Habitat identification and hair tube surveys for the Endangered New Holland Mouse in Tasmania with a focus on the St Helens area.

A report from the North East Bioregional Network

Billie Lazenby, December 2009

Summary

The North East Bioregional Network (NEBN) was the successful recipient of an Envirofund (Round 9) grant to conduct habitat and presence surveys for the threatened New Holland Mouse, *Pseudomys novaehollandiae* around St Helens in Tasmania. Hair tubes were designed and manufactured by the NEBN and deployed in nine sites. Hair samples were analysed by an expert in the field and one sample was identified with a low level of confidence as New Holland Mouse. Other small mammal species recorded included the Swamp Rat, *Rattus lutreolus velutinus* and the House Mouse, *Mus musculus*. A habitat model was developed for the New Holland Mouse using geographic information systems which included historical records, Tasmanian vegetation and burn history layers, and potential habitat was mapped statewide. The accuracy of the habitat model was tested with ground searches in the St Helens area and 70% of the sites desktop mapped as New Holland Mouse habitat were correctly identified. The following report details results from the hairtube and habitat surveys.

Contents

Introduction

The North East Bioregional Network (NEBN) is a community group based in St Helens, Tasmania. In 2007 the NEBN was awarded an Envirofund (Round 9) grant to conduct community surveys and habitat identification for the threatened New Holland Mouse, *Pseudomys novaehollandiae* in the St Helens area. Activities conducted by the NEBN also included community information sessions and the production of an information pamphlet. Aims specific to animal and habitat surveys were:

- To develop an effective passive survey method suitable for the New Holland Mouse;
- To improve our current understanding of the distribution of the New Holland Mouse in the St Helens area; and
- To map New Holland Mouse habitat at a fine scale around the St Helens area and at a broader scale across the State of Tasmania.

The outputs from the above aims are provided in the following report.

Background

The New Holland Mouse is a rodent native to Australia, with adults weighing between 20-25grams. The species lives in burrows which are often shared with other individuals, and is omnivorous eating a range of seeds, insects, fungi and plant material. The New Holland Mouse has been observed to be a habitat specialist, and has been consistently recorded from heathlands, woodlands with a heathland understorey and vegetated sand dunes in the early to mid stages of vegetation succession induced by fire (e.g. Seebeck *et al*. 1996). The optimal fire-age of New Holland Mouse habitat is believed to be variable from site to site depending upon factors such as soil fertility and fire intensity, however the general estimates are 3-7 years (Seebeck *et al*. 1996).

The New Holland Mouse is found in south-eastern Australia; namely Queensland, New South Wales, Victoria and Tasmania. It is listed as Endangered in Tasmania under the *Tasmanian Threatened Species Protection Act* 1995 and Vulnerable in Victoria under the *Flora and Fauna Guarantee* 1998. Reasons for the New Holland Mouse's threatened status include a severe contraction in range and small fragmented populations. Decline has probably been caused by habitat loss, habitat modification (through altered fire regimes and *Phytophthora cinnamomi* infection) and predation by introduced carnivores.

The first documented discovery of the New Holland Mouse in Tasmania was in 1976 (Hocking 1980). Since then, there have been just 36 monitoring expeditions to five areas that have recorded the species (Tasmanian Natural Values Atlas, DPIPWE, 2009). Despite a lack of survey effort in Tasmania, and the highly elusive nature of the New Holland Mouse, there is growing evidence that species' conservation status is worsening. Five comprehensive trapping expeditions in the last eight years have failed to

detect the species in areas where it was found in the past. In light of these recent survey results, further surveys to try and deduce the current distribution of the New Holland Mouse and development of a passive time efficient survey method are unarguably high priorities for effective conservation of the New Holland Mouse in Tasmania.

Methods

Habitat mapping using Geographic Information Systems

Habitat mapping with the aid of Geographic Information Systems (GIS) was used to generate a coarse scale map of potential New Holland Mouse habitat across Tasmania. On-ground habitat searches in the St Helens area, using the methods described in the 'habitat searches' section below, were used to verify the accuracy of the desktop GIS mapping.

Three GIS layers were used to develop a Statewide potential habitat map for the New Holland Mouse and these layers were TASVEG 2.0 (Harris and Kitchener 2005), a fire history layer which included spatial dimensions of all controlled burns and wildfires which have been recorded in Tasmania over the past 25 years (provided by the Parks and Wildlife Service), and a *Phytophthora cinnamomi* isolation layer which contained point data for all locations where the fungus had been confirmed using laboratory tests (provided by the Department of Primary Industries Water and Environment, DPIPWE). It is important to note that not all areas of potential New Holland Mouse habitat have been tested for *Phytophthora cinnamomi* therefore the following maps indicate where the fungus is found, they are not indicative of where it is absent.

New Holland Mouse capture records downloaded from the Tasmanian Natural Values Atlas were overlayed on TASVEG 2.0 and all vegetation types which were overlayed by a capture record were used to create a New Holland Mouse vegetation layer. MapInfo Professional 9.0 was used to create maps and conduct analyses. Likely optimal habitat i.e. habitat that had been burnt in the last 10 years, was identified by overlaying the fire history and New Holland Mouse vegetation layers.

Habitat searches in the St Helens area

Potential New Holland Mouse habitat within the St Helens area was identified using a search image which consisted of features that had been recorded at New Holland Mouse capture sites in the past in Tasmania. These features were light and deep sandy soils, high percentage of bare ground, species diverse heathlands, woodlands with a heathland understorey and sand dunes. The co-occurence of four plants which have been found to be associated with New Holland Mouse populations (Lazenby et al. 2008) was also used to identify potential habitat and these plants were *Aotus ericoides, Hypolaena fastigiata, Lepidosperma concavum* and *Xanthorrhoea spp.* Habitat searches were predominantly conducted by Todd Duddley who is an experienced field naturalist.

Hair Tubes

Hair tubes were designed and constructed by Benjamin Dean of the NEBN using hair tube design attributes such as size of hair tubes used successfully in Victoria to survey the New Holland Mouse (Wilson and Roede 1995).

An important design addition to the tubes used for the present survey was a metal insert across the inner top of the tube (Figure 1), which acted as a fixing point for double-sided tape. Tubes were constructed using 25mm PVC pipe cut into 10 -15cm lengths. A small hole was drilled into the middle of each metal insert, and a mix of rolled oats, peanut butter and honey was wrapped in gauze and the resulting bait 'pudding' placed in the hole in the metal strip. The metal strip was held in place using a heavy duty rubber band made by cutting a round off an old bicycle inner tube. A galvanised bracket was attached to the middle of each tube and the holes on either end of the bracket were used to insert nails into the soil when the tube was set to ensure the structure was stable.

Hair tubes were set for a minimum of 7 nights in groups of at least 15 at each site. In most cases a number of sites were surveyed in each area. Sites for hair tube survey were generally selected using the habitat search methods described above however some additional sites were also incorporated that were adjacent to the classic description of New Holland Mouse habitat in areas of unreserved land. As a community group the NEBN were in a fortunate position to survey a number of blocks of private land tenure. A hair tube setting protocol was outlined in a two page document (included in Appendix 1) and distributed to all community members assisting with the hair tube surveys. Combined with verbal guidance and the assistance of an experienced person who had already conducted a hair tube survey at each new survey site the NEBN were able to standardise surveys.

Figure 1 – Picture detail of the North East Bioregional Networks hair tubes with from left to right a photo of a bait pudding being made, the metal insert including double-sided tape, and the completed hair tube ready to be set. Hair tubes were designed by Benjamin Dean.

Results and Discussion

Eleven TASVEG 2.0 vegetation types were identified as constituting New Holland Mouse habitat by overlaying historical New Holland Mouse records in Tasmania and these were; Coastal scrub (SSC), Coastal heathland (SCH), Dry scrub (SDU), Coastal scrub on alkaline sands (SCA), *Eucalyptus amygdalina* coastal forest and woodland (DAC), *E. nitida* Furneaux forest (DNF), *E. sieberi* forest and woodland not on granite (DSO), Heathland on granite (SHG), *E. sieberi* forest and woodland on granite (DSG), *E. viminalis* Furneaux forest and woodland (DVF), and Heathland scrub complex at Wingaroo (SCW).

There were 3532 square kilometres of potential New Holland Mouse habitat identified in Tasmania (Figure 2A). A closer look at the St Helens area revealed extensive tracts of potential habitat around the township (Figure 3). However incorporation of a fire layer into the habitat model at both the State (Figure 2B) and St Helens level (Figure 4), which excluded all New Holland Mouse habitat which had not been burnt in the last ten years indicated a significant reduction in the area of 'optimal' habitat i.e. habitat in which we might expect to currently find the New Holland Mouse. We would expect to find the New Holland Mouse in all other 'potential' habitat if it had been burnt in the last ten years but it is important to remember that the species is still occasionally found at detectable levels in much older vegetation in the order of 20-30 years. A fire age of less than ten years was selected as being a predictor of currently suitable habitat as the optimal fire age for New Holland Mouse habitat has been estimated at 3-7 years (Seebeck *et al*. 1996). Inclusion of the fire layer reduced the amount of predicted potential New Holland Mouse habitat from 3532 square kilometres to 658 square kilometres of optimal habitat.

Phytophthora, otherwise known as root rot fungus, has been described as one of the major threats to heathlands in Tasmania, which includes New Holland Mouse habitat (Kirkpatrick el al. 1999). There are a number of plant species which are particularly susceptible to Phytophthora including Xanthorrhoea species, which are indicator plants for New Holland Mouse habitat. Moreover Phytophthora reduces plant species diversity and high plant species diversity has been found to be an important determinant of New Holland Mouse habitat. This insidious disease has been found over much of Tasmania (Figure 5), including the St Helens area (Figure 6) and as searches continue it is likely to be found over a much broader area.

Of the 10 sites identified through desktop mapping as potential New Holland Mouse habitat, over 7 were identified as at least containing suitable habitat (Table 1). The results of the on-ground verification indicated the desktop mapping was reasonably accurate in identifying suitable New Holland Mouse habitat, and may be very useful for broad scale New Holland Mouse habitat planning and management. Furthermore, hair tube surveys returned one 'probable' New Holland Mouse result in the Mt Pearson area which is within 100m of an area identified as potential habitat in desktop mapping. Caution needs to be exercised however in interpreting the accuracy and meaning of the following desktop mapping. It is very important to remember that the areas of potential New Holland Mouse habitat that have been identified in desktop mapping are identified based on information from past New Holland Mouse capture records, and that these capture records may be biased to a certain habitat type. This scenario is feasible given there have been few if any systematic surveys for small mammals that included survey of a range of habitat types, and that researchers surveying specifically for the New Holland Mouse are likely to have focussed their survey effort on areas where they believed they would be more likely to catch the species based on past New Holland Mouse capture

records. In light of this, the results of the desktop mapping in the following report should be used as an indication of where the New Holland Mouse might be found, and not an indication of where the species does not occur.

Three areas, which included areas 1 and 5 identified as being potential New Holland Mouse habitat from the desktop mapping, comprising a total of nine sites (multiple sites were surveyed in each area) were surveyed for the New Holland Mouse using hair tubes (Figure 7). One 'probable' New Holland Mouse hair tube result was obtained which was identified by hair analysis expert Barbara Triggs (Table 2). The area from which the probable hair result was obtained will be surveyed again using hair tubes and Elliott traps to hopefully confirm the result.

The development of an effective hair tube design has been pivotal to the success and continuation of New Holland Mouse surveys. Hair tube surveys are ongoing, and will continue over the next two years in areas of suitable habitat. The resulting information will be used to inform the Natural Values Atlas, a Statewide database of species occurrences, the North East Bioregional Network's 'Linking Landscapes' landscape scale connectivity project, and other local planning schemes in the North East region, particularly the Break O Day Municipality.

Site number	Name and general area	Outcome of on-ground search
1	Area north of Diana's Basin	Suitable habitat
2	Humbug Point	Marginal (mostly grassy/sedgy *E.amygdalina* forest)
3	Humbug Hill	Parts of the area have suitable habitat
4	East of Binnalong Bay Rd near Grants Lagoon	Part of the area has suitable habitat
5	Mt Pearson	Part of the area has suitable habitat
6	Btwn Tasman Hwy and Argonaut Rd	Part of the area has suitable habitat
7	North of Mt Echo	Part of the area has suitable habitat
8	Near Anson's Bay	Suitable habitat
9	Near Pebbly Beach	Probably was suitable habitat but may have been cleared in the last few years
10	South of Bowens Sugarloaf	Did not conduct ground search however knowledge of the area indicates probably suitable habitat

Table 1: Ten sites identified as potential New Holland Mouse habitat around the St Helens area from desktop mapping and the results of on-ground searches to verify the accuracy of the desktop mapping. Sites are mapped in Figure 7.

a. Survey 1, Kuncios, September 2008

Site	Central grid reference (WGS84)	No. of hair tubes	No. of nights set	Mammal species identified
A1	0606694E 5419888N	25	7	No result
A2	0606923E 5419800N	25	7	1 x probable Brush-tail Possum *Trichosurus vulpecula*
A3	0606961E 5419693N	25	7	1 x probable Dog *Canis familiaris*

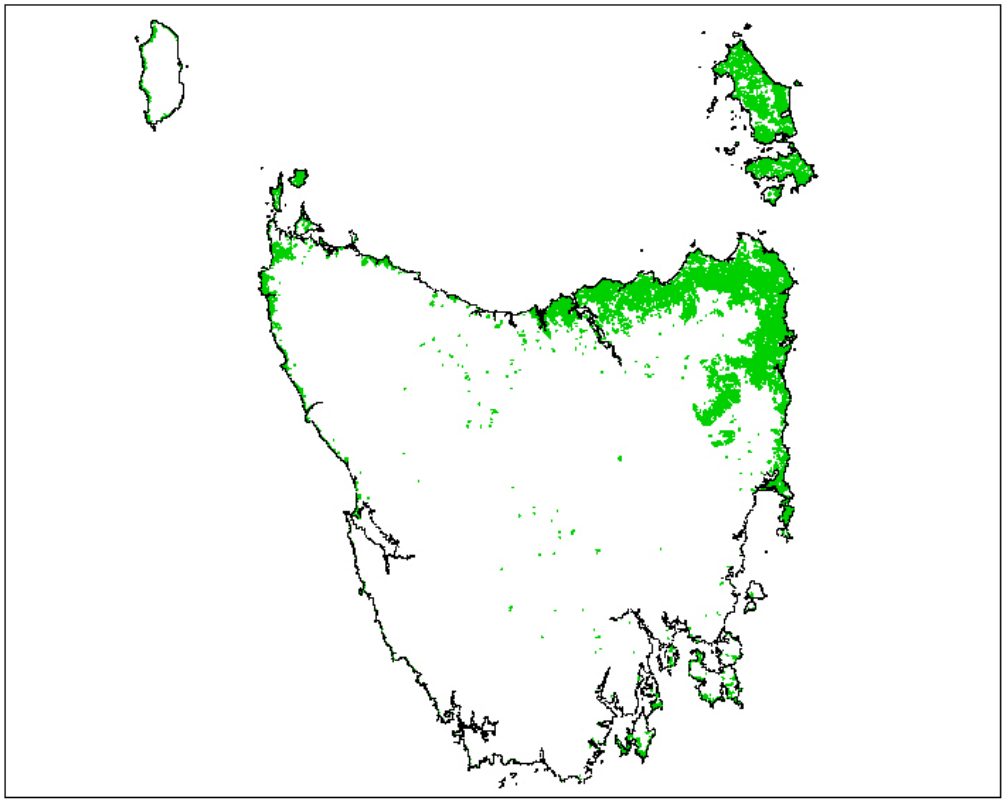
b. Survey 2, RG Binalong Bay, November 2008

Site	Central grid reference (WGS84)	No. of hair tubes	No. of nights set	Mammal species identified
B1	0607398E 5433110N	50	7	5 x definite *Rattus lutreolus* and 5 x probable *Rattus sp.*

c. Survey 3, Mt Pearson Reserve, April 2009

Site	Central grid reference (WGS84)	No. of hair tubes	No. of nights set	Mammal species identified
C1	0606440E 5433788N	15	7	11 x definite House Mouse *Mus musculus*
C2	0606529E 5433999N	15	7	1 x probable House Mouse *Mus musculus*
C3	0606928E 5434148N	15	7	5 x definite House Mouse *Mus musculus* 1 x probable New Holland Mouse *Pseudomys novaehollandiae*
C4	0606928E 5434160N	15	7	One fine hair that was unidentifiable
C5	0607212E 5434378N	15	7	1 x definite House Mouse *Mus musculus*

Table 2: Hair analyses results for each area and site surveyed. Hair analyses were conducted by Barbara Triggs, and a 'definite' identification has a high level of surety of correct diagnosis, whereas a 'probable' identification has a lower surety of correct diagnosis. Probable as opposed to definite hair identifications were usually the result of only a small number of hairs. The number of mammal species identified indicates the number of occurrences of a particular species on a site, and not the number of individuals.



A

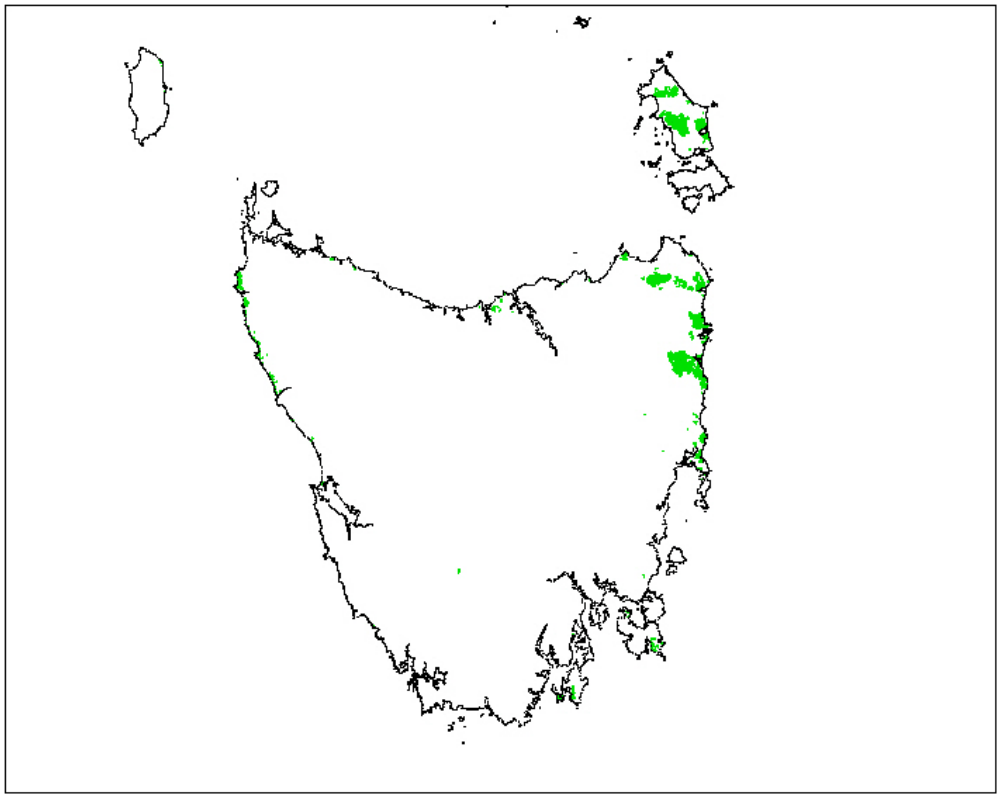


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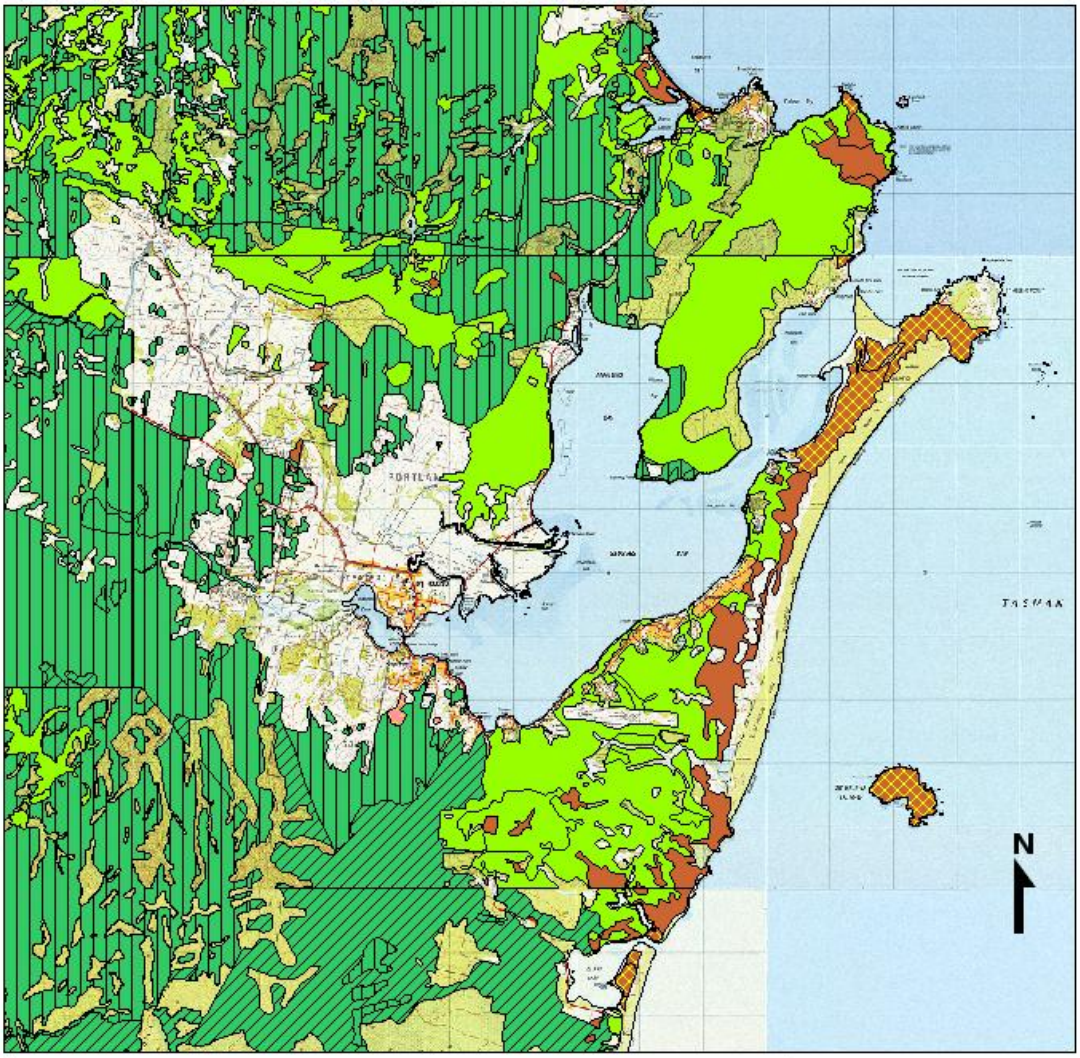
Figure 2 – A. Potential New Holland Mouse habitat based on 11 TASVEG 2.0 layers from which the New Holland Mouse has been recorded in the past. B. Predicted optimal New Holland Mouse habitat based on potential habitat that has been burnt in the last 10 years.



NHM habitat TASVEG 2.0 legend

- SSC Coastal scrub
- SCH Coastal heathland
- SDU Dry scrub
- SCA Coastal scrub on alkaline sands
- DAC Eucalyptus amygdalina coastal forest and woodland
- DNF Eucalyptus nitida Furneaux forest
- DSO Eucalyptus sieberi forest and woodland not on granite
- SHG Heathland on granite
- DSG Eucalyptus sieberi forest and woodland on granite
- DVF Eucalyptus viminalis Furneaux forest and woodland
- SCW Heathland scrub complex at Wingaroo

Figure 3 – Predicted potential New Holland Mouse habitat around the St Helens area. Potential habitat is based upon historic records of the New Holland Mouse from the Tasmanian Natural Values Atlas (DPIPWE 2009) and TASVEG 2.0 layers (DPIPWE).

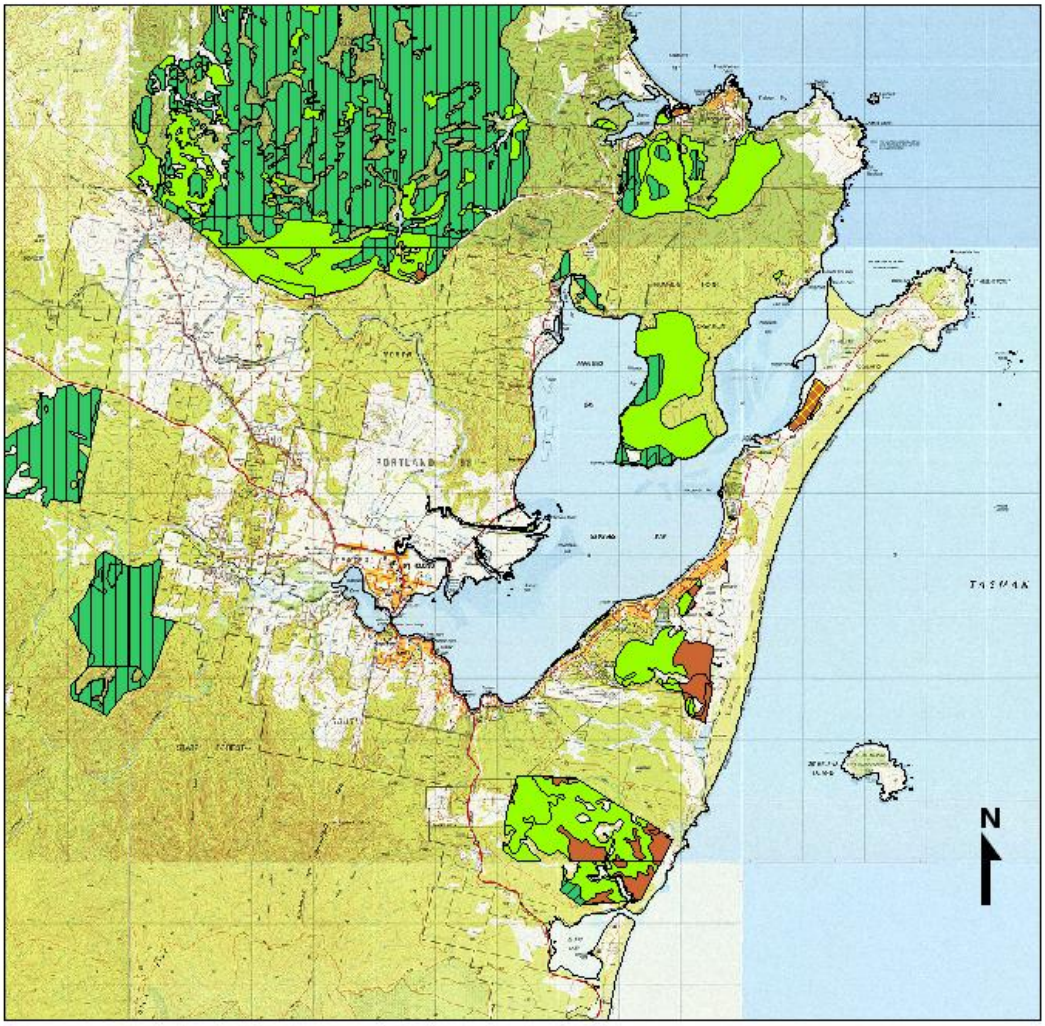


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Figure 4 – Predicted potential New Holland Mouse habitat in the St Helens area that has been burnt in the last 10 years. Fire history information was obtained from DPIPWE and includes both controlled burns and wildfires.

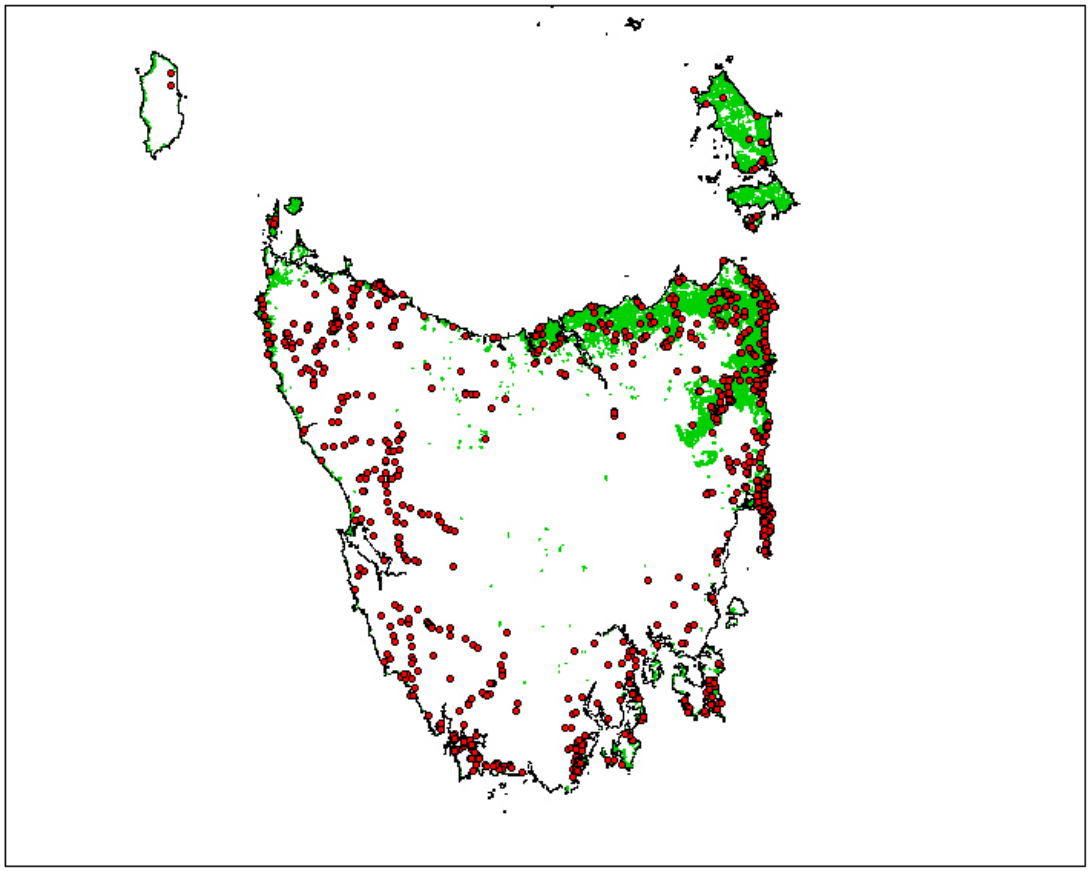
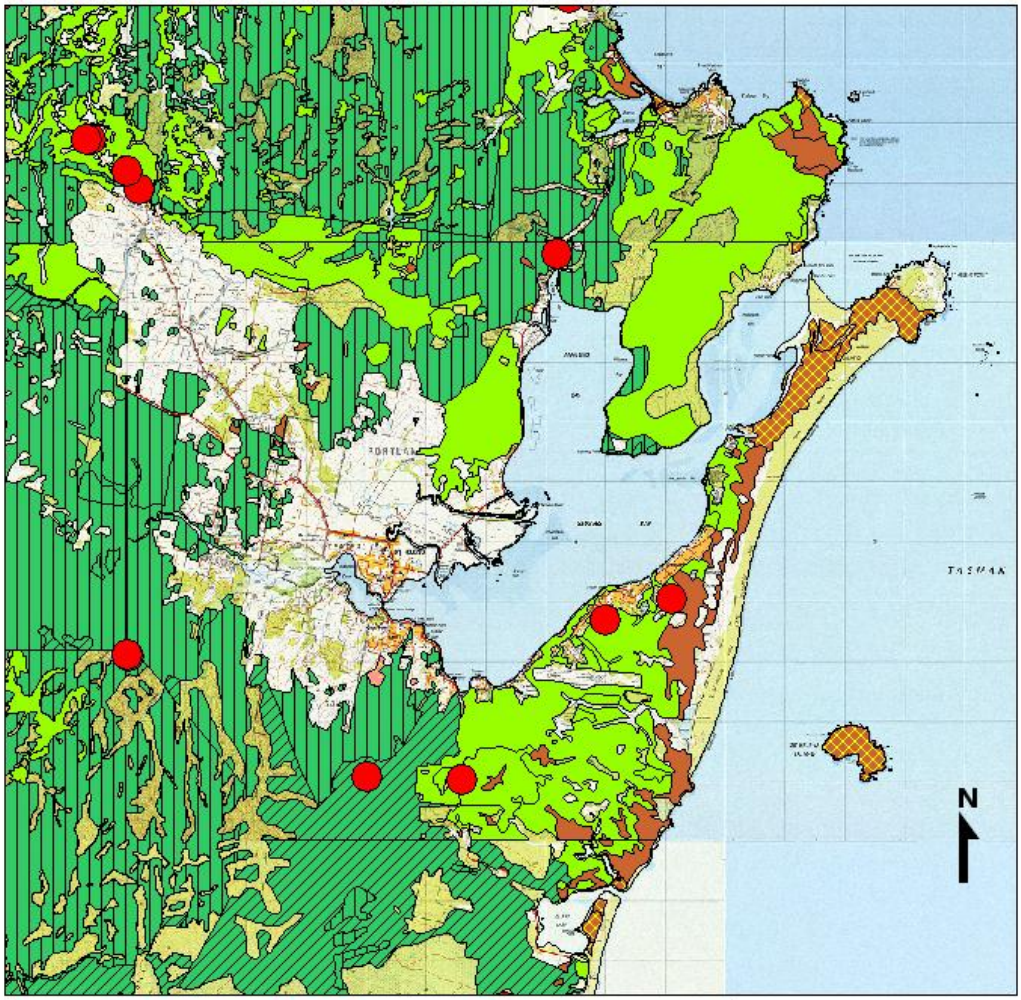


Figure 5 – Predicted potential New Holland Mouse habitat in Tasmania and point isolations where *Phytophthora cinnamomi* has been confirmed. GIS layers were supplied by DPIPWE.



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- DVF Eucalyptus viminalis Furneaux forest and woodland
- SCW Heathland scrub complex at Wingaroo
- Phytophthorra cinnamomi isolation

Figure 6 – Predicted potential habitat around the St Helens area and point isolations of *Phytophthorra cinnamomi* which was confirmed by laboratory analysis. GIS layers were supplied by DPIPWE.

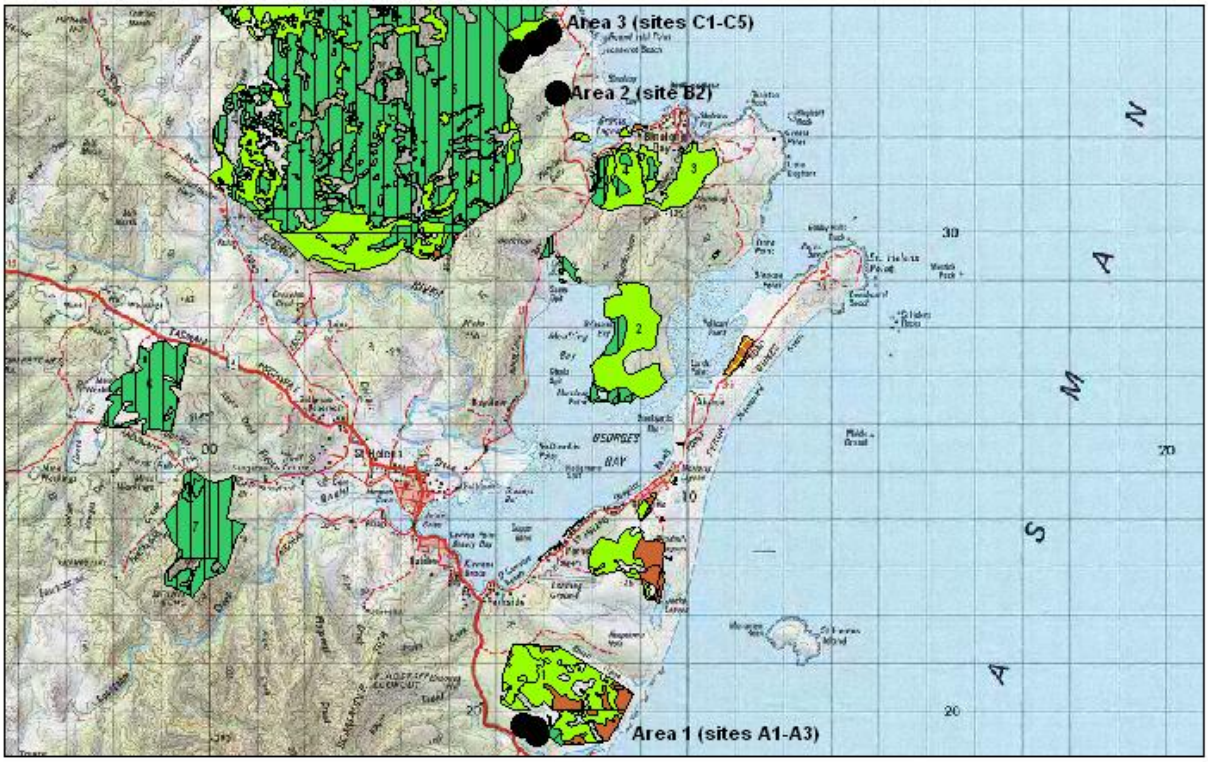

Figure 7 – Location of the hair tube survey areas (each site is marked by a solid black dot) and areas 1-7 of potential habitat (denoted by a number in the middle of a habitat patch) that were identified from desktop mapping and later tested with on-ground searches. Areas 8-10 were further north. For the results of the on-ground verification please refer to Table 1.

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Wilson, B. A. and R. Roede (1995). Identification of New Holland Mouse, *Pseudomys novaehollandiae*, populations using hair sampling tubes. Australian Mammalogy **20**: 135-138.

Acknowledgements

The NEBN would like to thank all volunteers and landowners who participated in the project. If you are interested in having a New Holland Mouse survey done on your land please contact the North East Bioregional Network at www.northeastbioregionalnetwork.org.au

This project was conducted under approval from the DPIPWE Animal Ethics Committee (approval no. 15/2008-09).

New Holland Mouse hair tube survey methods

Background

The North East Bioregional Network is currently conducting a survey for the New Holland Mouse in and around the St Helens area. The New Holland Mouse is listed as Endangered under the *Tasmanian Threatened Species Protection Act 1995*. In Tasmania, the New Holland Mouse is restricted to the east coast and St Helens is a very important component of the species coastal distribution. It has been nearly 20 years since the species was confirmed from some locations in and around St Helens, and it is becoming increasingly important to obtain up-to-date information on locations that the New Holland Mouse currently occupies. Hair tubes, which catch small amounts of hair as small mammals run through them, are being used to collect distribution records for the New Holland Mouse in the St Helens area. Hair samples are then sent to an expert for identification. The following information details methods for setting hair tubes. For a more detailed description of the New Holland Mouse and its' habitat, please refer to the pamphlet titled 'Am I in your backyard? The Threatened New Holland Mouse in North-eastern Tasmania'.

A newly rolled bait pudding

A freshly taped metal band

A hair tube ready to set

Step 1 – Setting hair tubes

Baiting: combine rolled oats, peanut butter, honey and vanilla essence in a large bowl until the mixture just holds together. Roll the mixture into small balls the size of a 5c piece and wrap in one layer of guaze effectively creating a bait plumb pudding.

Taping: remove the metal tape band from the tube and place a 2.5cm length of double-sided tape at either end of the band. Be careful to keep foreign debris from the tape, especially hair. Place the gauze pudding in the central hole on the metal band, insert into the tube, and hook into place with the

rubber band. NB ensure rubber band is elastic and supple. If the rubber band is brittle then replace with a new one.

Setting: It is very important to set at least 25 tubes per site. If more tubes are set, ensure that they are set in blocks of 25 i.e. 25, 50, 75, 100 etc because we need to be able to standardize our hair tube effort between sites. Set each tube 25m from the last one on a 5 by 5 grid ie 5 lines containing 5 tubes at 25m spacing. Each line is set 25m from the last one. Place the tube in a position clear of ants nests, and secure by pushing a nail through the holding bracket into the ground. Mark each individual tube with a piece of flagging tape secured to a nearby shrub or tree.

Recording: Record how many tubes that you have set, the date, obtain a central coordinate for their position (preferentially with a GPS in WGS 84 datum but reading off a map is fine), and describe the vegetation in terms of plant species present, dominant plant species, and soil type. Also record land tenure, land owner contact details, and provide a written description of how you accessed the site e.g. 1km west of Sloop Lagoon off the Old Gardens Road.

Step 2 – Leave in-situ for exactly seven nights.

Ensure that hair tubes are left in situ for at least seven nights. They can be left in-situ for a couple of extra nights if absolutely necessary.

Step 3 – Collecting hair tubes

Walk down each grid line systematically collecting hair tubes. At each tube, carefully slide the metal band from the tube and inspect thoroughly for hairs. Use a magnifying glass if necessary. If hairs are spotted (even if it is only one) peel the tape off the band and place in an individual snap lock bag. Label the bag with location, date, and collector's name.

Step 4 – Washing survey materials and preparing to reset.

Remove double sided-tape from hair tubes. Wash all hair tubes, including pegs and nails in water, being sure to wash off any dirt residue. Leave tubes and associated gear to dry in the sun. Wash boots and any other survey gear that has come in contact with soil in a similar fashion. New Holland Mouse habitat is very susceptible to root rot infection therefore it is extremely important not to spread the disease from one site to another.

Step 5 – Forwarding survey results and gear

Return clean survey gear, survey notes, and any hair samples to either Todd Duddley or Benjamin Dean from the North East Bioregional Network.

Thank-you for your hard work and time