

The Victorian Naturalist

Volume 140 (5)

October 2023



Published by The Field Naturalists Club of Victoria since 1884

Editor required

The editorial team of *The Victorian Naturalist* is seeking a new member.

On-the-job training is available, but some knowledge and experience in the following areas would be an advantage:

- Science, biology or natural history;
- proofreading or editing;
- desktop publishing (preferably InDesign);
- science publishing.

Interested readers can phone Gary Presland (0416 316 419) or Mary Gibson (0427 876 930), to discuss details of this honorary position.

The Victorian Naturalist
is published six times per year by the

Field Naturalists Club of Victoria Inc

Registered Office: FNCV, 1 Gardenia Street, Blackburn, Victoria 3130, Australia.

Postal Address: FNCV, 1 Gardenia St, Blackburn, Victoria 3130, Australia.

Phone: +61 (03) 9877 9860. Email: <admin@fncv.org.au>.

Website: <www.fncv.org.au>.

Address correspondence to:

The Editors, *The Victorian Naturalist*, 1 Gardenia Street, Blackburn, Victoria 3130, Australia.

Phone: (03) 9877 9860. Email: <vicnat@fncv.org.au>.

The opinions expressed in papers and book reviews published in *The Victorian Naturalist* are those of the authors and do not necessarily represent the views of the FNCV. Copyright of all original material published in *The Victorian Naturalist* remains with the author.

Yearly Subscription Rates – The Field Naturalists Club of Victoria Inc

(effective from 1 July 2023)

Membership category

Single	\$ 90	Institutional	
Family	\$116	- within Australia	\$180
Single Country/Concession	\$ 67	- overseas	AUD193
Family Country/Concession	\$ 90		
*Junior Family	\$ 53		
Junior additional	\$ 18	Schools/Clubs	\$103
Student	\$ 41		

* Junior membership is entitled to receive *Junior Naturalist* only.

Non-member fees: Meetings \$3; Excursions \$5

All subscription enquiries should be sent to:

FNCV, 1 Gardenia Street, Blackburn, Victoria 3130, Australia.

Phone: +61 (03) 9877 9860. Email: <admin@fncv.org.au>.

The Victorian Naturalist

Volume 140 (5) 2023



October

Editors: Gary Presland, Maria Gibson, Sue Forster

Assistant Editor: Virgil Hubregtse

Naturalist Notes	Observations on a population of Heath Wrinklewort <i>Rutidosia heterogama</i> Philipson 1937 (Magnoliopsida: Asteraceae) in Cooranbong, New South Wales, by <i>Terence Annable</i>	128
	Slender Onion Orchid pollinated by insects in suburban Sydney, by <i>Marlies Sazima and Ivan Sazima</i>	136
	Echidnas in the snow, by <i>Ken Green</i>	140
	Possum on a barbed wire fence: a slow death, or was the carcass hung there? by <i>Matthew Mo</i>	142
	Birds baths, buns and cached bread at Notting Hill, Victoria, by <i>Virgil Hubregtse</i>	145
	Perch preferences of the Welcome Swallow <i>Hirundo neoxena</i> , by <i>Virgil Hubregtse</i>	146
Tribute	Bruce Alexander Fuhrer OAM 31 December 1930 – 31 March 2023, by <i>Matt Dell</i>	148
Book Reviews	People Passion Science: Celebrating 50 years of the Arthur Rylah Institute for Environmental Research 1970–2020, by <i>John Koehn, Geoff Brown, Pam Clunie, Peter Menkhorst, Luke Woodford, Michele Kohout and Andrew Pickworth</i> , reviewed by <i>Maria Gibson</i>	152
	Mistletoes of Western Australia, by <i>Tony Start and Kevin Thiele</i> , reviewed by <i>David M Watson</i>	155

ISSN 0042–5184

Front cover: Bruce Fuhrer photographing fungi. Photo Matt Dell.

Observations on a population of Heath Wrinklewort *Rutidosia heterogama* Philipson 1937 (Magnoliopsida: Asteraceae) in Cooranbong, New South Wales

Introduction

The Heath Wrinklewort *Rutidosia heterogama* is one of 9 *Rutidosia* spp. endemic to Australia (Atlas of Living Australia [ALA] 2023). This species is a small perennial herb with a capitulum (flower head) (Fig. 1) of bright yellow, polygamous (mainly bisexual), monocarpous florets. Its distribution includes 3 disjunct locations: two in north-eastern New South Wales (NSW) and 1 in the Lower Hunter-Central Coast region of NSW. One of the north-eastern locations is on the coast, with populations occurring between Woolli and Evans Head in Yuraygir and Bundjalung National Parks (NSW Office of Environment and Heritage [NSW OEH] 2017); the other site occurs on the New England Tablelands, with populations found from Torrington and Ashford south to Wandsworth, south-west of Glen Innes (NSW OEH 2017). On the Lower Hunter-Central Coast, the species occurs from Wyong to Newcastle (NSW OEH 2017). The 2 north-eastern populations are separated by about 150 km and each is separated from the Lower Hunter-Central Coast population by about 350 km. There are very few occurrences of *R. heterogama* between these respective populations (ALA 2023). Most of the other 8 species of *Rutidosia* also have restricted distributions in eastern Australia, but Grey Wrinklewort *R. helichrysoides* is widespread across Australia (ALA 2023), and Button Wrinklewort *R. leptorhynchoides* is known from southern NSW, through eastern Victoria and into western Victoria (ALA 2023).

Rutidosia heterogama is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and under the *Biodiversity Conservation Act 2016 No 63* (Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2018), largely because it faces a high risk of extinction in the medium-term, as determined by the criteria prescribed in the regulation (NSW OEH 2017). It also has been listed in the 1997 IUCN Red List of Threatened Plants (RLTP) (IUCN 1998) and, at the time of writing, remained on the RLTP.



Fig. 1. *Rutidosia heterogama*: capitulum of yellow florets.

Observations were made over a period of 5 years (2012–2017) on one sub-population of the Hunter-Central Coast region. The major aim was to investigate the biology of the species with a view to benefitting long-term conservation efforts. A glossary of scientific terms is provided at the end of the article.

Methods

Study area

The sub-population of *R. heterogama* examined was located at Cooranbong in the catchment of Dora Creek, south of Newcastle and west of Lake Macquarie. The soil was mainly shallow (< 100 mm depth) with reddish topsoil and whitish lateritic subsoil on a sandstone base, and fell within the Yarralong soil formation located on Quaternary alluvial sediment (Murphy 1993).

Weather data, such as maximum and minimum temperatures and rainfall, were measured daily by the author on the grounds of Avondale University, Cooranbong, about 2 km away from the study site but with a similar altitude. The average annual rainfall was about 1,100 mm. Less

rainfall fell in summer months, but the amount varied significantly with El Niño and La Niña weather patterns. The average summer maximum temperature was 28.7 °C, although maximum temperatures reached in excess of 38 °C in most summers. Occasional severe droughts occurred, but usually were not very prolonged. The average winter minimum was 5.0 °C, but occasional brief ground frosts occurred in exposed areas every winter.

This sub-population was first recorded in 2003 (ALA 2023) and, at the time of the study, was spread over an area of about 2.5 ha, although split into 3 segments by a 'T' road junction constructed circa 1970. A remnant of natural mixed eucalypt and Melaleuca woodland was located on one corner of the road junction, but almost all of the trees and native flora had been cleared on the other sides. The groundcover at the least disturbed areas of the site consisted largely of native grasses, herbs and small shrubs together with several young trees. A list of native vascular and exotic plant species found within the limits of the study site is provided in Table 1. The list of exotic species excludes several cultivated species that had been either planted or escaped into the area. No

R. heterogama plants were found in the woodland except within a few metres of the margin, where it was more open. Very few *R. heterogama* plants were found growing among dense groundcover plants.

Observations

Initial observations of the population in early 2012 revealed there were over 100 plants. These were examined at monthly intervals for one year, and then twice-monthly for about two and a half years. Observations were undertaken to assess various aspects of plant morphology and phenology as described below.

To investigate morphology, plant height, leaf size and shape and capitulum size were quantified. A number of capitula were removed for microscopic study, particularly of floret morphology. The numbers of open capitula were recorded on each visit. A capitulum was defined as open if the bright yellow of at least one of the florets could be seen. The numbers of florets in a capitulum were counted either by removing florets one at a time or after seed dispersal, by counting the cypsela scars left on the base of the capitulum. The numbers of florets and potential seeds in a capitulum were thus quantified.

Table 1. Native and exotic vascular plants found within the study area.

Native species		Exotic species
<i>Acacia schinoides</i>	<i>Gymnostachys anceps</i>	<i>Arrhenatherum elatius</i>
<i>Allocasuarina torulosa</i>	<i>Hakea sericea</i>	<i>Asparagus aethiopicus</i>
<i>Angophora costata</i>	<i>Hardenbergia violacea</i>	<i>Axonopus fissifolius</i>
<i>Boronia barkeriana</i>	<i>Hibbertia vestita</i>	<i>Cenchrus clandestinus</i>
<i>Brachyscome graminea</i>	<i>Imperata cylindrica</i>	<i>Cyperus sesquiflorus</i>
<i>Bulbine bulbosa</i>	<i>Lobelia purpurascens</i>	<i>Hypochaeris radicata</i>
<i>Bursaria spinosa</i>	<i>Lomandra longifolia</i>	<i>Paspalum urvillei</i>
<i>Callistemon pinifolius</i>	<i>Lomandra filiformis</i>	<i>Pinus elliottii</i>
<i>Cassytha glabella</i>	<i>Lomandra obliqua</i>	<i>Richardia humistrata</i>
<i>Comesperma volubile</i>	<i>Melaleuca armillaris</i>	<i>Senecio madagascariensis</i>
<i>Corymbia gummifera</i>	<i>Microlaena stipoides</i>	<i>Sida rhombifolia</i>
<i>Corymbia maculata</i>	<i>Oxalis exilis</i>	<i>Trifolium</i> sp.
<i>Cynodon dactylon</i>	<i>Parsonia straminea</i>	<i>Verbena bonariensis</i>
<i>Daviesia ulicifolia</i>	<i>Paterosonia sericea</i>	
<i>Dianella caerulea</i>	<i>Persoonia linearis</i>	
<i>Echinopogon caespitosus</i>	<i>Caladenia picta</i>	
<i>Entolasia stricta</i>	<i>Phyllanthus hirtellus</i>	
<i>Epacris microphylla</i>	<i>Pimelia linifolia</i>	
<i>E. squarrosa</i>	<i>Pittosporum undulatum</i>	
<i>Eragrostis brownii</i>	<i>Pteridium esculentum</i>	
<i>Eucalyptus acmenoides</i>	<i>Sporobolus creber</i>	
<i>Eucalyptus pilularis</i>	<i>Styliidium graminifolium</i>	
<i>Gahnia clarkei</i>	<i>Themeda triandra</i>	
<i>Goodenia heterophylla</i>	<i>Xanthorrhoea media</i>	

Results

Morphology

A rosette of large radical, mainly oblanceolate leaves (Fig. 2) occurred at the base of the stem of *R. heterogama*. Cauline leaves of decreasing size and increasing separation occurred up the length of the stem and became narrower, and more linear towards the apex. Cauline leaves were alternate and sessile, varied moderately in shape, were bright green and concolorous. Determination of the phyllotaxis formula on a single stem was so variable as to be of little value for descriptive purposes because of the irregular angular arrangement of the cauline leaves, which had an average internodal leaf angle of 152° with a standard deviation of 67° ($n = 19$). All leaf margins were entire, but cauline leaves tended to be strongly revolute, whereas radical leaves tended to be flat or recurved. All leaf apices were variably obtuse to acute, and the leaf surface was somewhat glossy and scabrous with small, scattered, muricate to papillate protuberances and villous hairs. The pale green mid-vein was distinct and depressed above and prominent below. Visually, no lateral veins or domatia were seen. The leaf lamina was thin,



Fig. 2. Plant of *Rutidosis heterogama* showing large radical leaves at the base of the stem and increasingly smaller cauline leaves ascending the stem.

although slightly fleshy and decurrent, but this was less obvious in the smaller leaves that were higher on the stem. The average mature radical leaf length was 70.7 mm, range 44–125 mm ($n = 28$), and the average maximum leaf width was 7.8 mm, range 4.0–13.5 mm ($n = 28$).

The stem was scabridulous with sparsely scattered hairs and small protuberances. All stems were sympodial, but could be single or have several branches, with a single inflorescence terminal on each branch. The average height of a flowering stem was 299 mm, range ~70–570 mm ($n = 31$). Stem internode distances began at less than 1 mm for the radical leaves but were up to several cm for the cauline leaves. The length of the peduncle (Fig. 3) from the uppermost cauline leaf to the lowest involucrel bract (Fig. 3) was variable, average 10.8 mm, range 2–34 mm ($n = 20$). Some cauline leaves occasionally merged into involucrel bracts. After flowering, the peduncle died back to the nearest branch below or to the base of the plant. After severe heatwaves and droughts, some plants shrivelled and died back and some young plants died off altogether. During winter, many, but not all, of the flowering stems died back to near ground level. On some plants, some of the radical leaves remained green over winter, but most spring regrowth occurred from near the base. The radical leaves often died off even if the cauline leaves remained green.

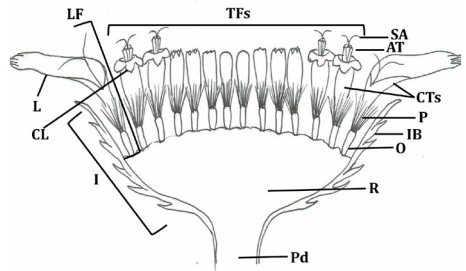


Fig. 3. Stylised diagram showing floral structures of a radiate (with ligulate and tubular florets) capitulum of the Asteraceae. TFs = tubular (or disk) florets; LF = ligulate (or ray) floret (absent in *Rutidosis heterogama*); I = involucre; Pd = peduncle; R = receptacle; IB = involucrel bract; O = ovary; P = pappus; CTs = corolla tubes; AT = anther tube; SA = style arm; L = ligule; CL = corolla lobe.

Stems were mostly green and erect, but occasionally were decumbent. No adventitious roots were seen on horizontal parts of stems in contact with the substrate. Older stems sometimes turned brownish and then woody at the base, especially in perennial specimens.

The longevity of individual *R. rutidosis* plants was not measured; however, several individual plants were observed to survive for at least 4 years.

Flowering

The capitula (Fig. 1) were fairly typical for the Asteraceae. There was a single capitulum on each stem, or branch, bearing many florets with inferior ovaries (Fig 3). Almost invariably, the capitulum and its bud stage (Fig. 4) faced vertically or near vertically upwards. The almost spherical capitulum bud was protected by a well-developed involucre (Fig. 3) of 6 (5–7) rings (or spirals) of narrow, green, imbricate involucre bracts (Fig. 3) with acute apices. The number of involucre bracts on a capitulum was variable, average 34 (range 31–47,

SD 15, $n = 5$). Involucre bracts, particularly the lower bracts, broadened towards oval as the capitulum bud expanded and became chartaceous while the apices became more rounded. An attempt to determine the involucre bract phyllotaxis on several flowers was fraught with difficulties, largely because of problems in assessing the timing of origins of primordia and the somewhat irregular arrangement of involucre bracts. The average internodal involucre bract angle was 162° , but the standard deviation was 87° ($n = 58$), so no reliable involucre bract phyllotaxis formula was determined.

Opening of the capitulum bud began with the peeling back of the central involucre bracts followed by the emergence of short floret petals. All visible floret parts, including unopened florets, were bright yellow. Florets were densely packed and all were tubular florets (Fig. 3). The average width of mature, fully open capitula was 17.9 mm, range 9–25 mm ($n = 20$). Almost all florets were bisexual. Only 10 female florets, all peripheral, occurred in a total of 215 florets from 3 capitula. Individual florets were 3–4 mm long and actinomorphic with 5 equal-length petals, although occasional florets with 6 or, rarely, 7 petals occurred. The petals tapered towards finely rounded apices. Most capitula had a few abortive floret buds in the centre. Petals were free above (for about 1 mm), but fused below to form a corolla tube that was about 1.5 mm long and 0.2 mm wide but had a swollen basal region. The base of the floral tube connected to a single cypsel. The stamens were fused by relatively long, narrow anthers which formed a tube around the style (i.e. were syngenesious) (Fig. 3) within the swollen basal region of the corolla tube. They became emergent as the floret matured, elongating to a point just below the tips of the stigma and where petals were no longer fused. Anthers were of equal length, initially whitish but turning yellow as they matured. Filaments were free from each other and adnate to the inside of the corolla tube at the base of the swollen region. Loculi dehiscence of pollen was introrse. Pollen grains were spherical and bright yellow with a smooth exine.

The cylindrical style was about 3–4 mm long and 0.1 mm wide. The stigma was bifid and recurved for about 0.4 mm at its tip, which was wholly emergent from the corolla at maturity.



Fig. 4. Bud stage of *Rutidosis heterogama*, with a spittle bug in a leaf axil in the lower right hand corner of the photograph.

The inner surfaces of the stigma were minutely papillate. Nearly all mature stigmas had pollen grains attached, ranging from a few to many. In very few cases, where growth of the style had apparently aborted or was stunted at an earlier stage of development, florets were found without a stigma. The corolla tube and style were shed when mature, whether or not the achene was fertile. The developing achenes were straw-coloured, becoming dark brown at maturity, papillose and cylindrical with an abscission scar at the base and a small stylar scar in the top centre. There was also a circular peripheral ridge at the top, which formed an attachment for the white feathery pappus.

A pappus was attached to each cypsela, whether fertile or infertile. Every pappus appeared white macroscopically, but was transparent and colourless microscopically. The pappus scales formed a ring around the top of each achene and each scale tapered towards the apex. The average number of pappus scales per achene was 9.2, range 7–13 ($n = 30$). Although most scales were very similar in size and shape, some differed in being wider, shorter, more curved or partially fused with adjacent scales, and were scattered amongst the more usual scales. The lateral margins of each pappus scale were fimbriate, with the long unbranched and unsegmented fimbriae extending circumferentially at various angles within the curved plane of the scale. Within the floret bud, the pappus scales were oriented paraxially (i.e. they formed a ring around the base of the floret) and the pappus was firmly attached. As it matured, the pappus scales opened and curved outwards. The pappus scale bases remained nearly vertical, or angled outwards up to about 40°, but there was also a variable amount of outwards curvature of the pappus scales of only a few degrees (especially in infertile cypselae), up to about 80°. However, the tips of most pappus scales on any given cypsela ended up at an angle of less than 90° to the cypsela axis. The cypselae were also shed from the capitulum and easily carried by wind currents. The pappi became more easily detached from the cypselae with maturity. The cypsela scars on the capitulum showed distinct spirals, but were considered too irregular to determine an accurate floral phyllotaxis.

Phenology

Each season, all mature plants showed evidence of flowering. Many plants were seen to flower prolifically during the summer. However, plants also flowered each month of the year (Fig. 5).

From May to August inclusive, very few capitula were seen; an average of only one open capitulum occurred in July. The highest number of open capitula recorded in any month was 670 in October 2014. However, the number of open flowers (Fig. 5) continued to remain moderately high throughout summer. The time that individual flowers remained open was not measured, but was much longer at low than at high temperatures. A few particular flowers noted in summer were still present a fortnight later and, in winter, even a month later.

On 25 November 2015, a total of 258 plants were examined. Of these, 253 (98%) had an inflorescence (capitulum in bud, open capitulum, or old capitulum). The total number of inflorescences counted was 1,023, average 4.06 inflorescences per plant, with a range of 1–32. Only 21% of all plants had more than 5 inflorescences and 23% of plants had only one inflorescence (the modal number).

Fruit

Rutidosia heterogama produces single seeds in fruits known as cypselae, which is typical of a daisy. Of 786 mature cypselae examined microscopically from 10 capitula, only 24 (0.031%) appeared fertile. Fertile cypselae were defined as those that were convex barrel-shaped, dark brown in colour, had an expanded pappus and did not shrivel over time. Infertile cypselae (even those with an expanded pappus) remained straw-coloured (until they began to decompose), were usually convex, or straight-sided in lateral view, and continued to shrivel over time.

Survival risks

About 50 individual plants disappeared in 3 circumstances. 1) On road edges, where plants were repeatedly inundated, mown, occasionally driven over or destroyed by roadside grading or use of herbicides. Only a very few plants in regularly mown areas produced flowers and none produced seeds. 2) In areas where the undergrowth became so tall and dense that plants

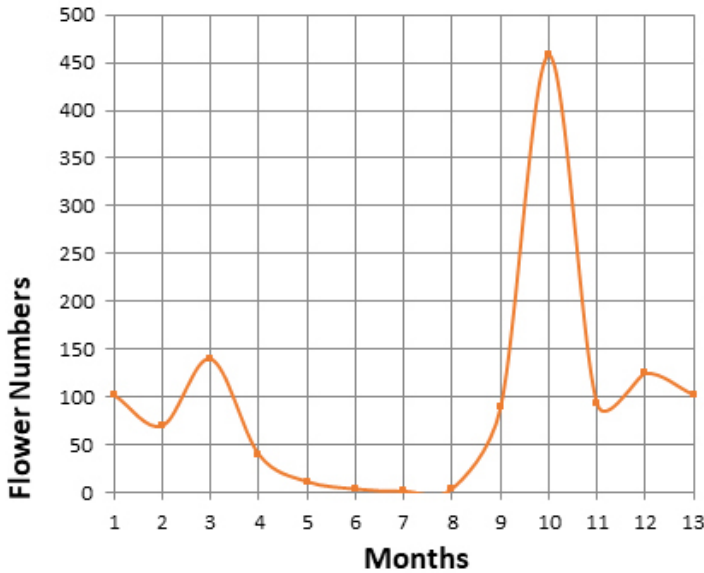


Fig. 5. Number of open capitula per month averaged over a period of 4 years. Month 1 (January) is duplicated at month 13 to show the complete cycle.

were overgrown and smothered. 3) In prolonged drought, a few smaller plants were severely stunted or died. In one summer, several plants had flower heads either cut off or nearly cut off, cause unknown, but in general there was very little evidence of foraging on any parts of the plants. However, in September 2023 numerous spittle bugs (subfamily Aphrophorinae species) were seen to attack many plants (Fig. 4).

No obvious mutant leaves, stems or flowers were seen. Some plants were stunted, probably because of drought and/or poor soil. Occasional conjoined twin, triplet or quadruplet cypsela were seen, but they (like the vast majority of other seeds observed) appeared infertile.

Two small roadside fires occurred during the observation period, but each covered only a small proportion of the site, and no plants were known to have been killed.

Discussion

This study investigated the biology of the vulnerable *R. heterogama*. The findings of low fecundity and high negative human impact should be carefully considered in the determination of conservation management for this species.

Rutidosia heterogama grew in a variety of situations, from bare ground to areas with moderately dense groundcover. Visually, there was no association with any other plant species in the study area. This was not surprising as previous studies have reported its presence in a variety of habitats including heath, various forest and woodland types and along roadsides (Bell and Driscoll 2004; DCCEEW 2008; NSW OEH 2017).

The morphology and flowering patterns and their variations were not exceptional for the Asteraceae. One reason why the involucre bract phyllotaxis was so irregular could be because their primordia developed on a radially expanding capitulum; thus, the primordia would have had less influence on opposing primordia and therefore would have been less likely to follow a strict Fibonacci pattern.

The observations on flowering and fertility pose a significant question: Why is this species so uncommon considering it flowers prolifically and the flowering (and presumably anthesis) season is long? Prolonged droughts, prolonged rainfall and exceptional heatwaves in the

flowering season would reduce fertility, but these factors would not explain the consistently low fertility. Less than 1% of seeds examined were fertile. The majority of stigmas examined had pollen grains attached, so the process of pollination in this population of *R. heterogama*, during this study, was not the problem. The lack of fertile seeds, in spite of high pollination, suggests the species was self-infertile. Self-infertility also is known in a congeneric species, *R. leptorrhynchoides* (NSW OEH 2012). In this species, seed is wind dispersed but dispersal distance is short, only about 0.5 m (Bell and Driscoll 2004). This results in strong spatial patterning where plants that are close together are more likely to be related to each other, that is, full- or half-sibs (Wells and Young 2002; NSW OEH 2012). This is likely to be occurring in *R. heterogama* and means that pollen landing on near neighbours is incompatible, thus no fertilisation occurs. As the species is not clonal, seed production is essential for ongoing population survival.

The fact that plant numbers remained moderately stable for 4 years, despite losses from various threats, suggests that recruitment continued, at least in areas of minimal interference. Also, a few small and immature plants were seen each summer. However, for the population to survive in the long-term, recruitment has to exceed loss. But threats were, and are, varied and invariably human-induced. Plants were trodden on, driven over, mown, had soil dumped on them, were graded during road works and sprayed with herbicide. Sometimes this was done in ignorance of the species' significance and, at other times, in spite of that knowledge. Mowing and fence-work destroyed a significant number (about 25%) of plants and reduced the total area occupied by the sub-population. Mistaken identity, indifference, overgrowth by more vigorous species, bushfire, fragmentation of habitat, climate change (particularly severe droughts and heatwaves) and, possibly, predatory species also were and are threats to the sub-population's survival. The presence of unmowable embankments and one corner of undisturbed, open low heath-like groundcover was very important to the conservation of this sub-population during this study and will remain so into the future.

This sub-population, like the species in general, remains significantly vulnerable and requires a higher level of protection than is currently provided.

Acknowledgements

Many thanks go to Dr Howard Fisher for his very helpful comments on this paper.

References

- Atlas of Living Australia (2023) A node of the Global Biodiversity Information Facility (GBIF). <www.ala.org.au> [accessed pro re nata].
- Bell S and Driscoll C (2004) Population count and assessment of *Rutidosia heterogama* (Asteraceae) Lower Hunter & Central Coast: report to Wyong Shire Council. East Coast Flora Survey, Kotara Fair, NSW.
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2008) Approved Conservation Advice for *Rutidosia heterogama* (Heath Wrinklewort). <<http://www.environment.gov.au/biodiversity/threatened/species/pubs/13132-conservation-advice.pdf>> [accessed August 2023].
- DCCEEW (2018) Species profile and threats database: *Rutidosia heterogama* — Heath Wrinklewort: SPRAT Profile <https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=13132> [accessed 14 June 2018].
- Walter KS and Gillett HJ (1998) 1997 IUCN Red List of Threatened Plants. Compiled by the World Conservation Monitoring Centre. (IUCN — The World Conservation Union, Gland, Switzerland and Cambridge, UK). <<https://www.iucnredlist.org>> [accessed June 2022.]
- Murphy CL (1993) Soil Landscapes of the Gosford-Lake Macquarie 1:100 000 Sheet. NSW Department of Land and Water Conservation, Sydney.
- NSW Office of Environment and Heritage (OEH) (2012) National Recovery Plan for Button Wrinklewort *Rutidosia leptorrhynchoides*. NSW Office of Environment and Heritage, Hurstville.
- NSW OEH (2017) Heath Wrinklewort — profile. NSW Office of Environment and Heritage, Hurstville. <<https://www.environment.nsw.gov.au/threatenedspeciesApp/profile.aspx?id=10737>> [accessed October 2023].
- Wells GP and Young AG (2002) Effects of seed dispersal on spatial genetic structure in populations of *Rutidosia leptorrhynchoides* with different levels of correlated paternity. *Genetics Research* 79, 219–26.

Glossary

Based on: Clark I and Lee H (2019) *Name that flower: identification of flowering plants*. (Melbourne University Press: Melbourne), and *New South Wales Flora Online: a glossary of botanical terms*. PlantNet NSW. <<https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&glossary=yes&alpha=V-Z>>. Please see these references for more detailed explanations.

actinomorphic: of a flower viewed from above, radially symmetrical.

acute: generally, two edges forming an angle < 90° to create a sharp point.

adnate: with one part or organ fused to another.

anemophilous: of a plant, wind pollinated.

anthesis: the time of opening of the bud of a flower. The term anthesis refers to that phenological phase in which a flower is completely open and functional. The term is sometimes used to indicate the beginning of the flowering event.

adventitious: refers to growth of tissue or organs in an unusual position, e.g. root growth on a stem.

capitulum: a flower head of compact, sessile florets on a receptacle — the expanded end of the inflorescence stalk.

cauline leaves: leaves attached directly to the stem, without a petiole.

corolla: petals collectively.

concolorous: the same colour throughout or on both sides.

congeneric: belonging to the same genus.

cypsela: a small, indehiscent, one-seeded fruit developed from an inferior ovary, typical of daisies.

decumbent: of a shoot, prostrate for most of its length but curving upwards towards the tip.

decurent: extending downward below the point of attachment.

domatia: small chambers on the underside of certain leaves, usually in the axils of major veins.

entire: of a margin, continuous and undivided, unbroken by lobes or indentations.

entomophilous: pollinated by insects.

exine: decay resistant, outer layer of a pollen grain or spore.

fimbriate: of a margin, fringed.

floret: in general, a small flower of an inflorescence, such as in the daisy family.

inflorescence: a cluster of flowers with associated axes and bracts.

internodal leaf angle: when looking from above, this is the angle between the midribs of 2 successive leaves, the portion of stem between the leaves being the internode.

internode: section of stem between 2 successive nodes, the node being the point where a leaf or branch arises or had once been.

involucre: series or rings of bracts usually surrounding the base of an inflorescence, especially the daisy family.

introrse: of anthers that open toward the centre of the flower.

monocarpous: of a flower, having only one carpel.

muricate: of a surface, roughened by having short, firm, pointed projections.

oblanceolate: a two-dimensional shape where the length is about 5 times the width, the widest part above the centre and tapering to the base.

obtus: rounded or blunt.

papillate: having small rounded projections.

pappus: in florets of most daisies, hairs, bristles or scales at the base of a the corolla (petals collectively).

peduncle: the stalk of an inflorescence having more than one flower.

phyllotaxis: arrangement of leaves around a plant stem.

radical leaves: leaves arising near the base of the plant.

recurved: curved under, e.g. of a leaf margin.

revolute: of a leaf or leaflet margin, curled downwards and rolled inwards, forming (or starting to form) a tube.

scabridulous: diminutive of scabrous. slightly or minutely rough to the touch.

scabrous: rough and covered with, or as if with, scabs.

sessile leaves: without a stalk or petiole.

sympodial: pertaining to growth where the main axis soon terminates, and growth is taken up by a lateral branch, the process repeating to form a compound axis.

villous: of a surface, with a covering of long, weak hairs.

Terence Annable

School of Science and Mathematics, Avondale University,
PO Box 19, Cooranbong, NSW 2265.
Correspondence: <tannable@avondale.edu.au>.