHD, 8 Mar 2022. **17.** Trifoliate leaves, usually found on the seedlings, unusually produced here from runners of a mature vine; surrounded by typical 3-pointed adult leaves. Alexander Park, 382 Manukau Road, Auckland. Photo: SHD, 14 Oct 2022. **18.** A few autumn-red leaves left, exposing ripening fruit, NE boundary Cornwall Park. Photo: SHD, 8 Mar 2022. **19.** Green flowers (5 petals, 5 stamens, ovary superior) and young green fruit, that were hidden under adult leaves, from 64 Wairiki Rd, Mt Eden. Photo: EKC, 14 Jan 2022. **20.** Young fruit under the leaves, near the top of the wall. NE boundary Cornwall Park. Photo: SHD, 6 Jan 2022. **21.** A few now-exposed ripening fruit remain (ignore the aborted red one), 7-8 mm wide; usually eaten as soon as turning blue-black. NE boundary Cornwall Park. Photo: SHD, 8 Mar 2022.

near well-established vines, e.g., in Wairiki Road, Mt Eden is an old vine 12 m long on a rock wall where the owner (pers. comm. to EKC) has never seen a seedling – looking around other established Auckland vines revealed none or very few seedlings.

Weather records for the last three years show that each year in New Zealand is getting progressively warmer; last year's winter in 2022 was the warmest and wettest on record (NIWA 2022). The warmer

winters and lighter, or no frosts over the last three years, in parts of Auckland at least, might be why we are witnessing these recent wild seedlings.

Considering the enormous number of seeds produced annually, the fleshy bird-dispersed fruit, coupled with the ease to germinate the seed, and the first-time appearance of seedlings, this species should be closely watched as a future environmental weed in New Zealand. It is remarkable that most of



Figs. 22 & 23: **22 A.** Fifty-nine cleaned Boston ivy seeds collected 22 Apr 2022 at 64 Wairiki Rd, Mt Eden, from which 52 were sown (see Fig. 12 & Table 2) Photo: E. Rawcliffe. Scale: 1 cm. **22 B.** Six of the seeds further magnified. Photo: E. Rawcliffe. Scale: 5 mm. **23.** Branched tendrils with adhesive disc-like tips (c.1 mm across) form on the new spring growth, enabling the plant to climb by firmly attaching to substrates. Photo: EKC, 22 Oct 2022.

these records appeared in the gardens of botanists who are interested in weed species – surely, they must be more widespread than this? We urge ABS members to look at the cotyledons (Figs. 12, 13) and the numerous images above of the juvenile trifoliate leaves and go out and look in your own gardens. If in doubt, allow the seedling to grow to see if it produces the diagnostic adhesive pads (Fig. 23) to confirm, and please inform us when you find some.

Acknowledgements

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seedling to voucher in AK; Ines Schonberger for Boston ivy records held at CHR; Ella Rawcliffe for taking the seed images; the property owners / managers who allowed us access to the plants and permission to voucher material; and text improvements by the Editors.

A more recent observation

Shelley's mum found another two Boston ivy seedlings at the cotyledon stage (no true leaves yet) in partial shade on 23 October 2022 at her Pukekohe East property in south Auckland, some 40 m from the original seedling (see Fig. 8. Table 1) in her garden.

References

- Cameron, E.K. 2021: Boston ivy (*Parthenocissus tricuspidata*) – the first wild seedling in New Zealand? *New Zealand Botanical Society Newsletter* 146: 10–12.
- iNaturalist observations.
<https://inaturalist.nz/observations/40678305>, Nelson record, accessed 8 Sep 2022
- NIWA 2022.
<https://niwa.co.nz/news/nzs-warmest-and-wettest-winter-on-record>, accessed 2 Oct 2022
- Webb, C.J.; Sykes, W.R.; Garnock-Jones, P.J. 1988: *Flora of New Zealand*, vol. IV. Botany Division, DSIR, Christchurch. 1365p.
- Wilcox, M.; Goodwin, B.; Heiss-Dunlop, S.; Gibbs, B.; Alder, J.; Ford, M. (in press): Nature in the City: Botany of Auckland's Cornwall Park and Maungakiekie/One Tree Hill Domain. *Auckland Botanical Society Bulletin* 35.