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Lectotypification of *Atriplex stipitata* Benth. (Chenopodiaceae) and recognition of a new subspecies

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Introduction

Atriplex stipitata Benth. is a widespread member of *Atriplex* Section *Dialysex* Moq. It occurs in all mainland states. Plants are generally low, shrubby, predominantly dioecious perennials. The species has very distinctive reniform fruiting bracteoles with a prominent stipe, leading to its common name of Kidney Saltbush. It is readily identified when fruit are available, and the reliance on fruit characters alone appears to have led to a simplistic appreciation of the species. Observations of specimens identified as *Atriplex stipitata* in the field and herbarium suggest the existence of two distinct taxa. As represented by the type, *A. stipitata* is a relatively sturdy, spreading-erect perennial shrub with relatively broad leaves and stems. The other putative taxon is a gracile, erect and probably rather short-lived shrub typically with narrow leaves and fine branches. Closer examination shows that the gracile form is monoecious, whereas the type form is dioecious or, in very few cases, monoecious but then with male and female inflorescences distinctly separated on plants. The gracile form has inflorescences with female flowers mixed with males in glomerules along the axes of the inflorescences or, sometimes, 1–few in leaf axils below the inflorescence. The gracile form is accordingly described here as a new subspecies.

Bentham (1870) cited a number of specimens in the protologue for *Atriplex stipitata* but neither he, nor Aellen (1937, 1938) or Wilson (1984) nominated an individual type for the species. As far as can be ascertained

Abstract

A new subspecies of *Atriplex stipitata* Benth is described and its distribution and habitat provided. At the broad scale it is largely co-extensive with the type subspecies, but there is currently no evidence of the two being sympatric. The new subspecies is apparently very rare in the Western Australia. A lectotype is chosen for *A. stipitata*.

Keywords: Kidney saltbush; *Atriplex miscella*; monoecious; revegetation.

from images available on JSTOR (2019) and those at MEL, each of the collections appear to represent the typical subspecies. In order to avoid any chance of ambiguity about the application of the name, the opportunity is taken here to lectotypify *A. stipitata*.

Results and Discussion

Taxonomy

Atriplex stipitata Benth., *Fl. Austral.* 5: 168 (1870).

Type: AUSTRALIA. "N.S. Wales. Desert of the Darling, Victorian Expedition, Mrs Ford; also in Leichhardt's collection. **Victoria.** In the N.W. portion of the colony, L. Morton (the specimen not in fruit and therefore doubtful). **S. Australia.** Murray scrub, Behr., F. Mueller; Gawler's range, Sullivan; towards Spencer's Gulf, Warburton."

LECTOTYPE (here designated): East Australia [New South Wales], F.W.L. Leichhardt *s.n.* (MEL 0607137 !); REMAINING SYNTYPES: New South Wales: Duroodoo, Vict. Expl. Exped. [Victorian Exploring Expedition], *H. Beckler s.n.*, 27 Dec. 1860 (K 000898568, image seen); Vict. Exped [Victorian Exploring Expedition], *H. Beckler s.n.*, 13.ii.1861 (MEL 607144 !); Darling Desert, F. Mueller *s.n.* 1869 (K 000898569, image seen); Darling Desert, *H. Beckler s.n.* (MEL 607138 !, 607143 !); Wentworth, Darling River, *Mrs Forde s.n.* (MEL 607139 !). South Australia: Gawler Range, *Dr Sullivan s.n.* (MEL 606994 !); Murray Scrub, *H.H.Behr*, March 1849 (MEL 607142!); Murray Desert in S. Austr., *F. Mueller s.n.*, 1848 (MEL 607145 !). Victoria: N.W. Victoria, *L. Morton s.n.* (MEL 607140 !).

Non *Atriplex stipitata* Westerl., *Linnaea* 40; 165 (1876) nom. illeg.

Typification: Type material at K, from which a lectotype might be expected to be chosen, consists of 3 collections mounted on the one sheet (Darling Desert; Duroodoo, Victorian Exploring Expedition; Murray Scrub). All are dated 1869, which is presumably the date of receipt or examination of the material by Bentham, and the only apparent collector's name is F. Mueller. Mueller certainly did not collect either the Darling Desert or the Duroodoo specimens (both Beckler collections), and the 'Murray Scrub' collection could be either Mueller's or Behr's. Of these three specimens, only one, 'Murray Scrub', includes the characteristic fruits of *A. stipitata* which would desirably be a part of a type. Two sheets labelled 'Murray Scrub', one collected each by Mueller

and Behr, are at MEL. The Behr sheet includes a few ripe fruits in a packet, but most of the mounted twigs are of male inflorescences. It is almost certain that this sheet represents gatherings from more than one plant. The Warburton 'toward Spencers Gulf' sheet (MEL 607136) is sterile and has been redetermined as *A. vesicaria* Heward ex Benth. (G.A. Parr-Smith *in sched.*). The Morton collection 'N.W. Victoria', as noted by Bentham in the protologue, is sterile but vegetatively resembles *A. stipitata* subsp. *stipitata*. It is tentatively included amongst the syntypes. All other syntypes at MEL (marked to indicate that Bentham had seen them), with the exception of the Leichhardt collection are, surprisingly, of male plants, or of mixed collections containing branchlets from male and female plants. The Leichhardt sheet (MEL 0607137) is unambiguously from a single branchlet bearing mature and immature fruits. As there seems to be no uncertainty about the provenance of this specimen and it displays well the characteristic fruits of *A. stipitata*, it is here chosen as the lectotype (Figure 1).

Atriplex stipitata Westerl. is a later homonym (Westerlund 1876), apparently representing a hybrid between the northern European *A. longipes* Drejer. subsp. *longipes* and *A. prostrata* DC. subsp. *calotheca* (Raf.) M.A.Gust.(Rafin.) M. Gust. (fide M. Gustaffston 1990, *in sched.* LUND 1224615).

Atriplex stipitata subsp. *miscella* N.G.Walsh & I.R.K.Sluiter subsp. nov.

Type: AUSTRALIA. Murray Sunset National Park, Henschke Tk, ca. 100 m E from its junction with Midnight Tank Tk., 24.xi.2011, N.G. Walsh 7483, J.L. Birch, C.L. Gallagher, S. Stewart (holotype: MEL 2357412; isotypes: AD, NSW).

Differs from the type subspecies in having generally narrower leaves, finer stems, an erect, upright habit and in having female flowers mixed within the males, or sometimes the females solitary, or rarely a few in leaf axils below the main inflorescence, not in unisexual terminal spicate inflorescences as in the type subspecies.

Sparse, twiggy, more or less erect shrub to ca. 60(–100) cm high. Stems rather fine, those of the inflorescence axis ca. 3 nodes from tip usually <0.5 mm diam. Leaves narrowly oblong to (usually narrowly) elliptic, (4–)7–20(–27) mm long, 1.5–4.5(–10) mm wide, length-width ratio (2–)3.5–4.5(–5.5). Inflorescences simple or sparingly branched



Figure 1. *Atriplex stipitata* lectotype (MEL 607137).



NATIONAL HERBARIUM OF VICTORIA (MEL)
A. stipitata Benth. subsp. *miscella* N.G. Walsh & Sluiter
Determinavit: N.G. Walsh 21.vi.2019
HOLOTYPE

NATIONAL HERBARIUM OF VICTORIA (MEL)
MELBOURNE, AUSTRALIA

MEL 2357412

Atriplex stipitata Benth.
Det.: Walsh, N.G., 24 Nov. 2011
Coll.: Walsh, N.G. 7483 Date: 24 Nov. 2011
Addit. Coll.: Birch, J.L., Gallagher, C., Stewart, S.
Collecting trip: National Herbarium of Victoria Field Trip 2011 (22-25 Nov. 2011).
Australia: Victoria
Loc.: Murray Sunset National Park, Henschke Tk, c. 100 m E from its junction with Midnight Tank Tk. 34° 34' 27" S 141° 56' 41" E. Alt.: 40 m.
Habitat: Treeless subsaline depression surrounded by chenopod-mallee woodland.
Associated taxa: *Atriplex acutilibractea*, *A. eardleyae*, *Angianthus tomentosus*, *Osteocarpum acropterum*, *Sclerochlamys brachyptera*.
Descriptive notes: Delicate twiggly subshrub, c. 50 cm high.
Collecting notes: Locally common.
Dupl.: AD, NSW

Main collection: D. Dicotls - 070. Chenopodiaceae (5. Australasia)
Printed from MELISRS, 21 Mar. 2012

NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 2. *Atriplex stipitata* subsp. *miscella* holotype (MEL 2357412).

spikes; flowers clustered in more or less spherical glomerules to ca. 2 mm diam., each usually comprising mostly male and 1-several female flowers, occasionally female flowers 1–few in leaf axils below the main inflorescence. Male perianth ca. 1 mm long, dehisced anthers mostly ca. 3 mm wide. Fruiting bracteoles stipitate, the stipe-like portion ca. 4–9 mm long, the reniform bracteoles (4–)5–6(–7) mm long, (5–)7–9(–11) mm wide, apex usually somewhat pointed, at least when immature, margins entire (Figures 2, 3).

Selected specimens (from ca. 80 examined): WESTERN AUSTRALIA. Adjacent to Wattoning Reserve, *B.J. Lepschi 3373* & *T. Lally*, 8.ii.1997 (AD, CANB, PERTH). **NORTHERN TERRITORY.** Simpsons Gap N.P., *P.K. Latz 8546*, 24.xi.1980; 10 km N of Kulgera, *C. Lendon 37*, 10.iv.1973 (AD, NT). **SOUTH AUSTRALIA.** 10 km E of Mintabie, *P.K. Latz 25209*, 10.iii.2010 (AD, NT); 27 km W of Balcoonoona, *S.W.L. Jacobs 3631*, 19.v.1979 (AD, NSW); Dangali Conservation Park, *K.P. Nicolson & D.E. Peacock BS24-52941*, 12.vii.1991 (AD). **QUEENSLAND.** Wittenburra Stn, 36 miles [ca. 58 km] S of Eulo, *L.S. Smith 66*, 7.i.1937 (BRI); The Bluff, E of Yowah, *J.L. Silcock 788*, 18.ii.2011 (BRI). **NEW SOUTH WALES.** Caradoc Stn 25 km N of White Cliffs, *J. Piggins s.n.* ix.1993 (CANB); Byrock Rd, Bourke, *E.J. McBarron 18508*, 15.xi.1969

(NSW); Boppy Mountain, 25 miles [40 km] E of Cobar on Barrier Highway, *C.W.E. Moore 5663*, 19.vi.1970 (CANB, NSW); ca. 15 miles [24 km] W of Louth, *C.W.E. Moore 5646*, 11. Xi.1969 (CANB, NSW). **VICTORIA.** Near Lindsay Point (industrial area), *V. Stajsic 7091* & *J.A. Jeanes*, 20.xi.2013 (MEL); Hattah Kulkyne National Park, Mournpall Block, *I.R.K. Sluiter 8*, 2.xii.1991 (MEL).

Distribution: From more than 500 herbarium specimens examined, some observations of the relative abundance of the two subspecies may be made. In Western Australia, subsp. *miscella* is apparently rare and currently known only from a single collection ca. 80 km N of Merredin (Lepschi 3373) while subsp. *stipitata* is moderately common in inland areas of the south-west. In southern parts of the Northern Territory, both subspecies are present, but based on specimens at NT, subsp. *miscella* appears to be the commoner (P. Jobson pers. comm.). In South Australia, subsp. *miscella* is locally common in the North-West, the Flinders Ranges, and the Murray Mallee regions, while subsp. *stipitata* occurs in all regions except the South-East and Kangaroo Island. The species is relatively rare in Queensland (only 8 specimens represented in Australian herbaria, all from the Warrego Pastoral District) where both subspecies occur, with subsp. *miscella* apparently more common.



Figure 3. *Atriplex stipitata* subsp. *miscella* habit, Yarrara Flora and Fauna Reserve, NW Victoria (*N.G. Walsh 7423*, 22.xi.2011, MEL 2357284) (image N.G. Walsh).

In the species' range through western New South Wales, the two subspecies are similarly dispersed but subsp. *miscella* is more abundantly represented in herbaria. In Victoria, subsp. *miscella* is restricted to the far north-west while subsp. *stipitata* occurs there and has a remarkable disjunct occurrence near Bacchus Marsh (ca. 50 km NW of Melbourne) (Figure 4).

Habitat: Generally found on soils with topsoil textures of sandy clay loam, light sandy clay loam or sandy loam, occasionally including some limestone nodules or other stones or rock. Collectors' notes indicate that occupied landforms include 'swale between dunes', 'creek bank', 'stony flats and outwash plains', 'on dry stony, pebbly ridges', 'stony slope', 'flat plain'. It is often recorded as a member of open woodland communities with trees including *Acacia aneura* Benth., *A. excelsa* Benth., *A. Ioderi* Maiden, *Alectryon oleifolius* (Desf.) S.T.Reynolds, *Callitris* sp., *Eucalyptus intertexta* R.T.Baker, *E. populnea* F.Muell., *Flindersia maculosa* (Lindl.) Benth. These associations do not indicate a vast ecological difference between the two subspecies, but collectors' notes on specimens of subsp. *stipitata* suggest perhaps that it has a stronger affinity with saline soils (tending to clay loam), less of a tendency to be associated with woodlands and more often a component of mixed chenopod shrublands.

Etymology: The epithet, *miscella*, is from Latin,

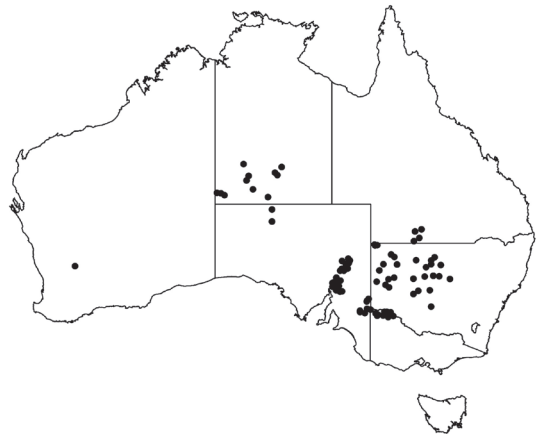


Figure 4. *Atriplex stipitata* subsp. *miscella* distribution (from herbarium specimens at AD, CANB, MEL, NSW, SA, PERTH).

meaning mixed, a reference to the mixed male and female flowers in glomerules of the inflorescence.

Notes: In general, the habit of subsp. *miscella* is more upright, twiggy with finer stems and sparser-leaved than that of subsp. *stipitata* (Figure 5). Notes on specimens indicate that subsp. *stipitata* is not infrequently 1 m high or more and often wider than high whereas subsp. *miscella* is generally described on collecting notes as growing to ca. 60 cm high and not wider than this. The leaves are typically narrower than those of subsp. *stipitata*



Figure 5. *Atriplex stipitata* subsp. *stipitata* habit, ca. 33 km SW of Pooncarie, SW New South Wales (I.R.K. Sluiter s.n., 17.ix.2015, MEL 2407046). The quadrat frame is 1 x 1 m (image I.R.K. Sluiter).

with length-width ratio (2–)3.5–4.5(–5.5) while those of subsp. *stipitata* have length-width ratio of 1.5–2.5(–3) and are up to 30 mm long and 14 mm wide.

The inflorescences of subsp. *miscella* are simple or may be few-branched with more-or-less spherical glomerules about 2 mm diam. The male inflorescences of subsp. *stipitata* are often many-branched with glomerules about 3 mm diam. and those of short lateral branches very crowded such that they appear to be cylindrical spikes to ca. 1 cm long (Figure 6). In both subspecies, female flowers may be in axils of leaves subtending the main part of the inflorescence, or in subsp. *stipitata*, in female-only glomerules in few-branched inflorescences (Figure 7). In very few instances (<1% of all specimens examined) subsp. *stipitata* may have a very few female flowers in otherwise male inflorescences. Limited observation indicates the anthers of subsp. *miscella* are smaller than those of subsp. *stipitata* (0.3 mm wide when dehisced vs 0.5 mm wide respectively). The fruiting bracteoles of both subspecies are similar, but those of subsp. *stipitata* may be slightly larger and up to 12 mm wide. The apices of the fruiting bracteoles of subsp. *miscella* are often obtusely angled rather than the more typically rounded shape of subsp. *stipitata*, a character which is particularly apparent when the fruits are immature with the margins entire, while those of subsp. *stipitata* are often erose-crenate. The seeds of both subspecies appear identical.

It could be interpreted that the significant differences between subsp. *stipitata* and subsp. *miscella* in habit, floral sex distribution and, to some extent habitat, warrant the recognition of subsp. *miscella* at species rank. This option has not been taken here mainly due to the historical primacy in *Atriplex* taxonomy, at least in Australia, of the form of the fruiting bracteoles in establishing species boundaries. To date, no distinguishing features of the fruiting bracteoles have been detected that allow reliable assignment to either taxon, although a slight difference in marginal features (as noted above) can be suggestive of one or the other. The dioecy/monoecy distinction is persuasive, but in both subspecies there are a few specimens that display a slight deviation from either state, so this cannot be used as an absolute trait to separate the two taxa. Further studies (e.g. cytological, molecular) may indicate elevation to species rank is warranted, but on the basis

of current knowledge, subspecies rank is considered to be appropriate for the new taxon.

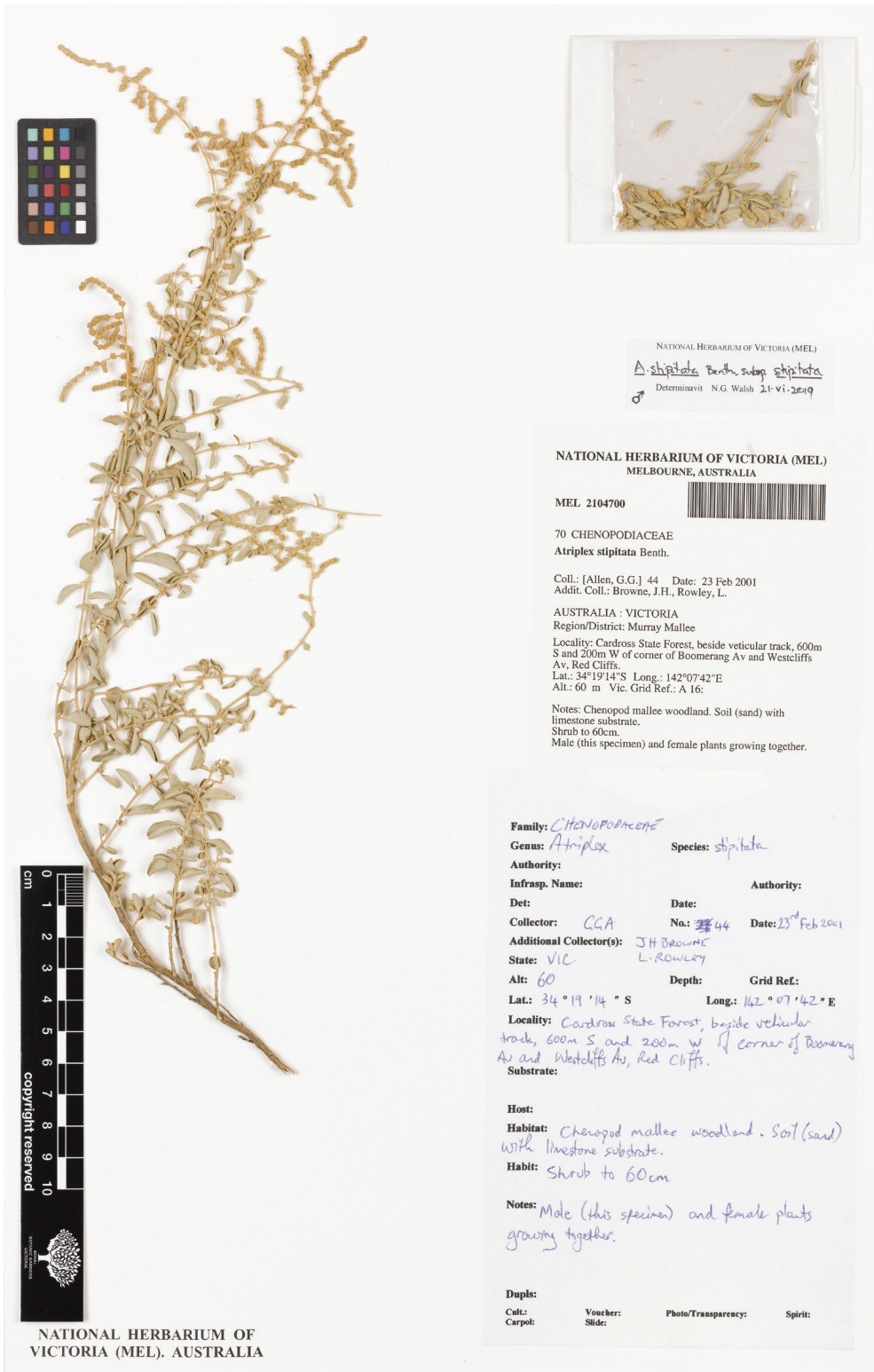
The distinctness of the new subspecies was first suspected by one of us (IRKS) when observing a post-mining revegetation plot in far south-west New South Wales. Previous surveys had shown that *Atriplex stipitata* subsp. *miscella* was the local subspecies, but subsp. *stipitata* had been used in the revegetation mix, on the basis of the *species* being local to the area, but from seed collected some 200 km to the south-west, near Blanchetown (SA) where subsp. *stipitata* was fruiting abundantly (subsp. *miscella* rarely produces copious seed). While there has been a wide acceptance of the need to widen genetic diversity in revegetation or translocation endeavours (e.g. following Broadhurst *et al.* 2008), in this case the opportunity to take advantage of a mast fruiting event had resulted in what we believe to be an inappropriate selection for the recipient area. It is recommended that some caution be exercised against roaming too widely to source seed in revegetation work to avoid collection of cryptic, perhaps unrevealed taxa.

Acknowledgements

We are grateful to directors and staff of AD, CANB, NSW and PERTH for access to specimens and preparing loans of specimens, to Kelly Shepherd, Peter Jobson, Jen Silcock and Dave Albrecht for examining specimens on our behalf from PERTH, NT, BRI and CANB respectively, to Alison Vaughan who prepared the distribution map from herbarium records, to Angharad Johnson who photographed the type specimens and to three referees for their helpful comments on the manuscript.

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NATIONAL HERBARIUM OF VICTORIA (MEL)
A. stipitata Benth. subsp. *stipitata*
 Determinavit N.G. Walsh 21-VI-2019
 ♂

NATIONAL HERBARIUM OF VICTORIA (MEL)
 MELBOURNE, AUSTRALIA

MEL 2104700

70 CHENOPODIACEAE
Atriplex stipitata Benth.

Coll.: [Allen, G.G.] 44 Date: 23 Feb 2001
 Addit. Coll.: Browne, J.H., Rowley, L.

AUSTRALIA: VICTORIA
 Region/District: Murray Mallee
 Locality: Cardross State Forest, beside vehicular track, 600m S and 200m W of corner of Boomerang Av and Westcliffs Av, Red Cliffs.
 Lat.: 34°19'14" S Long.: 142°07'42" E
 Alt.: 60 m Vic. Grid Ref.: A 16:

Notes: Chenopod mallee woodland. Soil (sand) with limestone substrate.
 Shrub to 60cm.
 Male (this specimen) and female plants growing together.

Family: *CHENOPODIACEAE*
 Genus: *Atriplex* Species: *stipitata*
 Authority:
 Infrasp. Name: Authority:
 Det: Date:
 Collector: CGA No.: 44 Date: 23rd Feb 2001
 Additional Collector(s): J.H. Browne L. Rowley
 State: VIC
 Alt: 60 Depth: Grid Ref.:
 Lat.: 34° 19' 14" S Long.: 142° 07' 42" E
 Locality: Cardross State Forest, beside vehicular track, 600m S and 200m W of corner of Boomerang Av and Westcliffs Av, Red Cliffs.
 Substrate:
 Host:
 Habitat: Chenopod mallee woodland. Soil (sand) with limestone substrate.
 Habit: Shrub to 60cm
 Notes: Male (this specimen) and female plants growing together.

Dupls:
 Cult: Voucher: Photo/Transparency: Spirit:
 Carpels: Slide:

0 1 2 3 4 5 6 7 8 9 10 cm
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NATIONAL HERBARIUM OF VICTORIA (MEL), AUSTRALIA

Figure 6. *Atriplex stipitata* subsp. *stipitata* specimen, male plant (MEL 2104700).

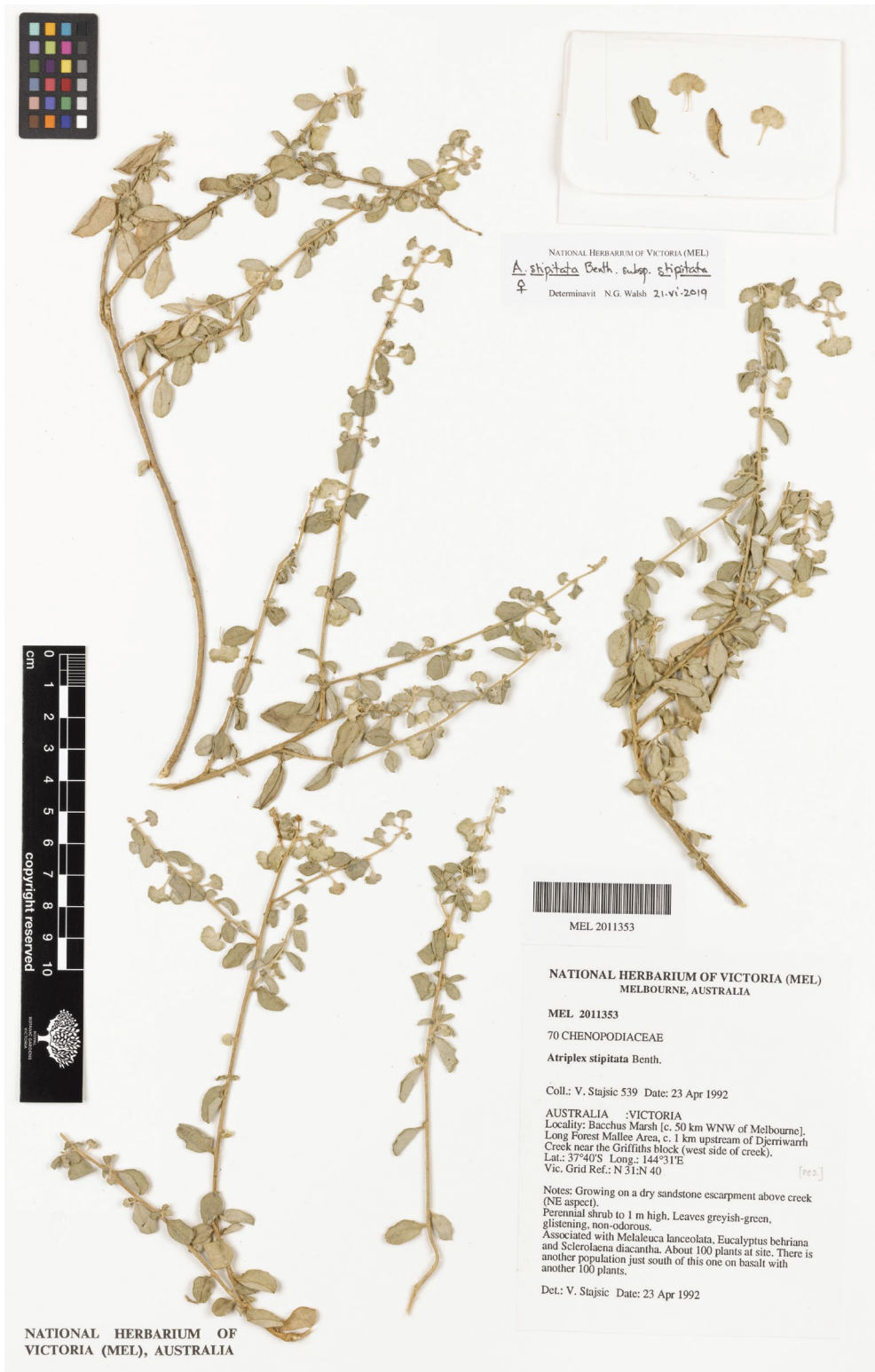


Figure 7. *Atriplex stipitata* subsp. *stipitata* specimen, female plant (MEL 2011353).