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Aotearoa / New Zealand

First record of *Youngia japonica* (L.) DC. (Asteraceae: Tribe Cichorieae) in Aotearoa / New Zealand

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Abstract

We report the first verified records of *Youngia japonica* subsp. *japonica* (Asteraceae: Tribe Cichorieae) in northern Aotearoa / New Zealand. Five populations have been discovered across Tāmaki Makaurau / Auckland and Te Tai Tokerau / Northland. Specimens were identified using morphological characteristics consistent with flora descriptions, and verified through sequencing using nrDNA ITS (ITS1 and ITS2 spacer regions) and the chloroplast trnH-psbA intergenic spacer. The presence of *Youngia japonica* in Aotearoa extends its known distribution into the southwestern Pacific, and adds to the growing body of evidence that imported coco peat ‘soils’ are adding to the weed flora of the country. We also explore the potential weediness of *Youngia* in Aotearoa.

Keywords

Aotearoa / New Zealand, Asteraceae, Compositae, Cichorieae, *Youngia*, *Youngia japonica* subsp. *japonica*, invasive species

Introduction

Youngia japonica (L.) DC. (Asteraceae: Tribe Cichorieae), commonly known as Japanese hawkweed or oriental false hawkbeard, is a small annual herb native to temperate and tropical Asia (Figure 1) (Babcock & Stebbins 1937; Royal Botanic Gardens, Kew 2026a). Three subspecies are currently recognised: *Youngia japonica* subsp. *japonica*, *Y. japonica* subsp. *elstonii* (Hochr.) Babc. & Stebbins, and *Y. japonica* subsp. *monticola* Koh Nakam. & C.I.Peng (Royal Botanic Gardens, Kew, 2026a).

This treatment was made despite Nakamura et al. (2013) noting that *Youngia japonica* subsp. *elstonii* is a separate lineage from *Y. japonica*, and so warranting treatment as a separate species, *Y. japonica* subsp. *formosana* (Hayata) Kitam. Nakamura et al. (2013) also noted that *The flora of China* (Shi et al. 2011) had synonymised *Y. pseudosenecio* (Vaniot) C. Shih with *Y. japonica* subsp. *elstonii*, an action that is inappropriate because the basionym *Lactuca pseudosenecio* Vaniot was published earlier.

Thus, Nakamura et al. (2013) accepted three subspecies in *Y. japonica*: *Y. japonica* subsp. *japonica*, *Y. japonica* subsp. *formosana* and *Y. japonica* subsp. *monticola*. We note, however, that Plants of the World Online do not follow Nakamura et al. (2013), treating *Youngia japonica* subsp. *formosana* as a synonym of *Y. japonica* subsp. *japonica*, and have retained *Y. japonica* subsp. *elstonii*, continuing to treat *Y. pseudosenecio* as a synonym of it (Royal Botanical Gardens, Kew 2026b). As these are matters beyond the scope of this paper we have elected to follow this treatment of *Youngia japonica*.

Globally, only *Y. japonica* subsp. *japonica* is considered weedy (e.g., Kalamian & Marble 2023), having spread pantropically as a coloniser of disturbed ground, while *Y. japonica* subsp. *elstonii* and *Y. japonica* subsp. *monticola* remain restricted to their indigenous ranges and are not known to be invasive. The species has become widely naturalised in tropical and subtropical regions where it is a known coloniser of human-modified landscapes (Cen et al., 2025), particularly disturbed soils, roadsides and urban wastelands (Institute of Pacific Islands Forestry 2026). Its lightweight cypselae with a pappus enable long-distance dispersal by wind (anemochory). Despite these invasive traits, *Youngia japonica* is also edible; the young leaves are eaten cooked or raw as a wild vegetable, and the species has been shown to possess anticancer and antiviral activity (Ooi et al. 2004).

Despite being naturalised across much of the



Figure 1. *Youngia japonica* naturalising on the side of a railway in Kuranda, Queensland, Australia (<https://www.inaturalist.nz/observations/310629018>). Photo: Marley Ford, 14 August 2023.

Pacific, North America, the Caribbean, South America and Africa (Institute of Pacific Islands Forestry 2026; Babcock & Stebbins 1937), *Y. japonica* has not previously been recorded from Aotearoa / New Zealand (hereafter Aotearoa). However, on 11 June 2018 an observation of this species in Aotearoa was made by the senior author (<https://www.inaturalist.nz/observations/13356591>). This observation and subsequent finds prompted this paper, in which we document the discovery of several naturalised populations of *Y. japonica* in Tāmaki Makaurau / Auckland and Te Tai Tokerau / Northland, and provide notes on its ecology, identity and the potential implications of its discovery.

Methods

Samples were collected from sites in Tāmaki Makaurau and Te Tai Tokerau, and voucher specimens were prepared and lodged at the AK, NZFRI and UNITEC (Herbarium codes follow Thiers (2008– onwards)). These herbarium specimens were compared to published taxonomic descriptions of *Youngia japonica* and used to prepare a description of the species for this paper. Time and funding constraints meant that national Cichorieae collections were not examined at other Aotearoa herbaria.

A leaf fragment was removed from a specimen collected at Newmarket (NZFRI 35360) and used for DNA analysis. DNA was isolated using a modified CTAB extraction method (steps 1, 3–7 from Table 1 in Shepherd & McLay 2011). The nuclear ITS region (including the ITS1 and ITS2 spacer regions and the 5.8S rRNA gene) was amplified and sequenced using the ITS1 and ITS4 primers (White at al. 1990), and the chloroplast *trnH-psbA* intergenic spacer was amplified and sequenced with the psbAF (Sang et al. 1997) and trnH (Tate 2002) primers.

Loci were PCR amplified in 12 µl reactions containing 1× Mytaq reagent buffer (Bioline, Australia), 5 rmol of each primer, and 0.04 µg bovine serum albumin (BSA) and 0.1 M betaine. Thermocycling conditions for the ITS

region were: an initial denaturation step of 95 °C for 2 min., followed by 40 cycles of 95 °C for 20 seconds, 54 °C for 20 seconds and 72 °C for 30 seconds, then a final extension time of 72 °C for 5 min. For the *trnH-psbA* intergenic spacer, PCR thermocycling followed the ‘slow and cold’ conditions from Shaw et al. (2007). PCR products were purified by digestion with 0.5 U shrimp alkaline phosphatase (rSAP: New England Biolabs, Massachusetts, USA) and 2.5 U exonuclease I (Exol: New England Biolabs, Massachusetts, USA) at 37 °C for 15 min., followed by inactivation of the enzymes at 80 °C for 15 min. DNA sequencing was performed in both directions by capillary separation on an ABI 3730xl at Macrogen (Samsung, Seoul, South Korea). Sequences were edited in Sequencher 5.4.6 (Gene Codes Corporation, Ann Arbor, MI, USA).

GenBank BLAST searches (Altschul et al. 1990) of the newly generated sequences matched *Youngia japonica*, therefore all provenanced sequences of this taxon were downloaded for each locus and aligned with MAFFT 1.5.0 (Kato & Standley 2013) in Geneious Prime 2024.0.7 (<https://www.geneious.com>) using the default settings. Phylogenetic analyses were performed using the PhyML v.3.0 web server (<http://www.atgc-montpellier.fr/phyml>) (Guindon et al. 2010) with maximum likelihood (ML), and MrBayes v.3.2.7 (Huelsenbeck & Ronquist 2001) for Bayesian inference (BI). The ML analyses used a

Table 1. Comparative morphology of *Mycelis muralis*, *Lapsana communis* and *Youngia japonica*.

Character	<i>Mycelis muralis</i>	<i>Lapsana communis</i>	<i>Youngia japonica</i>
Subtribe	Lactucinae	Cichoriinae	Crepidinae
Habit	Perennial herb, 30–100 cm	Annual herb, 20–100 cm	Annual to biennial herb, 8–100 cm
Leaves	Basal rosette present but early-withering; cauline leaves alternate, clasping, glabrous	Basal and cauline leaves present, alternate, ovate, hairy	Basal rosette persistent, lyrate pinnatifid; cauline leaves alternate, few (1–5) or absent
Involucre height	5–8 mm	4–6 mm, inner involucre bracts enlarging and enclosing achenes in fruit	5.0–7.6 mm
Florets per capitulum	5	8–20	10–20
Achene shape	Oblong, compressed, ribbed, short-beaked	Ellipsoid to oblong, laterally compressed, smooth, not beaked	Fusiform, terete, longitudinal ribs, apically attenuate, not beaked
Achene length	3–4 mm	3–4 mm	1.5–2.5 mm
Pappus	Present; free, soft bristles in two unequal series (inner 5–6 mm, outer minute), easily detached	Absent	Present; bristles basally connate into a ring, persistent, 2.5–3.5 mm

K80 + I model of sequence evolution with proportion of invariable sites = 0.727 for ITS and HKY85 for *psbA-trnH*, as identified by Smart Model Selection (Lefort et al. 2017) with the Akaike information criterion, subtree pruning–regrafting branch swapping and 10 random starting trees, and branch support was assessed with 1000 transfer bootstrap pseudoreplicates. For BI, two concurrent analyses were run, each with four Markov chains of 10 million generations that were sampled every 1000 generations, and with $nst = 6$, rates = invgamma and the default priors. Tracer v.1.7.1 (Rambaut et al. 2018) was used to assess stationarity, with the first 10% of samples discarded as ‘burn-in’. Phylogenetic trees were outgroup rooted on *Youngia heterophylla* (Hemsl.) Babc. & Stebbins.

Results

Generic differentiation of *Mycelis muralis*, *Lapsana communis* and *Youngia japonica* (Asteraceae: Cichorieae)

In Aotearoa *Mycelis muralis* (L.) Dumort., *Lapsana communis* L. and *Youngia japonica* are superficially similar yellow-flowered, milky-latex species within tribe Cichorieae Lam. & DC., but occupy different subtribes (Lactucinae Cass. ex Dumort., Cichoriinae Cass. and Crepidinae Cass., respectively). These species are readily separated on achene and pappus morphology, the most reliable diagnostic characters across the tribe (Shi et al. 2011; Barkley et al. 2006). *Mycelis muralis* is most often confused with *Youngia japonica*, from which it is segregated principally for achene and pappus differences; *Lapsana communis* is distinguished from all other species treated here by its complete absence of



Figure 2. *Youngia japonica* achene with pappus from specimen NZFRI 35360. Photo: Marley Ford, 29 September 2025.

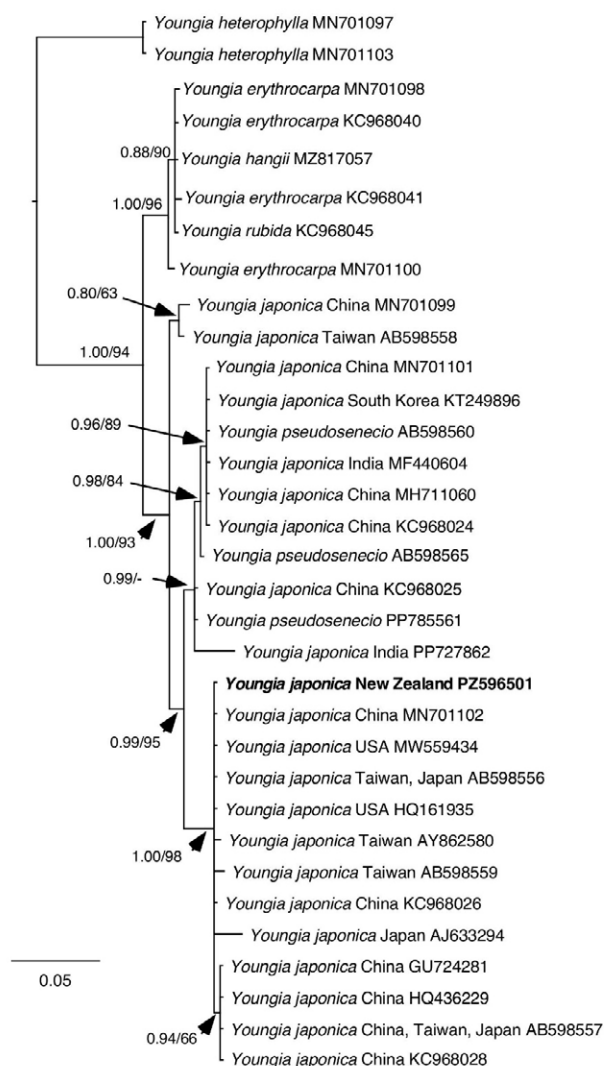


Figure 3. Bayesian phylogeny of the ITS locus of *Youngia japonica*. Support values for branches are given in the order of posterior probabilities for the Bayesian inference/maximum likelihood bootstrap support.

a pappus; and *Youngia japonica* is separated from allied species by achene apex shape and the basally connate pappus bristles (Figure 2) (Shi et al. 2011).

Based on field observations and herbarium examination, the Aotearoa populations of *Youngia* conform to the morphological description of the species *Y. japonica* and subsp. *japonica*; this identification was confirmed by DNA sequencing. The ITS region sequence (GenBank Accession PZ596501) of the Aotearoa specimen was identical to GenBank sequences of *Youngia japonica* from China, Taiwan, Japan and the USA. The alignment of the newly generated ITS sequence to those of *Y. japonica* with known provenance and other *Youngia* taxa was 757 base pairs (bp) in length and contained 93

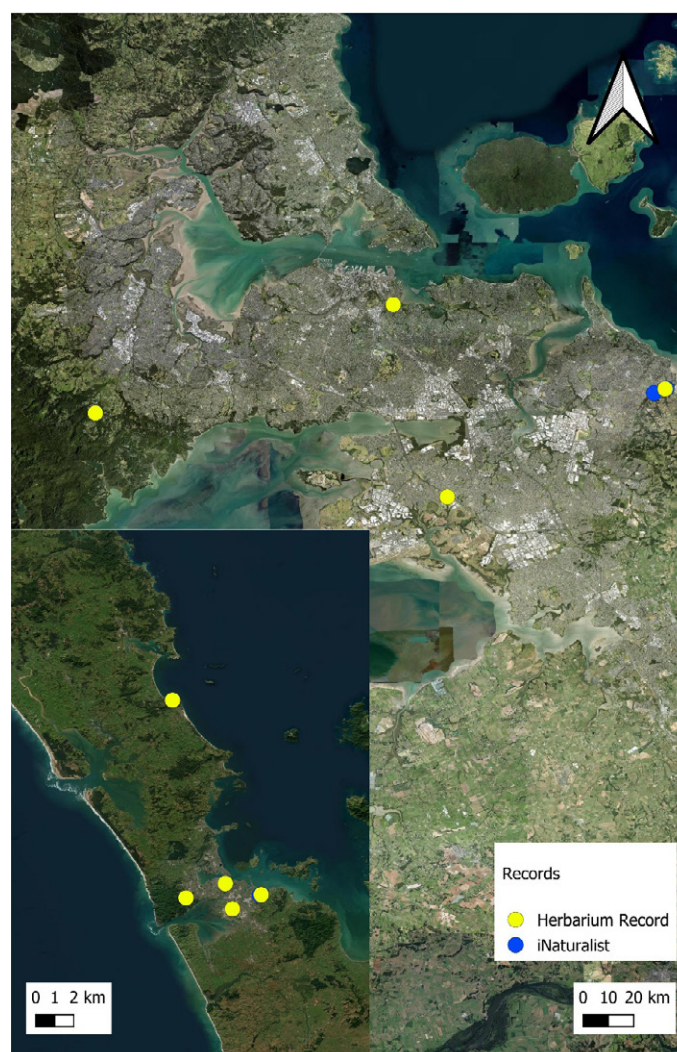


Figure 4. Distribution map of *Youngia japonica* in Aotearoa / New Zealand, based on herbarium specimen records and redeterminations (yellow), and iNaturalist observations (blue). The larger map shows the distribution in the Tāmaki Makaurau / Auckland region, while the inset map shows the broader distribution in northern Aotearoa / New Zealand. Map created using QGIS Desktop 3.34.13 with Esri WorldImagery basemap.

variable sites, of which 82 were parsimony-informative. In both the BI and ML ITS phylogenies (Figure 3) the Aotearoa sequence was in a strongly supported clade of *Y. japonica* sequences (0.98 ML BS, 1.00 BI PP).

The *trnH-psbA* intergenic spacer sequence (GenBank Accession PZ618382) of NZFRI 35360 was identical to sequences of *Y. japonica* on GenBank from China, USA and Mexico. The alignment was 455 bp in length and contained 9 variable sites, of which 7 were parsimony-informative. The *trnH-psbA* phylogeny (not shown) was largely unresolved.

Location of newly discovered populations

A distribution map for the species was prepared based on Aotearoa records from herbarium specimens and records posted on iNaturalist NZ (<https://www.inaturalist.nz/home>) (Figure 4). Two distinct populations are noted in the distribution of *Y. japonica* in Aotearoa: the first in Tāmaki Makaurau, where four subpopulations are recorded spread across the city, and a second in Te Tai Tokerau, comprising two subpopulations, Kaiwaka and Mangawhai. Two of the Tāmaki Makaurau specimens were associated with nurseries, growing in nursery stock (P.J. de Lange 15919 & T.J.P. de Lange, UNITEC 15506; M. Ford MF 3789, UNITEC 15634), while the other two were growing along paths in urban reserves. One of the Te Tai Tokerau sites was associated with a Kaiwaka nursery, where seedlings were growing in potting medium alongside juvenile pukatea (*Laurelia novae-zelandiae* A.Cunn.). At this site specimens flowered and produced seed throughout autumn and into winter 2026, and were subsequently removed to prevent further naturalisation. The second Te Tai Tokerau site was associated with cultivated, recently planted (2025) *Pimelea* Sol. & Banks ex Gaertn., grown as part of infrastructure upgrades in Mangawhai from a separate Kaiwaka nursery.

Discussion

The discovery of *Youngia japonica* in Tāmaki Makaurau and Te Tai Tokerau represents a new naturalisation event for Aotearoa, and overseas experience suggests this species has the potential to become a persistent and expanding weed in this country. In the southern United States, the species is reported to be spreading rapidly and increasingly colonising minimally disturbed natural areas, rather than remaining confined to roadsides and other disturbed ground (Weakley & Southeastern Flora Team 2026). This suggests that, given sufficient time and propagule pressure, populations currently restricted to nurseries and urban infrastructure in Aotearoa could similarly expand into semi-natural habitats. Comparable distributional data for Australia are limited, but available records indicate the species is well established along the eastern seaboard, with a long-standing presence in Queensland and New South Wales (Zich et al. 2020; Royal Botanic Gardens and Domain Trust 2026), and more recent records suggesting range expansion into Victoria and Western Australia (PERTH 8383537) (<https://www.inaturalist.nz/observations?nelat=-31.70965235&nelng=152.23708942&subview=map&swlat=-39.351450323>

&swlng=142.832792545&taxon_id=127066).

The occurrence of *Y. japonica* in Aotearoa represents a notable range extension into the southwestern Pacific, as it is the southern end of its range. Given the species' extensive global spread and its established, expanding presence in Australia and Oceania (e.g., Whistler 1988), recent arrival is plausible, most likely via accidental introduction associated with horticultural imports, contaminated soil on machinery, or long-distance wind dispersal from Australia.

The Aotearoa records are localised in urban areas around Tāmaki Makaurau or in Te Tai Tokerau, suggesting that long-distance wind dispersal from Australia is unlikely as the primary introduction pathway. Wind-dispersed arrivals in Aotearoa follow well-established pathways of wind movement from Australia, with landfalls anticipated in northern Te Tai Tokerau, Taranaki and Te Moana-o-Raukawa / the Cook Strait Region (Graham 1976; Raven & Raven 1976; Webb 1989; de Lange & Molloy 1995; de Lange & Crowcroft 1997; Fraser 1996; Fraser 2008), establishing opportunistically in these locations across a broader range of habitats, including semi-natural and rural sites distant from human activity, rather than clustering tightly around nurseries and other horticultural infrastructure. The consistent association of Aotearoa records with nurseries and recently disturbed or planted urban sites instead points to human-mediated introduction, most plausibly via contaminated nursery stock or potting medium, as the more likely pathway.

Coco peat (coir), widely used as a nursery growing medium, has previously been identified as a vector for weed-seed contamination in Aotearoa: a 2008 biosecurity breach traced coco peat imported from Sri Lanka to at least 44 contaminant plant species across several Aotearoa nurseries, with Te Tai Tokerau and Tāmaki Makaurau identified among the most affected regions (James et al. 2012). The implications of these naturalisations was explored in detail by Ogle et al. (2020). Several other naturalised species now locally established or widespread in northern Aotearoa are clearly derived from this potting medium, and one of these, *Veronica javanica* Blume (Ogle et al. 2020), is commonly associated with *Youngia* in nurseries and coco peat potting medium. Seed contamination of nursery potting medium containing coco peat provides the most plausible mechanism whereby *Y. japonica* has arrived in Aotearoa from producers in localities such as India and Sri Lanka.

Given the limited genetic variation and shared sequences between countries at the ITS and *psbA*-

trnH loci, a different approach is required to accurately infer invasion pathways of this species. The nuclear target–capture approach previously used to investigate the invasion history of the spread of the invasive fireweed complex (*Senecio inaequidens* DC.–*Senecio madagascariensis* Poir.) (Schmidt-Lebuhn et al. 2025) or a genotyping-by-sequencing approach (Elshire et al. 2011) would be more suitable; however, it would need to be combined with more comprehensive geographical sampling, including samples from Australia and Oceania.

Cen et al. (2025) found that both intensity and duration of urbanisation shape how *Youngia japonica* grows and behaves. Plants in long-urbanised areas become bigger and more competitive, while ones in recently urbanised sites stay smaller and focus on quick reproduction. These differences are not just the plant responding to its surroundings; they still show up when plants are grown in the same garden, which means urbanisation could be driving genetic change in the species over time.

The discovery of *Youngia japonica* in Aotearoa adds another genus and species to the ever-expanding naturalised vascular flora and raises biosecurity questions, flagging the need for controls on imported potting media such as coco peat. Given the weedy behaviour and rapid spread of *Youngia* in other naturalised regions, monitoring of known populations and targeted surveys of similar habitats are recommended to evaluate spread dynamics and potential ecological and biosecurity impacts.

Taxonomy

***Youngia japonica* (L.) DC.**, *Prod.* 7: 194, 1838.

Description (adapted from Babcock & Stebbins 1937): Annual herb, 8–100 cm tall, highly variable in form. Caudex narrow and leafy. Basal leaves oblanceolate, obtuse to acute, lyrate-pinnatifid, lighter green abaxially than adaxially and elliptic, ovate, obovate or oblong–truncate in shape; lateral laminal lobes few to numerous, sometimes gradually reduced or absent; petioles short to long, narrowly to obscurely winged, broadening at the base; indumentum ranging from glabrous to densely pubescent, hairs short or long, piliform, often becoming crinkled and brown on drying. Stems 1–6, erect, slender to robust, terete, hollow, glabrous to puberulent or tomentose near the base, branching paniculately from near the base or above the middle into loose, many-headed, cymose–corymbose

arrays. Peduncles 2–10(–15) mm long, filiform. Heads erect, (5.0–)6.0(–7.6) mm, with 10–20 florets. Involucre cylindric before anthesis, becoming campanulate in fruit, outer involucre bracts glabrous, inner bracts hairy adaxially; outer involucre bracts ~5, triangular to ovate, acute, pale; inner bracts ~8, lanceolate, acute to obtuse, often scarious-margined, pubescent within with appressed shining hairs, becoming thickened along the keel and reflexed at the base as the fruit matures. Receptacle naked, areolate. Florets yellow, the ligule occasionally tinged purple; anther tube dark green; style and style branches yellow. Achenes light brown to dark reddish brown, 1.5–2.5 mm long, slightly compressed, fusiform, tapering more strongly toward the apex, the pappus disk slightly expanded, the base narrowed and lightly calloused; 11–13-ribbed, with 2–4 ribs more prominent, finely spiculate. Pappus white, 2.5–3.5 mm long, in a single series, fine, extremely finely barbellate, soft, persistent, slightly exceeding the involucre. It has been observed flowering in Aotearoa throughout the year.

Distribution: Native to Japan and Korea to western China and Indochina; Malay Peninsula to north-western India; Philippines and Malay Archipelago. Introduced in scattered locations across the tropics and subtropics, including the south-eastern United States, Mexico and Central America, the Caribbean, northern South America (Colombia, Guyana, Paraguay, Venezuela), Macaronesia (Canary Islands, Madeira) and the western Indian Ocean islands (Madagascar, Mauritius, Réunion, Seychelles, Comoros), KwaZulu–Natal in South Africa, southern Europe (Sicily), Australia and the Pacific Islands, and Aotearoa (Figure 4).

Specimens seen: AOTEAROA / NEW ZEALAND: Te Ika-a-Māui / North Island: Māngere, Roger Hunter's Garden Centre, *P.J. de Lange* 15919 & *T.J.P. de Lange*, 4 Feb 2024, UNITEC 15506; Newmarket, *Y. Dorsman s.n.*, 9 Oct 2025, NZFRI 35360; Oratia, *M. Ford* MF 3789, 27 Jan 2026, UNITEC 15634 (Duplicate: AK); Roger Hunter's Garden Centre, *P.J. de Lange* 15927 & *T.J.P. de Lange*, 15 Aug 2026, UNITEC 15656 (Duplicates: AK, WELT).

Ecology: Plants associated with nursery stock and recently planted nursery plants have been noted growing in and around potted plants, usually with *Epilobium ciliatum* Raf., *Solanum nigrum* L., *Sonchus oleraceus* L. and *Veronica javanica*. Outside these areas in urban locations, *Youngia* has been found along urban tracksides with *Lapsana communis* L. *Cyperus* L. and the moss *Eurhynchium praelongum* (Hedw.) Schimp. In all of these habitats *Youngia* seems to have a preference for

shaded sites or conditions where the ground is almost perpetually moist.

Author Contributions

Marley Ford: Conceptualisation (lead); investigation (lead); project administration (lead); supervision (lead); data curation (lead); validation (lead); writing – original draft preparation (lead); writing – review and editing (lead); figures (lead).

Yannick Dorsman: Investigation (equal); writing – review and editing.

Jack Warden: Investigation (equal); writing – review and editing.

Lara Shepherd: Investigation; writing – review and editing.

Peter de Lange: Investigation; data curation (lead); writing – review and editing.

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