

1.0 Organism description

Scientific name

Mollugo nudicaulis Lam., Molluginaceae.

Common names

Daisy-leaved chickweed, naked-stem chickweed, naked-stem carpetweed (Randall 2002, USDA).

Synonyms (Hassan et al. 2005).

Mollugo bellidifolia (Poir.) Ser.

Pharnaceum bellidifolium Poir.

Pharnaceum spathulatum Swartz.

Cultivars, strains, or variants

None found.

Previously recorded in New Zealand

No (Ministry of Agriculture and Forestry, Landcare Research).

2.0 Summary

- The genus *Mollugo* comprises 35 species, found mostly in tropical/warm regions. They have little economic value, although some have been used medicinally or as vegetables. Several are minor weeds overseas.
- *M. nudicaulis* is a small, annual or short-lived perennial, prostrate herb. Its leaves grow in a basal rosette with erect or ascending, branching inflorescences up to 30cm high. Propagation is by seed.
- It grows mostly in tropical/sub-tropical areas, as well as some arid regions.
- Preferred habitats are disturbed, open places such as waste areas, roadsides, river beds, grassland and cultivated land.
- Economic impacts overseas are generally low. Most sources indicate that it is a minor weed of a variety of cultivated crops, mostly in the tropics and sub-tropics. However, it is listed as a quarantine plant in Western Australia due to its weed potential.
- No environmental impacts are known from overseas.

- In New Zealand, it is likely to be restricted to the northern North Island, but it may extend further south through coastal and lowland localities to the top of the South Island. It is possible, but unlikely, that it could also establish in hot, dry parts of New Zealand such as the central South Island.
- Economic impacts are likely to be negligible. It could become a minor weed of cultivated crops and nurseries, and is unlikely to be a problem in pastoral agriculture.
- Unlikely to pose an environmental risk in New Zealand. However, there is a lack of information on its general ecology e.g. seed dispersal, growth rate, reproductive capacity, competitiveness, and potential constraints to spread.

3.0 Basic biology and ecology

3.1 Overseas distribution

- Mostly tropical/sub-tropical, and in some arid regions. Found in Africa and from East Asia to India, Sri Lanka and China. It also occurs in South America, the Caribbean, North America (one record only from Maryland) and New Caledonia.
- Africa (tropical/sub-tropical/arid); Sudan, Egypt, Ivory Coast, Malawi, Mozambique, Zambia, Zimbabwe, Burundi, Central African Republic, Ethiopia, Ghana, Madagascar, Tanzania, Kenya, Uganda and South Africa (Flora Zambesiaca, W³TROPICOS, Hassan et al. 2005).
- East Asia (tropical/sub-tropical/arid); Pakistan [Sindh, Punjab and North West Frontier Province], and Afghanistan (eFlora², eFlora³).
- Asia (tropical/sub-tropical); India, Sri Lanka, and China [Guangdong, Hainan] (eFlora²).
- Arabia (arid); Saudi Arabia, Yemen and Socotra (Miller & Cope 1996).
- South America (tropical/sub-tropical?); listed as present but no further information found (Hassan et al 2005, eFlora³).
- Caribbean (tropical); Cuba, Dominican Republic, Haiti, Puerto Rico, Virgin Islands, Guadeloupe, St. Lucia and St. Martin (USDA, W³TROPICOS).
- North America (sub-tropical or humid-continental); one record only from Maryland, dated 1964 (USDA, eFlora¹).
- Pacific (tropical); New Caledonia (W³TROPICOS).

3.2 Ecology/habitat

- The genus *Mollugo* comprises 35 species, found mostly in tropical/warm regions (Mabberley 1997).
- *M. nudicaulis* is a small, annual or short-lived perennial, prostrate herb. Its leaves grow in a basal rosette with erect or ascending, branching inflorescences up to 30cm high (Hassan et al. 2005, Flora Zambesiaca).
- Found at altitudes of 0-1800m (Hassan et al. 2005).
- Preferred habitats are disturbed, open places such as waste areas, roadsides, river beds and margins, and cultivated land. Also found on seashores, dry stream beds and on sandy plains and grasslands (Hassan et al. 2005, Flora Zambesiaca, eFlora²).
- In southern China it is said to flower and fruit almost year round (eFlora²) while in Nigeria it is present and reproductive only during the wet season from March - November (Marks 1983).
- Propagation is by seed. A small dehiscent capsule contains many, minute (<1.0mm), black seeds covered with many short, hard points (eFlora³). The dry season in the tropics replaces the cold winters of temperate regions as the unfavourable season for germination (Marks 1983).
- No specific information found regarding reproductive capacity, seed ecology or seed bank formation. However, in the glasshouse it had a fast maturity and seed did not appear to have any dormancy as seedlings grew in the pots where seed was set in the same season (James pers. comm.).
- *M. nudicaulis* is a quarantine plant (not approved for entry due to weed potential) in Western Australia (DAF).
- At least two other species in the genus are weedy. *Mollugo cerviana* is a minor weed of sandy places in the tropics and sub-tropics (eFlora¹). *M. verticillata* is a weed in cultivated areas and is listed as a prospective invasive in the Pacific (PIER). It is pan-tropical but also occurs in temperate regions e.g. throughout North America and Canada. In Australia it currently occurs from Queensland to Sydney, with one record in Victoria (AVH).
- The plant is said to be bitter and contains saponosides and traces of alkaloids. Cattle will not graze it in Senegal, but it is taken by sheep (ALUKA). However, it has been used by humans as a vegetable and for medicinal purposes (eFlora¹, Aslam 2006).

4.0 Likelihood of establishment and spread

4.1 Environmental tolerances overseas and comparison with New Zealand

4.1.1 Environmental tolerances overseas

- Mostly tropical or sub-tropical climates with associated high humidity and warm temperatures, and in hot, arid regions such as Saudi Arabia and Yemen. One isolated record is known from sub-tropical or humid-continental North America.
- Arabia (arid); peninsular Arabia typically experiences average daily winter temperatures of 8-20° C, average summer temperatures of 27- 43° C. There is a strong diurnal temperature range, with temperatures dropping rapidly at night, although frosts are very infrequent. Average annual rainfall is about 100mm (World Climate¹).
- China (sub-tropical); climate in the area of the city of Guangzhou, in the southern province of Guangdong, is warm and moist. Mean daily minimum and maximum temperatures are 18.4° C and 26.2° C respectively. Annual rainfall (1700mm) is moderately seasonal with April-September being the wetter months (World Climate²).
- North America (sub-tropical/humid continental); Maryland has a diverse climate ranging from humid sub-tropical in the east to humid-continental in the west. In the east, mean daily minimum and maximum temperatures range from 4.9-10.0° C and 16.6-19.2° C respectively. Average annual rainfall is about 1100mm, falling throughout the year (World Climate³).

4.1.2 Comparison with New Zealand

- The closest match to its sub-tropical environment overseas are the warmer regions of Northland, Auckland and coastal Bay of Plenty where average annual rainfall (1200-1500mm), rain days >1mm per year (111-137 days) and humidity (78-86%) are comparable, although mean daily minimum temperatures (10-11.8° C) are lower, and ground frosts are more frequent (1- 42 days per year) (NIWA).
- Note that the North American and Arabian distribution suggests that *M. nudicaulis* tolerates both hot, dry conditions, and possibly more temperate climates. Therefore it has the potential to grow further south in cooler parts of New Zealand, including areas such as the central South Island where summers are hot and dry.

4.2 History of spread in other countries

- Alien and naturalised in Swaziland (GCW).
- No other information found.

4.3 Natural dispersal mechanisms and human assisted means of spread

4.3.1 Natural dispersal mechanisms

- No references specifically relating to the dispersal of this species were found.
- The seed appears to have no specialised means of dispersal. Short to moderate distance dispersal is probably wind/gravity assisted.
- Seeds may be carried on the exterior of animals (e.g. on pelts, or in mud on hooves etc).
- Internal transport by animals and birds is possible, although no information was found relating to seed survival after passage through the gut.

4.3.2 Human dispersal

- Human mediated dispersal is likely via transport of seeds in contaminated machinery, produce and soil.

4.4 Distribution of potential habitat in New Zealand

- In New Zealand, probably restricted to the northern North Island but may extend further south through coastal and lowland localities to the top of the South Island. It is possible it could also establish in hot, dry parts of New Zealand such as the central South Island.
- Habitat is likely to be open places such as cultivated land, waste areas, roadsides, river beds and margins, and sea-shores.

4.5 Constraints to spread and predicted rate of spread in New Zealand

4.5.1 Predicted rate of spread

- Its low growing habit and small seed probably mean that the rate of spread by natural dispersal (wind/gravity) would be slow. Possible animal (external/internal) dispersal could facilitate new populations from local infestations.

- Could form widespread populations quickly via human vectors; seed in contaminated soil, produce and machinery.

4.5.2 Constraints to spread

- Climate is likely to limit its establishment and spread to warmer areas of the northern North Island, or to the areas outlined above in section 4.4.
- No information found on susceptibility to pests or diseases.

5.0 Consequences

5.1 Overseas impacts

5.1.1 Economic impacts

- *M. nudicaulis* has limited economic impact overseas.
- In tropical regions, it appears to be a minor weed of a variety of crops including upland rice, okra, tomato, groundnuts, cassava, yam, pineapple and maize (Marks 1983, Patel et al. 2004¹, Patel et al. 2004², Takyi 1969).
- Holm et al. (1979) list it as a principal weed in Ghana; present but rank unknown in Ivory Coast and Mozambique; and present in the flora but no proof of weediness in Puerto Rico.
- It is cited as an agricultural weed of unknown importance in South Africa (Randall 2002). It is a minor crop weed in Ethiopia (Marks 1983), although in another study farmers did not rank it in the top fifteen weeds there (Tamado & Milberg 2000). It is listed as a potential minor problem in Swaziland (SNTC).
- *M. nudicaulis* is not present in Australia but is listed as a quarantine weed in Western Australia due to its weed potential (DAF).
- In the Pacific it is only present in New Caledonia (W³TROPICOS). No impacts are reported there. It is not listed in Swarbrick (1997) or Waterhouse (1997).

5.1.2 Environmental impacts

- None known. Not listed as an environmental weed in Randall (2002).

5.1.3 Other impacts

- None known.

5.2 Potential impacts in New Zealand

5.2.1 Economic

- As a minor weed of cultivation and disturbed areas, its economic impact is likely to be negligible.
- It is unlikely to be a problem in pastoral agriculture. There is no indication that it invades pasture or lawns.

5.2.2 Environmental

- It is unlikely to pose an environment risk in New Zealand. It is not recorded as an environmental weed overseas, its growth habit is of no particular concern, there is no indication that it is particularly invasive, and it appears to be a weed mainly of ruderal situations.

5.2.3 Other impacts

- May be a nuisance weed in home gardens and nurseries due to its short maturity.

6.0 Control techniques

- A range of control techniques exist. Herbicides available in New Zealand are underlined.
- Pre-emergence application of fluchloralin and pendimethalin gave good control of *M. nudicaulis* and other weeds in okra (Patel et al. 2004¹). In transplanted tomatoes, butachlor, followed by alachlor and pendimethalin recorded the best cost: benefit ratio (Patel et al. 2004²). Pre-emergence application of chloramben-ammonium was recommended in groundnut crops (Takyi 1969).
- Manual weeding is probably difficult due to its low growing habit.

7.0 Uncertainty summary

- The potential New Zealand distribution is uncertain.
- Lack of information on general ecology e.g. seed dispersal, growth rate, reproductive capacity, competitiveness, and potential constraints to spread.
- Little information found regarding its economic impact overseas, although what information there is suggests that these are negligible.

8.0 References

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