

**OBSERVATIONS OF A NEW THREAT TO ONE OF TASMANIA'S
THREATENED ORCHIDS: THE STORY OF THE MITE VERSUS THE
GREENHOOD**

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Towards the end of May 2007 I travelled to the Pontville Small Arms Range Complex (the Range) at Pontville at the urging of Alister Clark who is the Senior Environmental Officer for the Department of Defence. My task was to enhance the department's knowledge of the species of *Pterostylis* (greenhood orchids) that grow in the Southern Temperate Lowland Grassland at the Range. Defence has a willingness (and some legal obligations) to manage threatened species that occur on its Tasmanian properties and has gone to great lengths to achieve this.

The Tasmanian *Threatened Orchid Recovery Plan 2004-2008* (TSS 2006) lists the property as having two *Pterostylis* species of interest: *P. wapstrarum* (fleshy greenhood) and *P. ziegeleri* (grassland greenhood). This latter species has undergone a taxonomic change and now includes what we used to call *P. cynocephala*, a species now regarded as absent from Tasmania.

P. wapstrarum (Figure 1) is currently listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) as Critically Endangered and TSS (2006) suggests that it occurs at only one site with a population of around 120 individual plants (it has since been found in low numbers at Gunners Quoin and a site in the northern Midlands). *P. wapstrarum* is also listed in the recovery plan as one of fourteen Tasmanian orchids that are facing imminent extinction in the wild. *P. ziegeleri* (Figure 2) is listed as Endangered (EPBCA) and it was thought that there are around 140 individual plants at this site.

So on a brisk morning I found myself wandering back and forth, back and forth looking for the elusive greenhoods. Even though I had been to the site the previous two years, my task was not easy as there were many other prostrate herbs growing. Eventually I began to stumble across some orchids and pulled out my GPS to start recording locations. It wasn't long, however, before I started to notice something very odd about the rosettes. They seemed to have a lighter area on the leaf surface and a closer inspection with a hand lens revealed something very disturbing: there was evidence of some sort of herbivory in progress with as many as twenty minute creatures seemingly dining on the leaf surface (Figure 3). The plants were under attack.

I observed the small creatures for a while. When disturbed, they would scurry off only to reappear at the very edge of the damaged area moments later to continue the devastation. I

had never seen this before and so took some photographs before contacting Hans Wapstra, one of Tasmania's recognised orchid specialists.



Figure 1. *Pterostylis wapstrarum*
(fleshy greenhood).



Figure 2. *Pterostylis ziegeleri*
(grassland greenhood).



Figure 3. Mite damage to rosettes of *P. wapstrarum*.

Within a day or thereabouts Hans advised that he had forwarded the images to David Jones (who is one of Australia's leading orchid taxonomists and also an expert horticulturist) and reported that neither he nor David had seen this before. I then contacted the Orchid Project Officer, Matt Larcombe, from the Threatened Species Section (DPIW) and provided images for his information. All parties (Defence, Hans and Matt) were very concerned. It was decided that more information was needed and so I contacted Dr John Ireson from the Tasmanian Institute of Agricultural Research to see if he could identify the invertebrate from my images.

John was most willing and did not hesitate to view the images. He asked if I could catch some, and from these he identified the creatures as the introduced pest *Halotydeus destructor*, the redlegged earth-mite (Figure 4). Unfortunately it seems that *H. destructor* is aptly named as it is a serious threat and John advised that there was probably little we could do to stop the damage.

Next stop was the University Of Tasmania. I had contacted Jasmine Janes (Jasmine has studied greenhoods and is in the process of writing a thesis) to see if she could identify some of the rosettes taken using DNA sequencing to see whether it was *P. wapstrarum* or *P. ziegeleri* being grazed. Jasmine stopped what she was doing immediately when I walked into her work area, such is her commitment to the welfare of endangered plants. Unfortunately the process takes some time and at this stage the results are not through.



Figure 4. Close-up of *Halotydeus destructor* (redlegged earth-mite) on leaves of *P. wapstrarum*.

Where does this leave us? The redlegged earth-mite is an opportunistic feeder, basically wandering around sampling everything until it comes across something that it likes. Does this mean that *P. ziegeleri*, which forms denser colonies than *P. wapstrarum*, is more at risk? Have these orchids always faced this herbivory? Will *H. destructor* continue to graze on plants until they die before moving on to the next feast?

How much does an earth mite eat? Are we past the worst of the seasonal grazing pressure that the earth mite exerts, or are we yet to see the full potential of this invader? Will *Pterostylis wapstrarum* or *P. ziegeleri* become extinct in the wild at this site?

There are so many unknowns. The only positive is that we now know what is happening and all parties are extremely concerned. Matt Larcombe is trying to interest students at the University of Tasmania, and Defence is planning further monitoring and data gathering. Hopefully, this herbivory that has only just been noticed has actually been occurring for many years and the orchid can cope with this pressure.

I do not wish to see the magnificent fleshy greenhood disappear from the wild.

SOME NOTES ON *HALOTYDEUS DESTRUCTOR*

The following notes are compiled from Ridsdill-Smith & Annells (1997) "Seasonal occurrence and abundance of redlegged earth mite *Halotydeus destructor* (Acari: Penthaleidae) in annual pastures of southwestern Australia" (*Bulletin of Entomological Research* 87: 413-423).

- *Halotydeus destructor* (Tucker) (Acari;Penthaleidae), was accidentally introduced to Australia from South Africa in 1917, and was considered a serious pasture pest throughout southern agricultural regions by 1934 and it remains so.
- *H. destructor* occurs mainly in regions with a cool wet winter where the winter rainfall, between May and October, is greater than 204 mm, and a warm dry summer where the summer rainfall, between December and April, is less than 104 mm.
- Based on a Western Australian study, *H. destructor* is active during the cooler wetter period of the year from May to October. In spring, the female mites retain eggs in their bodies, die on the soil surface, and summer is passed as diapausing eggs. Diapause is broken by high temperatures, requiring an equivalent of a month with soil temperatures over 50°C. In autumn, the eggs hatch with adequate soil moisture, when the mean daily temperature falls below 20.5°C for 10 days. Survival of diapause eggs during summer is reduced by moisture (summer rainfall).
- *H. destructor* appears to thrive at sites with well-drained sandy soil (Norris 1938).
- In a study of *H. destructor* abundance near Perth, Western Australia, it was suggested that there are three generations a year, with peaks in autumn and/or spring, but the limiting factors were not detected.

- Nutritional quality of the plant species strongly influences *H. destructor* rate of multiplication, and could be affecting mite abundance at the pasture sites.
- Each *H. destructor* generation in pastures took seven to eight weeks, using the peak numbers of mites plus eggs, or active mites, or eggs, as markers. In the laboratory at 11-18°C (temperature range similar to that at the pasture sites), *H. destructor* completed a generation every five weeks continuously, with no evidence of diapause.
- *H. destructor* abundance was significantly reduced when the quantity of pasture available was reduced by increased grazing intensity of sheep.

ACKNOWLEDGEMENTS

The Department of Defence has continued to be proactive in the management of threatened plants on its properties and I wish to especially thank Alister Clark (Senior Environmental Officer) for his interest. I also wish to extend my thanks to Hans Wapstra for his interest in the management of orchids at the Pontville Army grounds, for his enthusiastic response to the observation presented in this article and for commenting on a draft of the article; Jasmine Janes (University of Tasmania) for her enthusiasm for the management of these orchids and agreeing to undertake some DNA identifications of rosettes; Dr. John Ireson (Tasmanian Institute of Agricultural Research) for identifying the mites and providing commentary and information; Matthew Larcombe (Project Officer, Threatened Orchids, Threatened Species Section, DPIW) for interest and support in the management of the site; and Mark Wapstra for assisting with massaging a draft of this article into the present format.

Note. All images shown as grey scale tones are also shown as full colour in the central pages of this volume.

REFERENCES

- Ridsdill-Smith, T.J. & A.J. Annells, A.J. (1997). Seasonal occurrence and abundance of redlegged earth mite *Halotydeus destructor* (Acari: Pentheleidae) in annual pastures of southwestern Australia. *Bulletin of Entomological Research* 87: 413-423.
- Threatened Species Section (TSS) (2006). *Flora Recovery Plan: Tasmanian Threatened Orchids 2006–2010*. Department of Primary Industries, Water and Environment, Hobart.

ADDENDUM

This article was written and presented for review in August 2007. I have continued with the observations of the site, including mapping the distribution of the orchids (Figure 5), and have started some long-term monitoring of the impacts of the mite on the greenhousings by using quadrats placed amongst known colonies of the species. The mite appears to be grazing on both species of threatened *Pterostylis* and some other native species such as *Wurmbea dioica* (Figure 6). The mite seems to be attracted to the pollen masses in the

orchid flower but seems just as happy grazing on the leaves and outer floral parts (Figures 7 and 8).

Since the writing of the initial article, several additional field visits have been made to the site by members of the Threatened Species Section, the Threatened Orchid Recovery Team and Hans and Annie Wapstra. Collectively, we are all highly concerned about the possible impact of the mite on the threatened orchids and we are urging further research and monitoring as a matter of urgency.

Note. All images shown as grey scale tones are also shown as full colour in the central pages of this volume.

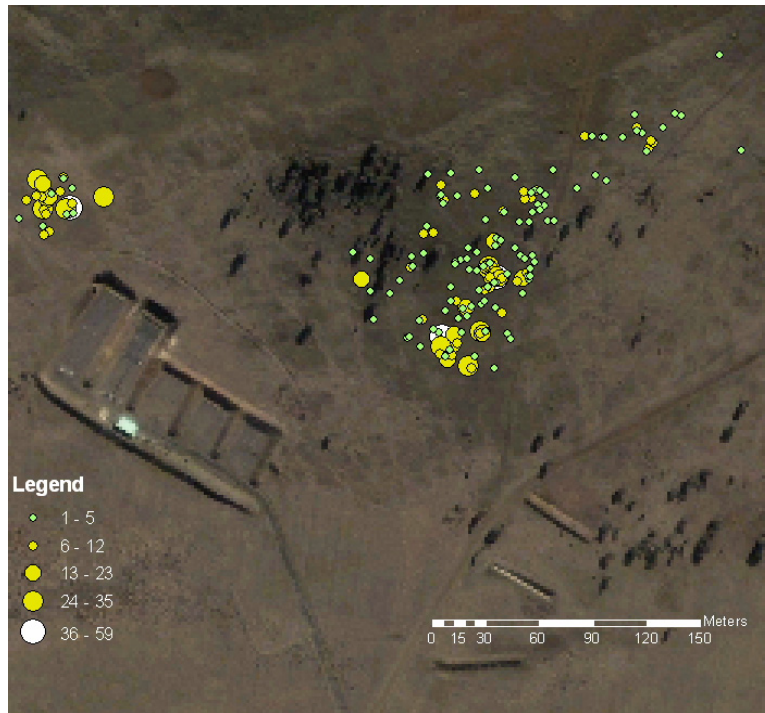


Figure 5. Distribution of threatened species of *Pterostylis* at the Pontville site. Mapping is a continuing project.



Figure 6. *Halotydeus destructor* on stigmas of the native annual lily *Wurmbea dioica*.



Figure 7. *Halotydeus destructor* on and in the flower of a *Pterostylis*. Note the large numbers of mites.



Figure 8. Damage to flowers of *Pterostylis*. Note the “destruction” of the flower structure.