A Survey of Threatened Stag Beetles

on the Tasmanian Land Conservancy Blue Tier and West Pyengana Reserves in North East Tasmania

Jane Keble-Williams

2013

TASMANIAN | Land CONSERVANCY

A Survey of Threatened Stag Beetle Species on the Tasmanian Land Conservancy Blue Tier and West Pyengana Reserves in North East Tasmania.

A Report to the Board of the Tasmanian Land Conservancy

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18 October 2013

Table of Contents

Report Summary 5
Introduction: Why Bother About Beetles? 6
Significance of Blue Tier and Surrounds..... 7
The Genus *Hoplogonus* Parry, 1875 (Coleoptera, Scarabaeoidea, Lucanidae)..... 7
Simson's and Vanderschoor's Stag Beetles (*H. simsoni* and *H. Vanderschoori*)..... 9
Community Engagement 10
The Surveys 11
Site Descriptions 13
Results 17
Results: *Hoplogonus simsoni*, Blue Tier 17
Results: *Hoplogonus vanderschoori*, West Pyengana.....19
Project Limitations 20
Summing Up 21
Conclusions.....21
Acknowledgments.....22
References.....23
Appendix 1. Identifying features for *Hoplogonus* spp. (Coleoptera, Scaraboidea, Lucanidae, Lucaninae).....27
Appendix 2. Survey Volunteer Flyer 29
Appendix 3. Recording Sheets: Figure A.3.1. Timed Search.....30
Figure A.3.2. Systematic Area Search.....31
Appendix 4 . Site Characteristics 32
Appendix 5. Survey Results: Blue Tier 33
Appendix 6. Survey Results: West Pyengana.....35
Appendix 7 Photo-record of the specimens observed or collected in the surveys.....37

List of Tables and Figures

Figure 1. Male Simson's Stag Beetle, *H. simsoni*, found at Tasmanian Land Conservancy Blue Tier Reserve, 21/02/2013. Photo: Jane Keble-Williams. 5

Figure 2. Head and thorax of male Vanderschoor's, Stag Beetle, *H. vanderschoori*, found at West Pyengana Reserve, 24/02/2013. Photo: Jane Keble-Williams..... 6

Figure 3. Parry's drawings of *Hoplogonus simsoni* in the original description of the beetle species: (1) male, (2) female, (3) details of spines on the thorax and elytra. Source: Parry, F. J. S., 1875; Description of a new genus and species of lucanoid Coleoptera from the interior of Tasmania, *Cistula Entomologica,* 2, page 134 Figure 11.1, 2, 3..... 8

Figure 4. Documented distribution of *Hoplogonus* Stag Beetles in north east Tasmania and approximate locations of the Tasmanian Land Conservancy (TLC) Blue Tier and West Pyengana Reserves. Modified from Munks et al., 2004, page 593, Figure 3. 9

Figure 5. Head and mandibles of females of (a) *H. simsoni* and (b) *H. vanderschoori*, showing differences in the mandibular structure. Scale bar = 2mm. Modified from Bartolozzi, L., 1996b. Description of a new species of *Hoplogonus* Parry, 1875 from Tasmania (Coleoptera Lucanidae), *Redia,* 79, page 94, figure 11. 10

Figure 6. Supporters Day at Blue Tier, 27/04/2013. Photo: Chris Crerar..... 10

Figure 7. Survey Protocol based on Forest Practices Authority, Fauna Technical Note No. 11: Method for surveying for *Hoplogonus* stag beetle species, Version 1.2 Feb 2011 11

Figure 8. Identification card for Simson's Stag Beetle, *Hoplogonus Simsoni*. Sources: http://www.threatenedspecieslink.tas.gov.au/simsons-stag-beetle; Bartolozzi 1996a; Bartolozzi 1996b; Matthews 1984; Parry 1875. Photos: Jane Keble-Williams..... 12

Figure 9. Location of the Tasmanian Land Conservancy Reserves in North East Tasmania 14

Figure 10. Blue Tier Reserve: vegetation type, location of surveys and presence/absence of Simson's Stag Beetle, *H. simsoni*, at the survey sites. See also Table 1. 15

Figure 11. West Pyengana Reserve: vegetation type, location of surveys and presence/absence of Vanderschoor's Stag Beetle, *H.vanderschoori*, at the survey sites. See also Table 2. 16

Figure 12. Non-*Hoplogonus* Stag Beetles (Lucanidae): (a) *Lissotes rudis* Lea 1910, male, photographed in situ at Blue Tier, 23/02/2013; (b) *Syndesus cornutus*, male, found at Blue Tier, 3/04/2013. Photos: Jane Keble-Williams..... 17

Table 1. Results of area and timed surveys for Simson's Stag Beetle, *Hoplogonus simsoni*, at the Tasmanian Land Conservancy Blue Tier Reserve (summary of data from Appendix 5)..... 17

Figure 13. Female Simson's Stag Beetle, *H. simsoni*, photographed in situ at Blue Tier, 22/02/2013, survey btT1. Photos: Jane Keble-Williams. 18

Figures 14. Entire, but dead Simson's Stag Beetles, *H. simsoni*, found at Blue Tier Reserve: (a) female and (b) male found in wet Eucalypt forest, 22/02/2013, survey btT1; (c) male found in rainforest, 23/02/2013, survey btA2. Photos: Jane Keble-Williams. 18

Figure 15. Examples of fragment s of Simson's Stag Beetles, *H. simsoni*, demonstrating the spines on (a) thorax (b) elytra. Specimens found at Blue Tier Reserve, in rainforest, 3/04/2013, survey btT2. Photos: Jane Keble-Williams. 19

Table 2. Results of area and timed surveys for Vanderschoor's Stag Beetle, *Hoplogonus vanderschoori*, at the Tasmanian Land Conservancy West Pyengana Reserve (summary of data from Appendix 6). 19

Figure 16. Examples of fragment s of Vanderschoor's Stag Beetles, *H. vanderschoori*,: (a) male head and mandibles (b) elytra, showing spines. Specimens found at West Pyengana Reserve, in rainforest, 24/02/2013, survey pyA2. Photos: Jane Keble-Williams. 20

Figure 17. Survey volunteers Marg Fitzgerald and Ian Matthews at work at West Pyengana Reserve, 24/02/2013. Photo: Matt Taylor. 22

Report Summary

The iconic Simson's Stag Beetle (*Hoplogonus simsoni*) (Figure 1), and its close relative Vanderschoor's Stag Beetle (*H. vanderschoori*) (Figure 2) are nationally endangered and occur, in separate ranges, only within a small area of Tasmania's north east, in the cool, wet forests around the Blue Tier Plateau. Adults live in the deep, moist leaf litter carpeting mature rainforest and wet eucalypt forest, while larvae live in the soil beneath the litter layer. This cool moist microenvironment is essential for these Stag Beetle species' survival, and is found at the Tasmanian Land Conservancy Blue Tier New Leaf Reserve and West Pyengana Reserve, which are close to the known ranges of Simson's, and Vanderschoor's, Stag Beetles respectively. The aim of the surveys has been to establish that the Stag Beetles occur at the properties and to engage local landholders in this conservation research. At a volunteer survey weekend in February, and further surveys in April, Simson's Stag Beetle was found at the TLC Blue Tier Reserve, while Vanderschoor's Stag Beetle was found at West Pyengana. These results will establish a baseline for ongoing monitoring of these threatened beetles; guide management of the reserves; and the data will be forwarded to the state government Natural Values Atlas, which informs the National Recovery Plan for each species.

Figure 1. Male Simson's Stag Beetle, *H. simsoni*, found at Tasmanian Land Conservancy Blue Tier Reserve, 21/02/2013. Photo: Jane Keble-Williams.

Introduction: Why Bother About Beetles?

Coleoptera is an ancient insect order: beetle fossils date from the Permian, at least 250 million years ago (Labandiera, 1998) and the order underwent a rapid species radiation coincident with the rise of the Angiosperms during the Cretaceous, 145 million years ago (Gullen & Cranston, 2000). With some 300,000 named species (in around 160 families) worldwide, Coleoptera is considered the largest and most diverse of the insect orders (Gullen & Cranston, 2000; Lawrence & Britton, 1991; New, 2007) and has long been regarded so, as epitomised by J.B.S. Haldane's oft quoted (e.g. in Fortey, 2008: 33) response to an eminent cleric that the Almighty must have 'an inordinate fondness for beetles'.

The Coleoptera have engaged people for millennia: the Ancient Egyptians revered the scarab beetle as sacred; while eighteenth and nineteenth century European naturalists were awed by the richness of beetle fauna at home and overseas. With advances in taxonomy and cladistics and better understanding of beetle biology, there is increasing recognition globally of the importance of beetles in the functioning of a wide range of ecosystems, and the need for conservation of individual taxa and their habitat (Evans & Bellamy, 2000; New, 2007). In Australia, concern for beetle conservation has focused mainly on the trade in charismatic taxa by beetle collectors; and the effects on habitat of forestry practices (New, 2007). With regard to forest ground beetle conservation, Tasmanian researchers have highlighted the importance of mature forest with minimal disturbance, retaining logs in varying stages of decay, and a deep leaf litter layer (Fox et al., 2004; Grove, 2002; Meggs & Munks, 2003; Meggs et al., 2003; Michaels & Bornemissza, 1999) – the environment found at both Tasmanian Land Conservancy Reserves in the region of Blue Tier in north east Tasmania.

Figure 2. Head and thorax of male Vanderschoor's, Stag Beetle, *H. vanderschoori*, found at West Pyengana Reserve, 24/02/2013. Photo: Jane Keble-Williams

Significance of Blue Tier and Surrounds

Tasmania's unique temperate rainforest flora reached its peak in diversity and range over 35 million years ago during the Middle Tertiary, when the climate was considerably warmer and wetter than today (Hill *et al.*,1999). In the Late Tertiary, the establishment of the Southern Ocean circumpolar current and expansion of the Antarctic ice sheet caused marked cooling and increased aridity in Australia (Quilty, 1994). The subsequent glacial-interglacial cycles of the Pleistocene saw varying degrees of contraction and expansion in rainforest and wet forest cover, and also fluctuation in sea level (Hill, 2004; Jackson, 1999). During these climatic perturbations, the retreat of rainforest and wet forest taxa to isolated damp and sheltered refugia (Kirkpatrick & Fowler, 1998; Nevill *et al.*, 2012) was compounded by Tasmania's eventual insolation from mainland Australia (Lambeck & Chappel, 2001). The rainforest and wet forest refugia effectively became, often widely separated, islands of flora with their associated invertebrate fauna.

North east Tasmania in particular, isolated from similar habitat in the south and west, has been considered to be a distinct biogeographical region (Mesibov, 1994; 1996). Among rainforest flora, genetic variations have been found which are specific to north east Tasmania (Worth, *et al.*, 2009; Worth, *et al.*, 2011), while a number of invertebrate taxa are found only in this region (Fountain-Jones *et al.*, 2012; Fox *et al.*, 2004; Keble-Williams, 2012; Mesibov, 1998, 1999; Ruhberg *et al.*, 1991) including stag beetles in the genus *Hoplogonus* (Meggs *et al.*, 2003; Munks *et al.*, 2004).

The Genus **Hoplogonus** *Parry, 1875 (Coleoptera, Scarabaeoidea, Lucanidae)*

The genus *Hoplogonus* sits within the family Lucanidae - known commonly as the 'Stag Beetles' because the males of most species in this family bear enlarged mandibles reminiscent of a stag's antlers. Globally, some 1,250 Lucanid species (in 95 genera) have been described; nearly a tenth of which, of ancient Gondwanan and more recent Oriental origin, are found in Australia (97 species in 17 genera) (Moore, 1987; Moore & Cassis, 2000, modified by Calder). Within the Australian Lucanidae, one third of species are endemic to Tasmania (32 species in 4 genera) and a further three occur in Tasmania as well as the mainland (ABRS, 2009). By comparison in Britain, another small island, climatically similar to Tasmania and where the insect fauna has been exhaustively studied and documented, just four Lucanid beetle species

(in 4 genera) have been found (Barnard, 2011). Thus Tasmania is a significant centre for stag beetle diversity in Australia and also worldwide.

Simson's Stag Beetle, *Hoplogonus simsoni,* described by Major F.J.S. Parry in 1875 (Figure 3), and named for its collector Augustus Simson (Parry, 1875), was the first discovered of the three *Hoplogonus* species which are confined to the Blue Tier region of north east Tasmania. Vanderschoor's and Bornemissza's Stag Beetles (*H. Vanderschoori* and *H. Bornemisszai*) were not recognised and described until the mid 1990's (Bartolozzi, 1996a & 1996b).

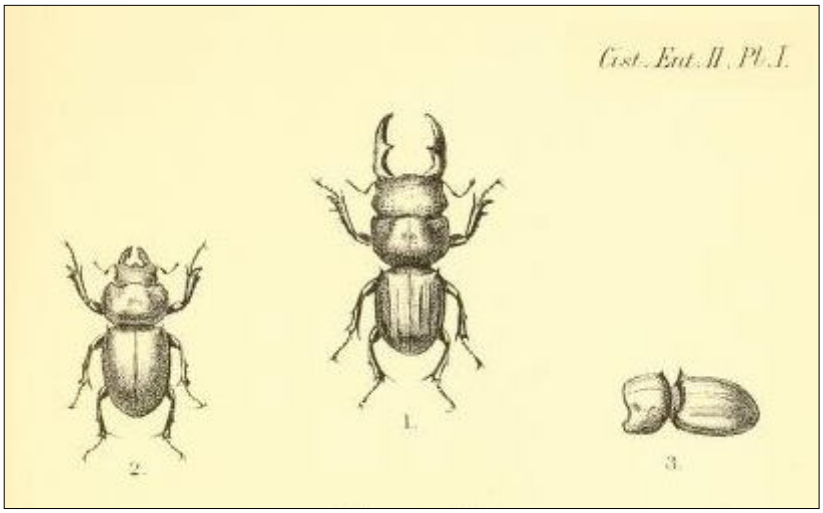


Figure 3. Parry's drawings of *Hoplogonus simsoni* in the original description of the beetle species: (1) male, (2) female, (3) details of spines on the thorax and elytra. Source: Parry, F. J. S., 1875; Description of a new genus and species of lucanoid Coleoptera from the interior of Tasmania, *Cistula Entomologica,* 2, page 134 Figure 11.1, 2, 3.

In recent decades the beetles have been surveyed (Meggs *et al.* 2003; Munks *et al.* 2004) and their ranges documented (Figure 4), although their distribution within these ranges is clustered. *Hoplogonus simsoni* has been studied the most extensively (Fox *et al.*, 2004; Meggs, 1997, 2003; Meggs *et al.*, 2003 & 2004). Abundance of *H. simsoni* was found to be influenced by forest structure, leaf litter depth, altitude, gradient and absence of disturbance for at least 50 years; optimum conditions occurring in wet eucalypt forest below 300m (Meggs *et al.*, 2003). All three *Hoplogonus* species are listed under the Environment Protection and Biodiversity Act 1999. The land parcels which are now the Tasmanian Land Conservancy Blue Tier and West Pyengana Reserves were not targeted as part of the above surveys, but being within, and close to, the known ranges of *H. simsoni* and *H. Vanderschoori* respectively, and with suitable habitat, they could be expected to support these stag beetles.

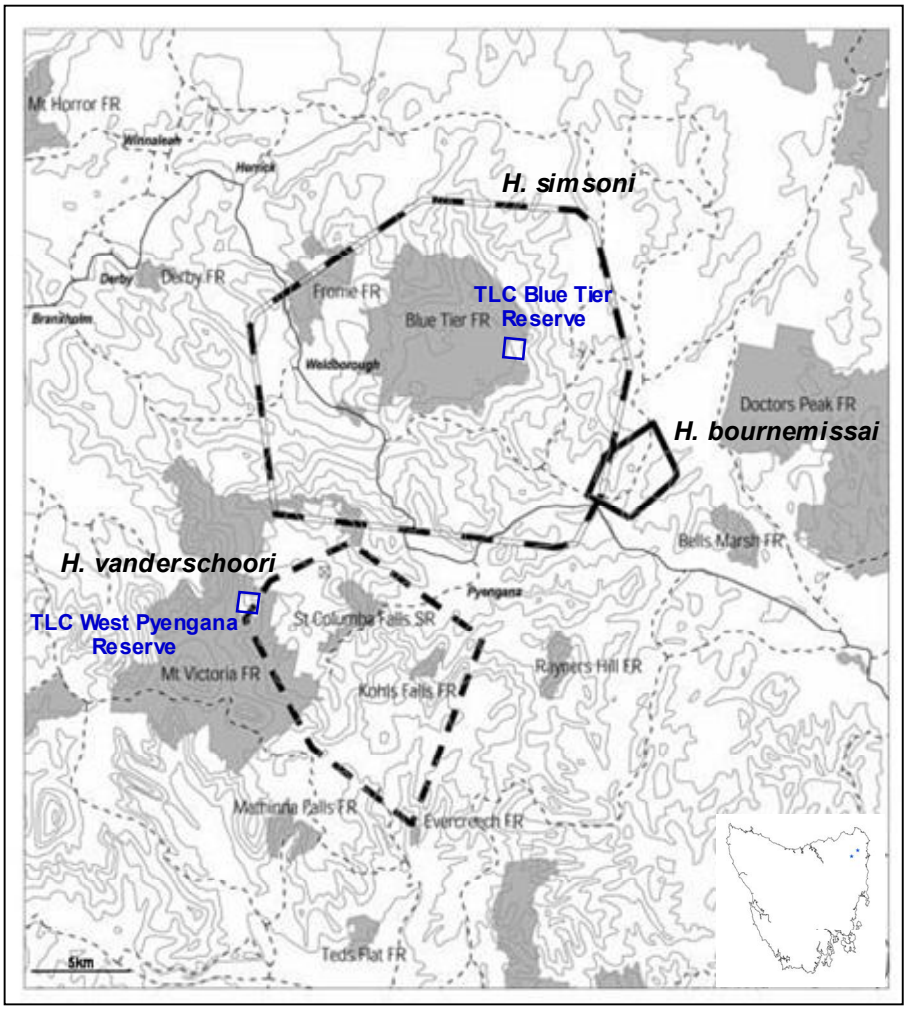


Figure 4. Documented distribution of *Hoplogonus* Stag Beetles in north east Tasmania and approximate locations of the Tasmanian Land Conservancy (TLC) Blue Tier and West Pyengana Reserves. Modified from Munks et al., 2004, page 593, Figure 3.

*Simson's and Vanderschoor's Stag Beetles (*H. simsoni *and* H. Vanderschoori*)*

The following brief description is drawn from several sources: K. Richards & C Spencer pers. comm.; P. McQuillan pers. comm.; Fox *et al.*, 2004; Meggs, 1997, 2003; Meggs *et al.*, 2003; Meggs *et al.*, 2004; Munks *et al.* 2004.

The *Hoplogonus* Stag Beetles are found in wet and damp Eucalypt forest and in rainforest. Adults of both Simson's and Vanderschoor's are large (body length up to 24mm for *H. simsoni*), black, glossy, flightless and relatively inactive. They inhabit deep, damp leaf litter especially where it banks against logs and rocks, or may live under rotting logs.

Although long lived (up to 2 years in the larval stage and up to 3 years in the adult stage for *H. simsoni*) the adult males do not feed, instead surviving on the fat reserves laid down as larvae. The larvae are soil dwelling beneath a deep leaf litter layer, the decomposition of which contributes nutrients. Adults are thought to be at their most

active in spring and summer, males in December/January, females in January/February.

The anatomically defining feature of the genus is the presence of prominent spines on the antero-lateral angles of the elytra; while the species are differentiated by variations in the tooth-like protrusions on the mandibles (Appendix 1; Figure 5).

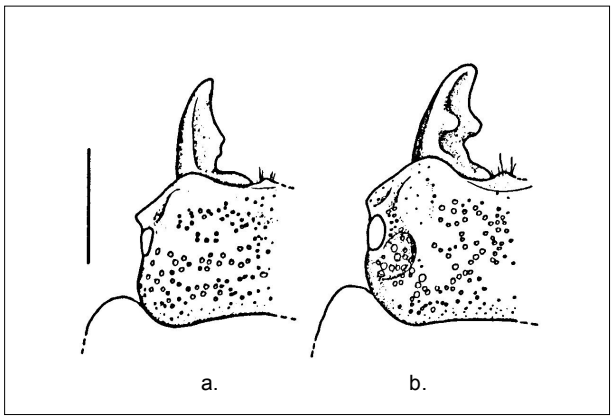


Figure 5. Head and mandibles of females of (a) *H. simsoni* and (b) *H. vanderschoori*, showing differences in the mandibular structure. Scale bar = 2mm. Modified from Bartolozzi, L., 1996b. Description of a new species of *Hoplogonus* Parry, 1875 from Tasmania (Coleoptera Lucanidae), *Redia,* 79, page 94, figure 11.

Community Engagement

In keeping with Tasmanian Land Conservancy (TLC) policy of engaging with neighbouring landowners, and communities close to the organisation's reserves, volunteers from the Blue Tier region were invited to participate in the surveys by flyer (Appendix 2). Updates about the surveys were posted on the organisation's blog and in newsletters, and a supporters day was held at Blue Tier (Figure 6).

Figure 6. Supporters Day at Blue Tier, 27/04/2013. Photo: Chris Crerar.

The Surveys

The surveys followed a modified protocol based on that used by the Forest Practices Authority for surveying *Hoplogonus* stag beetles (FPA, 2011). Two types of survey were followed: a timed search which establishes presence or absence of the target species; and a systematic area search aimed at providing a measure of species density (Figure 7).

Survey Notes

Timed Search (duration 2 person hours)

Note:
- GPS co-ordinates at start
- Start and end time
- General direction of the search and approx distance/area covered
- GPS co-ords of any specimens found

Systematic Area Search

- 10 m radius plot;
- six $1m^2$ quadrats per plot, placed at 'random ', but aiming to sample all potential microhabitats (leaf litter, under logs, under rocks, etc)
- note GPS coordinates of each quadrat
- within each quadrat area, systematically search for live *Hoplogonus* species and body parts of dead ones
- 15 minutes maximum per quadrat

For both survey methods record:

- species, if known (photo of unknown live specimens)
- condition – live, dead, fragment; male/female
- count
- fragments/parts of dead beetles can be removed for identification off site – these should be placed in a vial of ethanol and labelled with GPS coordinates/observation number
- where found - leaf litter, under log etc
- main vegetation type and any other site comments

Live beetles to be recorded and released at site of capture.

Figure 7. Survey Protocol based on Forest Practices Authority, Fauna Technical Note No. 11: Method for surveying for *Hoplogonus* stag beetle species, Version 1.2 Feb 2011

Recording sheets were drawn up for use on site (Appendix 3), including survey notes for volunteers. A laminated identification card was created for easy recognition of Simson's Stag Beetle (Figure 8) illustrating the beetle and summarising the salient features gleaned from various sources (Appendix 1; Threatened Species Link

website). Lightweight, flexible 1m^2 quadrats were made from old garden irrigation pipe.

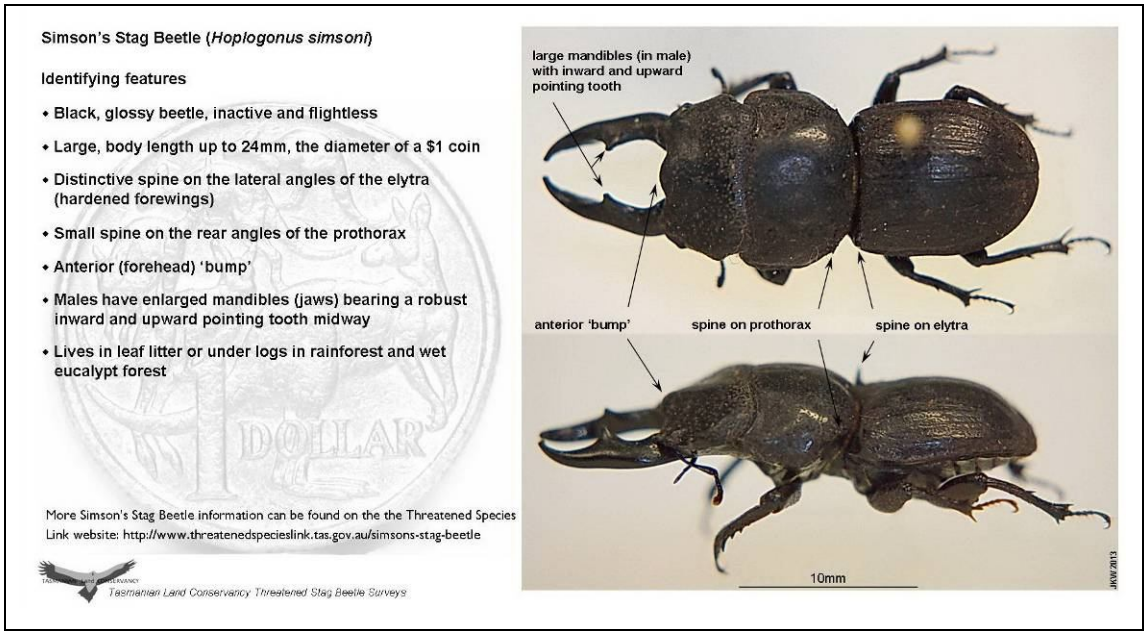


Figure 8. Identification card for Simson's Stag Beetle, *Hoplogonus Simsoni*. Sources: http://www.threatenedspecieslink.tas.gov.au/simsons-stag-beetle; Bartolozzi 1996a; Bartolozzi 1996b; Matthews 1984; Parry 1875. Photos: Jane Keble-Williams.

All live beetle specimens were left in situ, having been photographed if identification was uncertain. Beetle fragments were collected in vials of 70% ethanol and labelled with GPS co-ordinates, date, site and survey type. The fragments were later microscopically examined, photographed and identified. The beetle counts are of necessity an estimate, since it is impossible to know how many individual beetles are represented among a collection of fragments and body parts, thus the 'total' is the minimum number of beetles which could be present (FPA 2011) e.g. two elytra and a thorax has a minimum count of two beetles.

The results were entered into a spreadsheet database, and a copy forwarded to the Threatened Species and Marine Section, Department of Primary Industries, Parks, Water & Environment, for inclusion in the state government Natural Values Atlas, which informs the National Recovery Plan for each species. In order to produce a cartographical record of the results, the GPS co-ordinates were loaded into GIS software (Quantum GIS version 1.8 Lisboa), together with details of specimens found, or not, at each location.

Site Descriptions

The two Tasmanian Land Conservancy (TLC) reserves are situated in the highland of north east Tasmania approximately 25km inland from St Helens. They are roughly 10 km apart as the crow flies (Figure 9).

Blue Tier (Figure 10)

The TLC Blue Tier Reserve (83ha) is situated on the south-eastern slopes of the Blue Tier plateau, due east of Mt. Michael; it is accessed from the Sun Flats car park via the Three Notch walking track and a taped walking route. The reserve sits on granite and spans an altitude range of 190m (from 730m at the western boundary to 540m in the east); and is dissected by several steep, densely vegetated gullies. The predominant vegetation type (TASVEG 2 classification) is *Nothofagus – Atherosperma* rainforest (RMU) surrounding areas of *Nothofagus - Leptospermum* rainforest (RML) and a pocket of *Eucalyptus regnans* wet forest (WRE) in the north-eastern corner. The *Nothofagus – Atherosperma* rainforest abuts *Leptospermum* swamp forest (NLE) in the south-western corner.

West Pyengana (Figure 11)

The TLC West Pyengana Reserve (96ha) is on a mostly eastern facing slope at the foot of the Rattler Range; it is accessed at its south-eastern corner via an unsealed road branching off Forest Lodge Road. This reserve also sits on granite; its altitude range is 240m (from 800m in the south western corner to 560m in the north east); and two broad gullies flow out towards the northern boundary in the north-eastern corner of the reserve. The vegetation type (TASVEG 2 classification) is *Nothofagus – Atherosperma* rainforest (RMU).

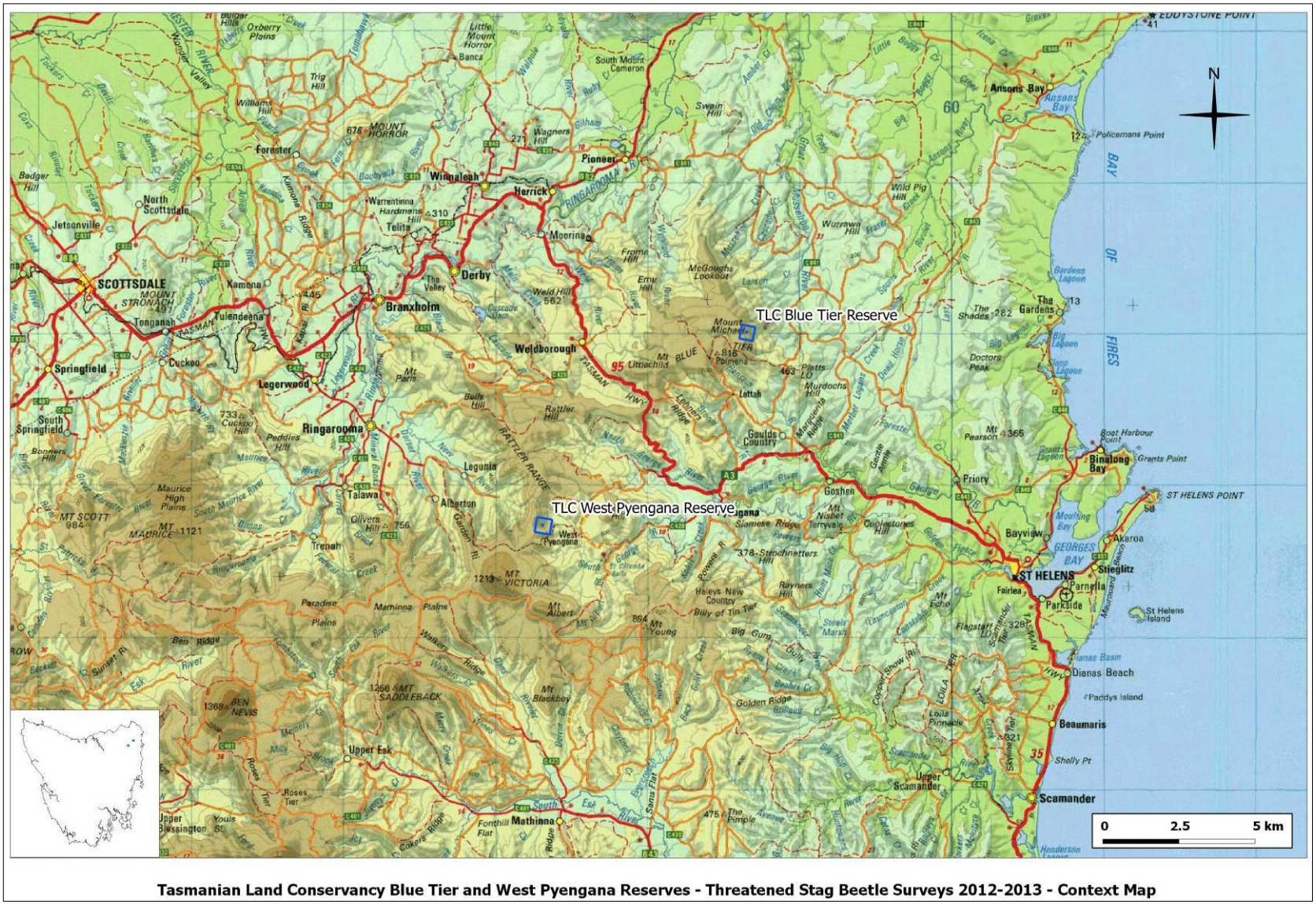
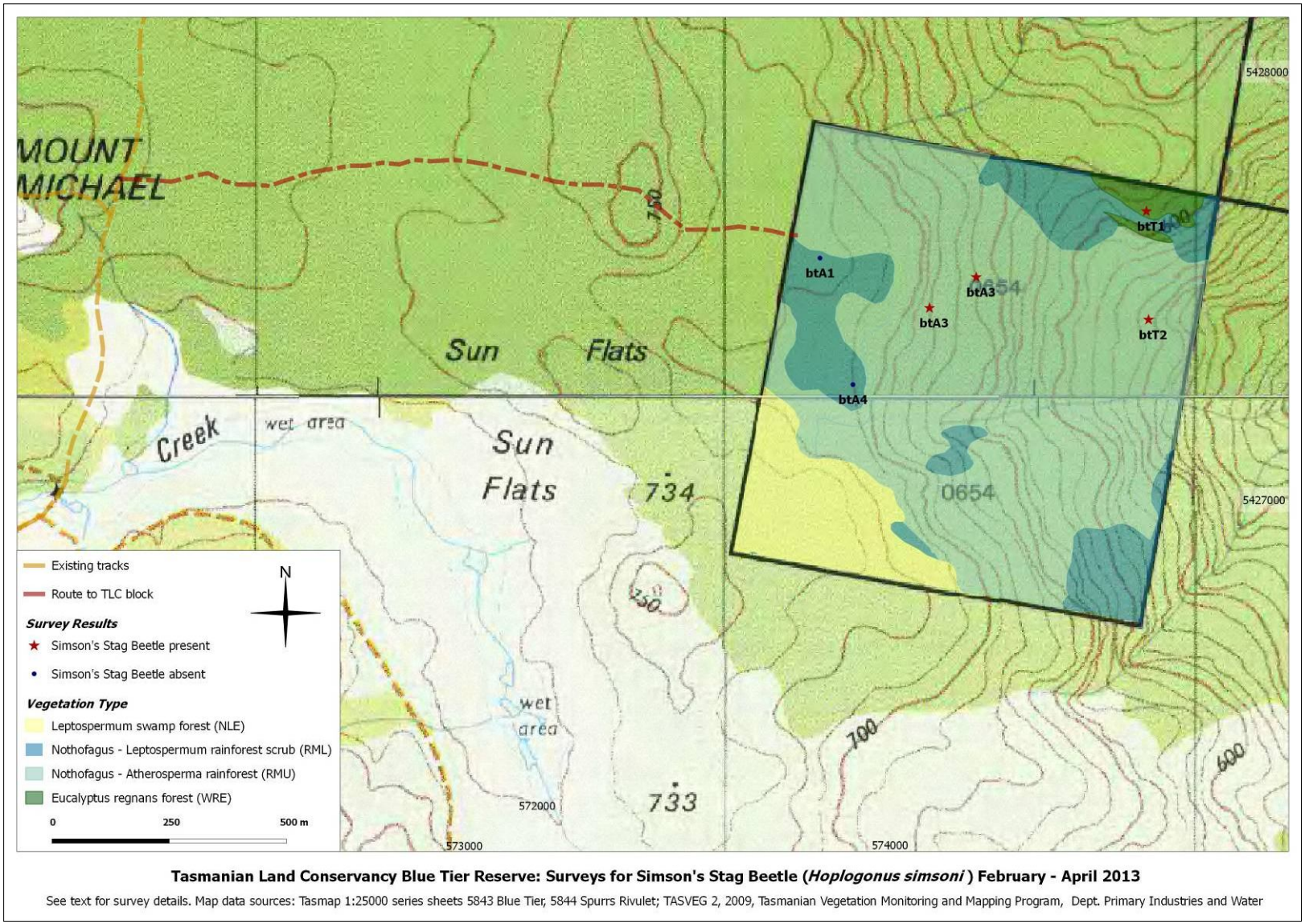


Figure 9. Location of the Tasmanian Land Conservancy Reserves in North East Tasmania



Tasmanian Land Conservancy Blue Tier Reserve: Surveys for Simson's Stag Beetle (*Hoplogonus simsoni*) February - April 2013

See text for survey details. Map data sources: Tasmap 1:25000 series sheets 5843 Blue Tier, 5844 Spurrs Rivulet; TASVEG 2, 2009, Tasmanian Vegetation Monitoring and Mapping Program, Dept. Primary Industries and Water

Figure 10. Blue Tier Reserve: vegetation type, location of surveys and presence/absence of Simson's Stag Beetle, *H. simsoni*, at the survey sites. See also Table 1.

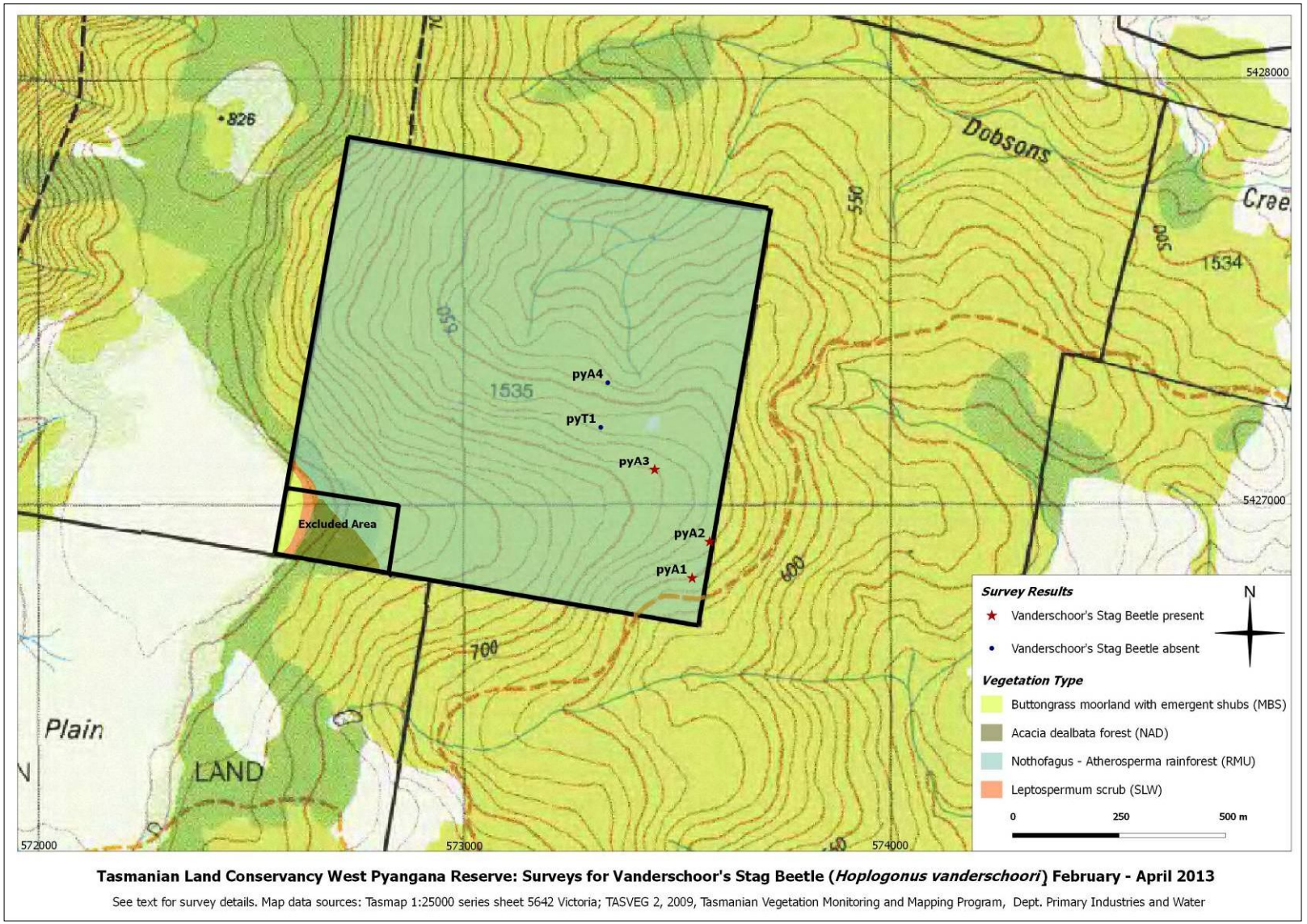


Figure 11. West Pyengana Reserve: vegetation type, location of surveys and presence/absence of Vanderschoor's Stag Beetle, *H.vanderschoori*, at the survey sites. See also Table 2.

Results

A total of eleven surveys were completed (six at Blue Tier Reserve, five at West Pyengana) yielding an overall total (entire beetles and fragments) of at least 30 *Hoplogonus* beetles (24 *H. simsoni* and 6 *H. vanderschoori* respectively). In addition, at least 34 non-*Hoplogonus* ground beetles from six families were found (Appendices 5, 6 & 7), including five non-*Hoplogonus* Lucanidae individuals - four *Lissotes* sp. and one *Syndesus cornutus* (Figure 12).

a. b.

Figure 12. Non-*Hoplogonus* Stag Beetles (Lucanidae): (a) *Lissotes rudis* Lea 1910, male, photographed in situ at Blue Tier, 23/02/2013; (b) *Syndesus cornutus*, male, found at Blue Tier, 3/04/2013. Photos: Jane Keble-Williams

Results: *Hoplogonus simsoni*, Blue Tier

Simson's Stag Beetle was found at two thirds of the survey sites explored at Blue Tier (surveys btT1, btA2, 3 & 4), and in each of these, traces were found of multiple individuals (Table 1, Appendices 5 & 7).

Blue Tier				**Simson's Stag Beetle: *Hoplogonus simsoni***					
Survey Type	**Date**	**Site & Survey Code**	**Altitude (m)**	**Live**		**Dead** (minimum count)			**Total**
				m	**f**	**m**	**f**	**m/f**	
Area	23/02/2013	btA1	720	0	0	0	0	0	0
	23/02/2013	btA2	680	0	0	1	0	3	4
	23/02/2013	btA3	660	0	0	3	0	4	7
	2/04/2013	btA4	710	0	0	0	0	0	0
Area Surveys Total				***0***	***0***	***4***	***0***	***7***	***11***
Timed	22/02/2013	btT1	610-620	0	1	2	1	2	6
	3/04/2013	btT2	555	0	0	1	1	5	7
Timed Surveys Total				***0***	***1***	***3***	***2***	***7***	***13***
Overall Total				**0**	**1**	**4**	**2**	**14**	**24**

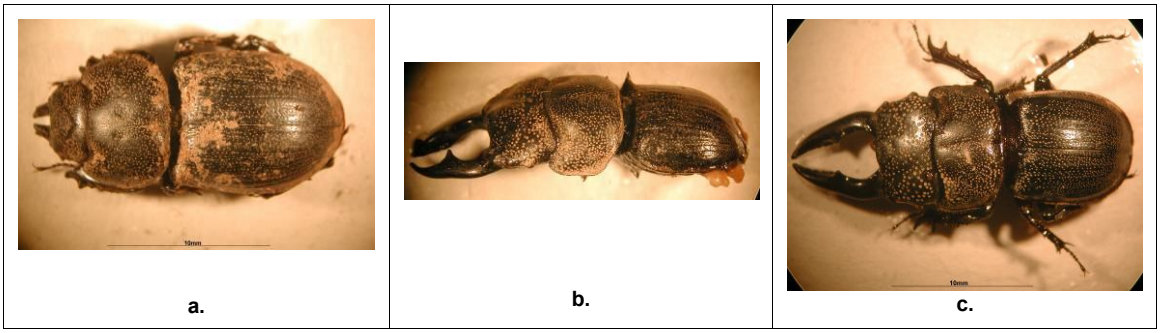
Table 1. Results of area and timed surveys for Simson's Stag Beetle, *Hoplogonus simsoni*, at the Tasmanian Land Conservancy Blue Tier Reserve (summary of data from Appendix 5).

The specimens were found at the lower altitude (≤ 680m), steeper gradient survey sites: btT1 being in *Eucalyptus regnans* wet forest (WRE) and the remainder in *Nothofagus – Atherosperma* rainforest (RMU) (Figure 10). The beetles, or fragments thereof, were found in deep damp leaf litter, especially where it banked against logs or rocks, except survey btT2, where parts of at least two *Hoplogonus* beetles, and miscellaneous other beetle fragments, were found on the leaf litter below a tall tree stump (Appendix 5).

Although there was evidence of at least 24 Simson's Stag Beetles in total, just a single live specimen was observed, a female (Figure 13), found in wet Eucalypt forest, in February 2013, survey btT1.

Figure 13. Female Simson's Stag Beetle, *H. simsoni*, photographed in situ at Blue Tier, 22/02/2013, survey btT1. Photos: Jane Keble-Williams.

Three further entire, but dead, Simson's Stag Beetles were found: a female and a male in wet Eucalypt forest, and a male in rainforest, all in February 2013, surveys btT1 and btA2 (Figure 14, Appendices 5 & 7).



Figures 14. Entire, but dead Simson's Stag Beetles, *H. simsoni*, found at Blue Tier Reserve: (a) female and (b) male found in wet Eucalypt forest, 22/02/2013, survey btT1; (c) male found in rainforest, 23/02/2013, survey btA2. Photos: Jane Keble-Williams.

The remaining specimens were fragments which could be recognised as belonging to *Hoplogonus* beetles (e.g. Figure 15; Appendix 7).

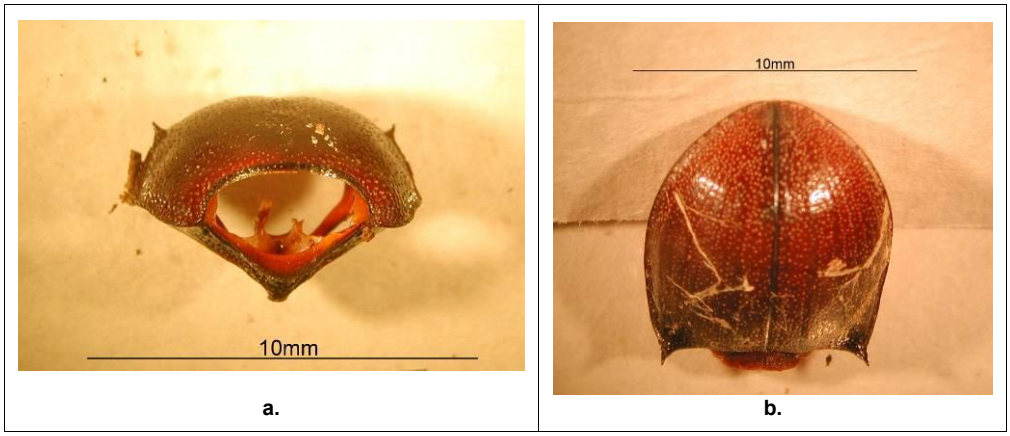


Figure 15. Examples of fragment s of Simson's Stag Beetles, *H. simsoni*, demonstrating the spines on (a) thorax (b) elytra. Specimens found at Blue Tier Reserve, in rainforest, 3/04/2013, survey btT2. Photos: Jane Keble-Williams.

Results: *Hoplogonus vanderschoori*, West Pyengana

At West Pyengana, evidence of Vanderschoor's Stag Beetle was found at three (pyA1, 2 & 3) of the five survey sites, at 690m or lower, within deep leaf litter in rainforest (Figure 11; Appendix 6). All recognisably *Hoplogonus* specimens were fragments (e.g. Figure 16, Appendix 7), comprising at least six individuals (Table 2; Appendix 6).

West Pyengana				**Vanderschoor's Stag Beetle: *Hoplogonus vanderschoori***					
Survey Type	**Date**	**Site & Survey Code**	**Altitude (m)**	**Live**		**Dead** (minimum count)			**Total**
				m	**f**	**m**	**f**	**m/f**	
Area	24/02/2013	pyA1	650	0	0	1	0	1	2
	24/02/2013	pyA2	660	0	0	0	0	3	3
	25/02/2013	pyA3	690	0	0	0	0	1	1
	1/04/2013	pyA4	640	0	0	0	0	0	0
Area Surveys Total				***0***	***0***	***1***	***0***	***5***	***5***
Timed	1/04/2013	pyT1	668	0	0	0	0	0	0
Timed Surveys Total				***0***	***0***	***0***	***0***	***0***	***0***
Overall Total				**0**	**0**	**1**	**0**	**5**	**6**

Table 2. Results of area and timed surveys for Vanderschoor's Stag Beetle, *Hoplogonus vanderschoori*, at the Tasmanian Land Conservancy West Pyengana Reserve (summary of data from Appendix 6).

Figure 16. Examples of fragment s of Vanderschoor's Stag Beetles, *H. vanderschoori*,: (a) male head and mandibles (b) elytra, showing spines. Specimens found at West Pyengana Reserve, in rainforest, 24/02/2013, survey pyA2. Photos: Jane Keble-Williams.

Project Limitations

There were fewer, and less extensive, surveys than originally intended. Fewer and with a delayed start due to time needed to tape the route to Blue Tier Reserve, and an unrelated injury to the project coordinator; less extensive due to the impenetrability of the vegetation over much of both properties Thus the surveys were restricted to the northern half of Blue Tier Reserve and the south-eastern quarter of West Pyengana Reserve (Figures 10 & 11).

After an initial timed search established the presence of Simson's Stag Beetle at Blue Tier Reserve, subsequent choice of survey type was determined by available time and personnel. For a single surveyor, timed searches could be most efficient; but for the volunteer-weekend team, area searches, keeping the group in close proximity, were the better option.

The resulting data set is somewhat idiosyncratic and too small for meaningful statistical analysis, but useful observations can be drawn from it.

Summing Up

Simson's Stag Beetle, *H. simsoni*, was found at the Tasmanian Land Conservancy Blue Tier Reserve, with evidence of more than one individual at each of the survey sites where the beetle species was found. These sites were at an altitude of 555m to 680m, and three of the four were in *Nothofagus – Atherosperma* rainforest. At all of these sites, in rainforest and wet eucalypt forest, the beetles were found in deep moist leaf litter, especially where it banked against rotting logs. The beetles were absent from the survey sites in the drier habitat of rainforest scrub over 700m.

Fragments of at least one individual of Vanderschoor's Stag Beetle, *H. vanderschoori*, were found at three of the five survey sites at the Tasmanian Land Conservancy West Pyengana Reserve. These specimens were found in deep moist leaf litter in *Nothofagus – Atherosperma* rainforest at an altitude of 640 – 690m.

Over the weekend of 22/23 February 2013, a small group of enthusiastic local and visiting volunteers undertook the bulk of the above surveys (Figure 17). A subsequent Tasmanian Land Conservancy supporters day at Blue Tier aroused further community interest in the flora and fauna of the area, including the *Hoplogonus* Stag Beetles, and in the TLC reserves in this region.

Conclusions

Having found the threatened Simson's and Vanderschoor's Stag Beetles at the Tasmanian Land Conservancy Blue Tier Reserve and West Pyengana Reserves respectively, this knowledge can be used to guide reserve management. In particular, with regard to disturbance regimes and maintenance of woody debris and leaf litter.

While these surveys will not extend the known range of these threatened beetle species, the results will contribute to the general body of *Hoplogonus* research data, and will provide baseline data for ongoing monitoring at the reserves. The *H. simsoni* findings at the Blue Tier Reserve are of interest in that the beetles were found at an altitude considerably higher than the considered optimum of 300m, and most were in rainforest rather than wet eucalypt forest.

Community outcomes include the contribution of data to the state government Natural Values Atlas, which informs the National Recovery Plan for each species; and engagement of neighbouring landholders and local volunteers in the project.

Acknowledgments

Many thanks to the following:

At the Tasmanian Land Conservancy, Conservation, Research and Planning Unit: Dr Sally Bryant and Matt Taylor

At the Threatened Species and Marine Section, DPIPWE: Dr Karen Richards

At School of Geography & Environmental Studies, UTAS: Dr Peter McQuillan

For training in stag beetle identification, habitat recognition & survey technique: Karen Richards and Chris Spencer

The Volunteers for the Tasmanian Land Conservancy Threatened Stag Beetle Survey Weekend (23 & 24 February 2013): Marg Fitzgerald, Lillian Haines, Ian Matthews, Matt Taylor, Richard Taylor.

Figure 17. Survey volunteers Marg Fitzgerald and Ian Matthews at work at West Pyengana Reserve, 24/02/2013. Photo: Matt Taylor.

This project received funding from the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

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Appendix 1. Identifying features for Hoplogonus spp. (Coleoptera, Scaraboidea, Lucanidae, Lucaninae) (Sources: Parry 1875; Bartolozzi 1996a; Bartolozzi 1996b; Matthews 1984)

Superfamily: Scaraboidea

- Can't roll into ball (cf clambidae)
- Antennae 3-8 segmented, expanded into asymmetric club
- Fore tibiae flattened and toothed (for digging?)

Family: Lucanidae

- Antennae have long scape
- Labrum inconspicuous
- Scutellum separates bases of elytra

Subfamily: Lucaninae

- Antennae geniculate
- Eyes divided

Genus: *Hoplogonus*

- Wingless
- Elytra have spine on anterolateral angles (*cf. Lissotes* which has none)
- Pronotum has small spine on posterior angles (and no central diamond-shape depression *cf. Lissotes*)
- Head flattened & depressed (not convex, *cf. Lissotes*)
- Male has strong mandibles, as long as, or longer than head

Species: *H.* simsoni

- Head not depressed behind eyes in either ♂ or ♀
- Mandibles in ♂ straight and long in large individuals, rounded in small individuals; spine midway along upper margin, points inward more than upward (there is no basal spine – beware misleading mouthparts)

Species: *H.* vanderschoori

- Head has depression behind eyes more marked (& oval) in ♂ than ♀
- Temples protruding, more markedly in ♂ than ♀
- Mandibles in ♂ rounded; strong bicuspid (2-pointed) basal tooth on inner side of lower margin, directed downwards; strong acute tooth directed upwards, slightly inwards, in distal third of upper ridge; apex pointed.
- Mandibles in ♀shorter than head; curved and pointed; small medial tooth on inner margin, another on upper ridge directed upwards more than inwards

Species: *H.* bournemisszai

- Head has depression behind eyes more marked (& oval) in ♂ than ♀ (*as in H. vanderschoori*)
- Temples nearly parallel in ♂; straight in ♀
- Mandibles in ♂ rounded, longer than head in large individuals, shorter than head in small individuals; strong basal tooth on inner side of lower margin, (directed downwards in large ♂, inwards in small ♂); apical fork with three strong teeth, first directed upwards.
- Mandibles in ♀ shorter than head, pointed; small medial basal tooth inner margin; small elevation on upper side

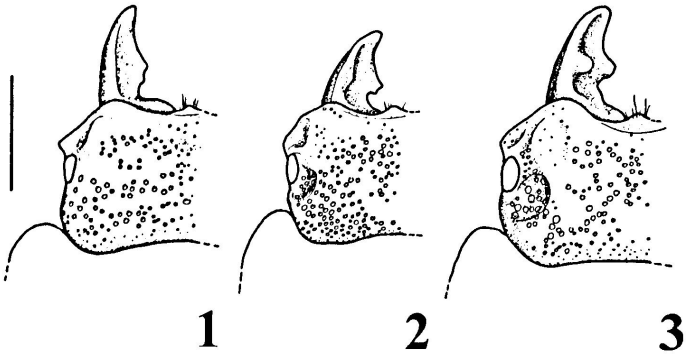


Fig. II
Head and mandibles of the females of *H. simsoni* (1), *H. bornemisszai* (2), and *H. vanderschoori* (3). Scale bar=2 mm.

'Figure 11' Source: Bartolozzi, L., 1996b. Description of a new species of *Hoplogonus* Parry, 1875 from Tasmania (Coleoptera Lucanidae), *Redia,* 79, page 94.

Cf *Lissotes* spp. which

- Has no marked humeral spines
- Has no anterior (forehead) bump
- Has diamond – shaped depression in medial prothorax ◊
- Is more active than *Hoplogonus*
- Looks brownish due to many punctations

Appendix 2. Survey Volunteer Flyer

Call for Volunteers:
Threatened Stag Beetle Survey Weekend, Blue Tier New Leaf Reserve

If you enjoy off-track scrambling around in the bush, and have an interest in ground beetles and/or other invertebrates, this is the weekend for you!

Photo ©K Richards & C Spencer

The iconic Simson's Stag Beetle (*Hoplogonus simsoni*) is nationally endangered and occurs only within a small area of Tasmania's north east, in the cool, wet forests around the Blue Tier Plateau. Adults live in the deep, moist leaf litter carpeting mature rainforest and wet eucalypt forest.

This cool moist microenvironment, essential for the Simson's Stag Beetle's survival, is exactly the habitat found at the Tasmanian Land Conservancy Blue Tier New Leaf Reserve.

What's Happening? The weekend is an opportunity for volunteers to help with systematic surveying for this threatened beetle. The data collected will help direct conservation management at the reserve and will also be forwarded to the DPIPWE Threatened Species Section for inclusion in the state government's Natural Values Atlas.

When? Saturday 23rd and Sunday 24th February 2013.
Volunteers are welcome to attend either or both days.
We'll meet at 10.00am at Poimena each day.

Where? The reserve is located on the Blue Tier Plateau, about 2km east-south-east of Mt Michael. The reserve boundary is a 1¼ hour walk (one way) from Sun Flats parking area, initially along the 3-Notch track and then following a flagging-taped route through the bush. There are no walking tracks or marked routes within the reserve.

Vehicle access to Sun Flats is from the Tasman Highway via Lottah Road and Poimena. Travel time is approximately 4 hours from Hobart via St Helens; or 2 hours from Launceston via Weldborough.

Knowledge & Ability? There will be training in identification of Simson's Stag beetles and their likely habitat; as well as training in the survey techniques required. Some knowledge of beetles and/or invertebrates is helpful but not essential, although good observational skills are definitely an asset.

Most importantly, volunteers *must* be capable of navigating, with map & compass/GPS, off-track, in (often dense) bush; be physically able to walk in steep uneven terrain; and be comfortable spending time kneeling, bending and crawling among fallen logs and tree roots whilst searching the leaf litter.

What to Wear/Bring?

Essentials:
- sturdy boots,
- gaiters and/or long pants (we're crashing around in bush that can be thigh or waist high)
- sufficient clothing to be comfortable in hot, cold, and wet weather. As a minimum: thermals, fleece jacket, raincoat, beanie, gloves and warm socks, and a sunhat and sunscreen.
- compass
- whistle,
- personal medications & first aid kit
- food and drinks for a weekend in the bush: packed lunches, snacks, plenty of water etc.

Useful extras if you have them (we'll supply some, but the more the better):
- GPS,
- UHF radio,
- digital camera,
- pencil and clipboard,
- hand lens,
- retractable tape measure,
- clean gardening gloves.

Plus whatever you need for an overnight stay

Where to Stay? There is bush-style camping at Poimena; and a variety of accommodation options are available in St Helens.

How to Register To register for the surveys, please return the attached forms, by Monday 18 February to Jane Keble-Williams or Matt Taylor at: info@tasland.org.au. There is number limit of ten volunteers.

Please Note In addition to the attached registration form, all participants will need to complete and sign a ***Volunteer Safety Registration Form*** and understand TLC's safety and participation policies – this form will be forwarded to participants upon registration and should be brought with you to the activity. This form asks volunteers to alert us of any medical conditions, allergies, disabilities or past injuries that may affect their participation, to allow us to be prepared in the case of any emergency. All information disclosed will be kept strictly confidential.

Further Information For more information about the weekend, please contact Jane Keble-Williams or Matt Taylor on 03 6225 1399, or email at: info@tasland.org.au

More Simson's Stag Beetle information can be found on the website of the Threatened Species Link: http://www.threatenedspecieslink.tas.gov.au/simsons-stag-beetle

Appendix 3. Recording Sheets: Figure A.3.1. Timed Search

Modified from: Forest Practices Authority, Fauna Technical Note No. 11 Method for surveying for *Hoplogonus* stag beetle species, Version 1.2 Feb 2011

Tasmanian Land Conservancy Threatened Stag Beetle Surveys – Timed Search

Stag Beetle Data Sheet – Timed Search

Location: Blue Tier Rainforest Reserve	**Date:**
Recorder(s):	
Grid ref./GPS at start:	
Direction of search:	**Approx. distance/area covered:**
Duration of search: **start time:**	**end time:**
Vegetation type:	
Other site comments (in/near gully, steep slope, dense vegetation, bare earth ...)	

Observations

#	GPS	Species (or photo / vial number)	Count	Condition (live, dead, fragment)	Where found (in leaf litter, under log etc)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Modified from: Forest Practices Authority, *Fauna Technical Note No. 11 Method for surveying for* Hoplogonus *stag beetle species, Version 1.2 Feb 2011*

Tasmanian Land Conservancy Threatened Stag Beetle Surveys – Timed Search

Stag Beetle Survey Notes

Timed Search (duration 2 person hours)

Please record:

- GPS co-ordinates at start
- Start and end time
- General direction of the search and approx distance/area covered
- Main vegetation type and any other site comments

When you find a beetle, or fragment, record:

- GPS co-ords
- Species, if known, otherwise a photo (with an indication of observation number)
- Count
- Condition – live, dead, fragment
- Fragments/parts of dead beetles can be removed for identification off site – these should be placed in a vial of ethanol and labelled with GPS coordinates/observation number
- Also note where found - leaf litter, under log etc

Please Note: live beetles are to be recorded and ***released at site of capture***.

#	GPS	Species (or photo / vial number)	Count	Condition (live, dead, fragment)	Where found (in leaf litter, under log etc)
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Modified from: Forest Practices Authority, *Fauna Technical Note No. 11 Method for surveying for* Hoplogonus *stag beetle species, Version 1.2 Feb 2011*

Figure A.3.2. Systematic Area Search

Modified from: Forest Practices Authority, Fauna Technical Note No. 11 Method for surveying for *Hoplogonus* stag beetle species, Version 1.2 Feb 2011

Tasmanian Land Conservancy Threatened Stag Beetle Surveys - Area Search

Stag Beetle Data Sheet – Systematic Area Search

Location:	Blue Tier Rainforest Reserve	**Date:**
Recorder(s):		
Grid ref./GPS at centre of 10m radius site:		

Site details:

Topography:	
Flat	
Gully	
Upper/mid/lower slope	
Ridge	

Distance from stream:	
< 30 m	
30 - 50 m	
50 - 100 m	
> 100 m	

Vegetation:

Main species:		
Open understorey? (Y/N):		
Distinct Manfern layer? (Y/N):	**height:**	**cover:**

Leaf Litter:

Depth:		**Cover:**	
< 1 cm		0 - 25%	
1 - 3 cm		25 - 50%	
> 3 cm		50 - 75%	
		> 75%	

Simson's Stag Beetle sightings

Quadrat		**Live Beetles**			**Dead Beetles**		
No.	**GPS**	**Male**	**Female**	**Photo No.**	**Male**	**Female**	**Fragments (vial label)**
1							
2							
3							
4							
5							
6							

Notes

Modified from: Forest Practices Authority, *Fauna Technical Note No. 11 Method for surveying for* Hoplogonus *stag beetle species, Version 1.2 Feb 2011*

Tasmanian Land Conservancy Threatened Stag Beetle Surveys - Area Search

Stag Beetle Survey Notes

Systematic Area Search

- Mark out or estimate a 10 m radius circular plot;
- in that plot, place the 1m^2 quadrat six times at 'random ', but try to sample all potential microhabitats (i.e. leaf litter, under logs, under rocks, etc) over the six quadrat sub-plots!
- within each quadrat area, systematically search for live *Hoplogonus* species and body parts of dead ones
- Take no more than 15 min to search each quadrat sub-plot

What to record:

- number of live males/females
- number of dead males/females
- number of identifiable parts of dead beetles (heads with thorax attached, thoraces and abdomens)

Where you're uncertain of the identity of a beetle, please take a digital photo of it for later scrutiny, remembering to note which photo comes from which quadrat/site.

Please Note: live beetles are to be recorded and ***released at site of capture***.

Parts of dead beetles can be removed for identification off site – these should be placed in a vial of ethanol and labelled with GPS coordinates and quadrat number.

Please don't pickle live beetles in the ethanol

Modified from: Forest Practices Authority, *Fauna Technical Note No. 11 Method for surveying for* Hoplogonus *stag beetle species, Version 1.2 Feb 2011*

Appendix 4 . Site Characteristics

Table A. 4.a. Blue Tier Survey Site Characteristics

Survey Type	Date	Site & Survey	TASVEG type	Vegetation: main species at site*	Topography	Geology	Altitude (m)	Distance from stream	Leaf litter depth	Leaf litter cover	Open under-storey?	Distinct manfern layer?
Area	23/02/2013	btA1	RMU	Nc, Am, Pa	flat	granite	720	>100m	1-3cm	25-50%	Yes	No
Area	23/02/2013	btA2	RMU	Nc, Am, Da	mid slope	granite	680	>100m	1-3cm	50-75%	Yes	sparse
Area	23/02/2013	btA3	RMU	Nc, Am, Da	steep mid slope	granite	660	>100m	1-3cm	50-75%	Yes	10m away
Area	2/04/2013	btA4	RMU	Nc, Am, Bw, Gg, Tl	flat	granite	710	>100m	1-3cm	50-75%	No	No
Timed	22/02/2013	btT1	WRE	Nc, Er	mid slope	granite	605 - 620	>100m	1-3 cm	50-75%	Yes	No
Timed	3/04/2013	btT2	RMU	Nc, Am, Da, Tl	steep mid slope	granite	550 - 560	<100m	0-3cm	25-50%	Yes	No

Table A. 4.b. West Pyengana Survey Site Characteristics

Survey Type	Date	Site & Survey	TASVEG type	Vegetation: main species at site *	Topography	Geology	Altitude (m)	Distance from stream	Leaf litter depth	Leaf litter cover	Open under-storey?	Distinct manfern layer?	Manfern height	Manfern cover
Area	24/02/2013	pyA1	RMU	Nc, Am, Da	mid slope	granite	650	>100m	>3cm	>75%	Yes	Yes	up to 2m	>75%
Area	24/02/2013	pyA2	RMU	Nc, Am, Da	mid slope	granite	660	>100m	1-3cm	>75%	Yes	Yes	up to 2m	>75%
Area	25/02/2013	pyA3	RMU	Nc, Am, Da	flat	granite	690	>100m	1-3cm	>75%	Yes	Yes	up to 2m	>75%
Area	1/04/2013	pyA4	RMU	Nc, Am, Da, Bw	steep mid slope	granite	640	<100m	1-3cm	>75%	Yes	Yes	up to 2m	0-25%
Timed	1/04/2013	pyT1	RMU	Nc, Am, Da, Bw		granite	670	>100m	0-3cm	50-75%	No	No		

*Key to 'Vegetation: main species at site' for the above tables:

Am: *Atherosperma moschatum*
Bw: *Blechnum watsii*
Da: *Dicksonia antarctica*
Er: *Eucalyptus regnans*
Gg: *Gahnia grandis*
Nc: *Nothofagus cunninghamii*
Pa: *Phyllocladus aspleniifolius*
Tl: *Tasmania lanceolata*

Appendix 5. Survey Results: Blue Tier

Table A.5.a. Blue Tier Timed Searches: Details and Observations

												***Hoplogonus* Observations**			
Date	**Site & Survey**	**Search**	**Code**	**Obs No.**	**Altitude (m)**	**GPS_E**	**GPS_N**	**Family**	**Genus**	**Species**	**condition**	**min. count**	**m? f?**	**Where Found**	**Recorder**
22/02/2013	btT1	#1	btT1#1	1	610	587027	5440560	Lucanidae	*Hoplogonus*	*simsoni*	head, thorax, elytra	1	m	uphill litter beside log	JKW
22/02/2013	btT1	#2	btT1#2	1	605	587034	5440574	Lucanidae	*Hoplogonus*	*simsoni*	head, thorax, elytra	1	m	uphill litter beside log	JKW
22/02/2013	btT1	#3	btT1#3	1	610	587046	5440568	Lucanidae	*Hoplogonus*	*simsoni*	alive	1	f	litter beside log, parallel	JKW
22/02/2013	btT1	#4	btT1#4	1	611	587014	5440557	Elateridae	*Elatichrosis*	*exarata*	elytra x 1	0		downhill litter beside tree	JKW
22/02/2013	btT1	#5	btT1#5	1	616	586987	5440573	Lucanidae	*Hoplogonus*	*simsoni*	dead entire	1	f	litter beside tree, downhill	JKW
22/02/2013	btT1	#6	btT1#6	1	614	586985	5440568	Tenebrionidae	*Adelium*	*spp.*	dead, entire x 1	0		litter beside log, parallel	JKW
22/02/2013	btT1	#7	btT1#7	1	615	586987	5440571	Lucanidae	*Hoplogonus*	*simsoni*	elytra	1	m/f	litter beside log, parallel	JKW
22/02/2013	btT1	#8	btT1#8	1	617	586973	5440582	Carabidae	*Chylnus*	*ater*	head, thorax, elytra	0		downhill litter beside tree stump	JKW
22/02/2013	btT1	#9	btT1#9	1	620	586963	5440593	Lucanidae	*Hoplogonus*	*simsoni*	elytra	1	m/f	litter beside tree fern, downhill	JKW
3/04/2013	btT2	#1	btT2#1	1	555	587008	5440328	Carabidae		*spp.*	elytron	0		leaf litter below log	JKW
3/04/2013	btT2	#2	btT2#2	1	552	587016	5440327	Elateridae		*spp.*	thx.	0		leaf litter below log	JKW
3/04/2013	btT2	#3	btT2#3	1	551	587020	5440320	Lucanidae	*Hoplogonus*	*simsoni*	head, thx, forelegs; elytra fragment	1	m	litter between & below rocks	JKW
3/04/2013	btT2	#3	btT2#3	2	551	587020	5440320	Carabidae			elytra x 2	0		litter between & below rocks	JKW
3/04/2013	btT2	#4	btT2#4	1	550	587021	5440353	Lucanidae	*Hoplogonus*	*simsoni*	thx x 1, elytra x 3	3	m/f		JKW
3/04/2013	btT2	#4	btT2#4	2	550	587021	5440353	Tenebrionidae	*Adelium*	*spp.*	elytra	0			JKW
3/04/2013	btT2	#4	btT2#4	3	550	587021	5440353	Unidentified			elytra fragment; thx fragment	0			JKW
3/04/2013	btT2	#5	btT2#5	1	554	587014	5440361	Lucanidae	*Hoplogonus*	*simsoni*	head, thx x 2, elytra	2	m & m/f	on litter below tall tree stump	JKW
3/04/2013	btT2	#5	btT2#5	2	554	587014	5440361	Unidentified			legs, misc. fragments	0		on litter below tall tree stump	JKW
3/04/2013	btT2	#6	btT2#6	1	555	587007	5440357	Lucanidae	*Hoplogonus*	*simsoni*	elytra	1	m/f	on litter below tall tree stump	JKW
3/04/2013	btT2	#6	btT2#6	2	555	587007	5440357	Unidentified			elytra (? carabid), misc. fragments	0		on litter below tall tree stump	JKW
3/04/2013	btT2	#7	btT2#7	1	556	587013	5440373	Lucanidae	*Syndesus*	*cornutus*	dead, entire x 1	0		on leaf litter	JKW
***Hoplogonus simsoni* Total**												**13**			

Table A.5.b. Blue Tier Timed Searches: Duration and Approximate Area Covered

Site & Survey	Duration (hours)	Area Covered (m^2)	start GPS_E	start GPS_N
btT1	2	5300	587020	5440562
btT2	2	1234	587008	5440328

Table A.5.b. Blue Tier Systematic Area Searches: Details and Observations

												***Hoplogonus* Observations**			
Date	**Site & Survey**	**Quadrat**	**Code**	**Obs No.**	**Altitude (m)**	**GPS_E**	**GPS_N**	**Family**	**Genus**	**Species**	**condition**	**min. count**	**m? f?**	**Where Found**	**Recorder**
23/02/2013	btA1	1	btA1Q1	1	720	586313	5440472	Carabidae		*spp.*	live, observed	0		open ground	TLC vols
23/02/2013	btA1	2	btA1Q2	1	720	586307	5440462	Tenebrionidae		*spp.*	live, observed	0		near log	TLC vols
23/02/2013	btA1	3	btA1Q3		720	586308	5440473					0			TLC vols
23/02/2013	btA1	4	btA1Q4	1	720	586306	5440469					0			TLC vols
23/02/2013	btA1	5	btA1Q5		720	586307	5440482					0			TLC vols
23/02/2013	btA1	6	btA1Q6	1	720	586315	5440482	Lucanidae	*Lissotes*			0			TLC vols
23/02/2013	btA2	1	btA2Q1		680	586540	5440365					0			TLC vols
23/02/2013	btA2	2	btA2Q2	1	680	586539	5440365	Lucanidae	*Hoplogonus*	*simsoni*	male head, thorax; elytra x 2	3	m & m/f	downhill side of log, in litter	TLC vols
23/02/2013	btA2	2	btA2Q2	2	680	586539	5440365	Lucanidae	*Hoplogonus*	*simsoni*	thorax x 2		m/f	downhill side of log, in litter	TLC vols
23/02/2013	btA2	3	btA2Q3	1	680	586540	5440372	Lucanidae	*Lissotes*	*rudis*	male, live, photo	0		downhill side of log, in litter	TLC vols
23/02/2013	btA2	3	btA2Q3	2	680	586540	5440372	Scarabaeidae	*Telura*	*alta*	live, photo	0		downhill side of log, in litter	TLC vols
23/02/2013	btA2	4	btA2Q4		680	586538	5440363	Lucanidae	*Lissotes*		immature female live, photo	0		in litter between tree roots	TLC vols
23/02/2013	btA2	5	btA2Q5	1	680	586549	5440382	Lucanidae	*Hoplogonus*	*simsoni*	elytra	1	m/f	in litter between two logs	TLC vols
23/02/2013	btA2	6	btA2Q6		680	586551	5440351					0			TLC vols
23/02/2013	btA3	1	btA3Q1	1	660	586648	5440432	Lucanidae	*Hoplogonus*	*simsoni*	elytra	2	m/f	in litter between two logs	TLC vols
23/02/2013	btA3	1	btA3Q1	2	660	586648	5440432	Lucanidae	*Hoplogonus*	*simsoni*	head x 2		m/f		TLC vols
23/02/2013	btA3	1	btA3Q1	3	660	586648	5440432	Lucanidae	*Lissotes*		female, live, photo	0			TLC vols
23/02/2013	btA3	2	btA3Q2	1	660	586643	5440443	Lucanidae	*Hoplogonus*	*simsoni*	male head, elytra x 2	2	m & m/f		TLC vols
23/02/2013	btA3	3	btA3Q3	1	660	586637	5440432	Lucanidae	*Hoplogonus*	*simsoni*	elytra; thorax	1	m/f		TLC vols
23/02/2013	btA3	4	btA3Q4	1	660	586656	5440435	Lucanidae	*Hoplogonus*	*simsoni*	male head	1	m		TLC vols
23/02/2013	btA3	4	btA3Q4	2	660	586656	5440435	Carabidae		*spp.*	3 live, observed	0			TLC vols
23/02/2013	btA3	5	btA3Q5		660	586644	5440427					0			TLC vols
23/02/2013	btA3	6	btA3Q6	1	660	586635	5440426	Lucanidae	*Hoplogonus*	*simsoni*	male head, thorax, elytra	1	m		TLC vols
2/04/2013	btA4	1	btA4Q1	1	710	586381	5440207	Carabidae		*spp.*	alive, escaped before photo	0			JKW
2/04/2013	btA4	2	btA4Q2	1	710	586380	5440203				thx (lost) not *Hoplogonus*	0			JKW
2/04/2013	btA4	3	btA4Q3		710	586379	5440208					0			JKW
2/04/2013	btA4	4	btA4Q4	1	710	586379	5440205	Carabidae		*spp.*	alive, escaped before photo	0			JKW
2/04/2013	btA4	5	btA4Q5		710	586384	5440202					0			JKW
2/04/2013	btA4	6	btA4Q6		710	586376	5440210					0			JKW
***Hoplogonus simsoni* Total**												**11**			

Appendix 6. Survey Results: West Pyengana

Table A.6.a West Pyengana Timed Search: Details and Observations

												Hoplogonus Observations			
Date	**Site & Survey**	**Search**	**Code**	**Obs No.**	**Altitude (m)**	**GPS_E**	**GPS_N**	**Family**	**Genus**	**Species**	**condition**	**min. count**	**m? f?**	**Where Found**	**Recorder**
1/04/2013	pyT1	#1	pyT1#1	1	668	573436	5427355	Tenebrionidae	*Adelium*	*spp.*	live x 1, not photo'd	0	0	in leaf litter beside log	JKW

Table A.6.b. West Pyengana Timed Search: Duration and Approximate Area Covered

Site & Survey	**Duration (hours)**	**Area Covered** (m^2)	**start GPS_E**	**start GPS_N**
0	1/2	609	573436	5427355

Table A.6.b. West Pyengana Systematic Area Searches: Details and Observations

												***Hoplogonus* Observations**			
Date	**Site & Survey**	**Quadrat**	**Code**	**Obs No.**	**Altitude (m)**	**GPS_E**	**GPS_N**	**Family**	**Genus**	**Species**	**condition**	**min. count**	**m? f?**	**Where Found**	**Recorder**
24/02/2013	pyA1	1	pyA1Q1		650	573640	5426999	Unidentified			elytra, not Hoplogonus	0			TLC vols
24/02/2013	pyA1	2	pyA1Q2		650	573646	5427005					0			TLC vols
24/02/2013	pyA1	3	pyA1Q3		648	573652	5426994					0			TLC vols
24/02/2013	pyA1	4	pyA1Q4	1	649	573656	5427001	Lucanidae	*Hoplogonus*	*vandershoori*	male head	1	m	deep in litter, in a hole	TLC vols
24/02/2013	pyA1	4	pyA1Q4	2	649	573656	5427001	Lucanidae	*Hoplogonus*	*vandershoori*	thorax, misc. fragments	1	m/f	deep in litter, in a hole	TLC vols
24/02/2013	pyA1	5	pyA1Q5		650	573646	5427005					0			TLC vols
24/02/2013	pyA1	6	pyA1Q6		650	573642	5427000					0			TLC vols
24/02/2013	pyA2	1	pyA2Q1		660	573694	5427091					0			TLC vols
24/02/2013	pyA2	2	pyA2Q2	1	660	573691	5427072	Lucanidae	*Hoplogonus*	*vandershoori*	thorax	1	m/f		TLC vols
24/02/2013	pyA2	3	pyA2Q3	1	660	573693	5427088	Lucanidae	*Hoplogonus*	*vandershoori*	elytra	1	m/f	under deep litter	TLC vols
24/02/2013	pyA2	3	pyA2Q3	2	660	573693	5427088	Lucanidae	*Hoplogonus*	*vandershoori*	thorax	1	m/f	under deep litter	TLC vols
24/02/2013	pyA2	4	pyA2Q4		660	573699	5427063					0			TLC vols
24/02/2013	pyA2	5	pyA2Q5	1	660	573693	5427091	Cerambycidae	*Dorcadida*	*spp.*	live, photo	0			TLC vols
24/02/2013	pyA2	6	pyA2Q6		660	573695	5427087					0			TLC vols
25/02/2013	pyA3	1	pyA3Q1		688	573550	5427264					0			JKW
25/02/2013	pyA3	2	pyA3Q2		690	573557	5427255					0			JKW
25/02/2013	pyA3	3	pyA3Q3		691	573565	5427247				elytra, not Hoplogonus	0			JKW
25/02/2013	pyA3	4	pyA3Q4	1	690	573566	5427255	Tenebrionidae	*Adelium*	*spp.*	2, live, observed	0		in litter beside rock	JKW
25/02/2013	pyA3	5	pyA3Q5	1	690	573566	5427250	Lucanidae	*Hoplogonus*	*vandershoori*	elytra	1	m/f	under litter between rock and log	JKW
25/02/2013	pyA3	5	pyA3Q5	2	690	573566	5427250	Tenebrionidae	*Adelium*	*spp.*	1, live, photo	0		in litter between rock and log	JKW
25/02/2013	pyA3	5	pyA3Q5	3	690	573566	5427250				elytra, not Hoplogonus	0		under litter between rock and log	JKW
25/02/2013	pyA3	6	pyA3Q6		690	573572	5427250					0			JKW
1/04/2013	pyA4	1	pyA4Q1		636	573456	5427459					0		in litter between logs	JKW
1/04/2013	pyA4	2	pyA4Q2		637	573454	5427459					0			JKW
1/04/2013	pyA4	3	pyA4Q3		635	573455	5427462					0			JKW
1/04/2013	pyA4	4	pyA4Q4	1	640	573453	5427454	Tenebrionidae	*Adelium*	*spp.*	elytra	0		in litter between roots, under log	JKW
1/04/2013	pyA4	5	pyA4Q5		637	573455	5427459					0			JKW
1/04/2013	pyA4	6	pyA4Q6	1	635	573453	5427465				elytra, not Hoplogonus	0			JKW
1/04/2013	pyA4	6	pyA4Q6	2	635	573453	5427465	Tenebrionidae	*Adelium*	*spp.*	thorax & elytra	0			JKW
***Hoplogonus vandershoori* Total**												**6**			

Appendix 7 Photo-record of the specimens observed or collected in the surveys.

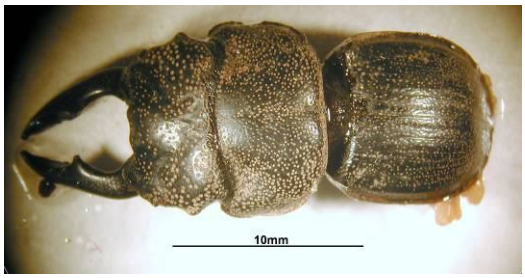
Photos: Jane Keble-Williams.

Simson's Stag Beetle (*Hoplogonus simsoni*) plates 1 – 3

Vanderschoor's Stag Beetle (*H. vanderschoori*) plate 4

Non-*Hoplogonus* Beetles plates 5 & 6

a. Male, dorsal and lateral views. btA2Q2

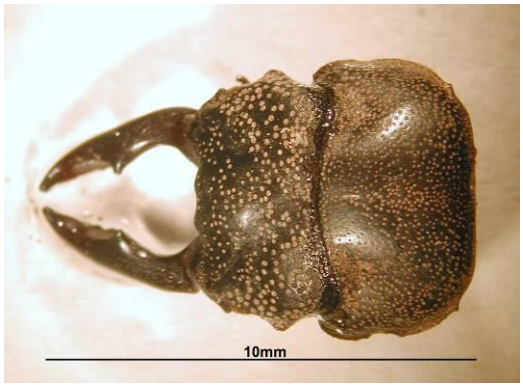


b. Male, dorsal and lateral views. btT1#2

c. Female, dorsal and lateral views.btT1#5

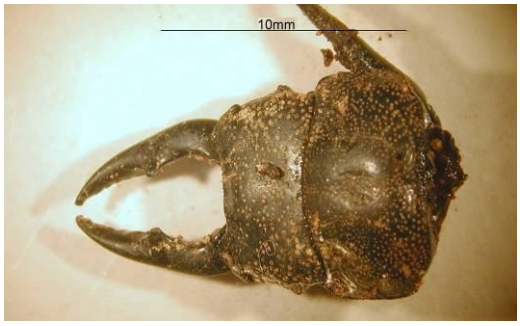
d. Live female in situ, dorsal view. btT1#3

Plate 1.a-d. *Hoplogonus simsoni* specimens found at the Tasmanian Land Conservancy Blue Tier Reserve. Description and survey code. Scale Bar = 10mm.



a. Male: mandibles, head & thorax, dorsal and lateral views. btT1#2

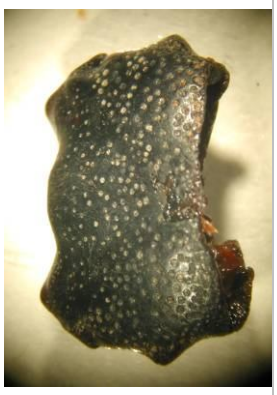
b. Male: mandibles & head, dorsal and lateral views. btT1#1



c. Male: mandibles, head, thorax, fore legs. btT2#3f.

d. Male: mandibles & head, dorsal view. btT2#5.

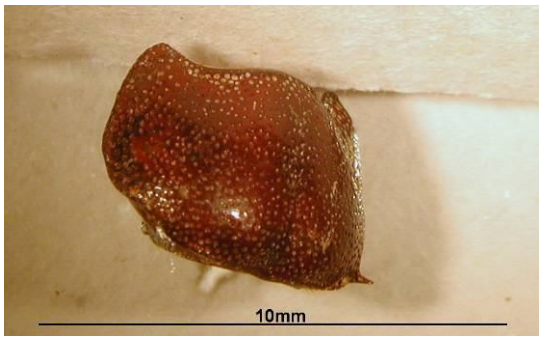
e. Head without mandibles. btA3Q1



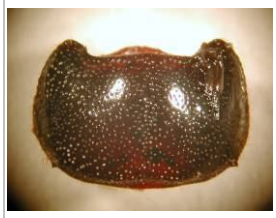
f . Head without mandibles. btA3Q1

Plate 2.a-f. *Hoplogonus simsoni* head fragments found at the Tasmanian Land Conservancy Blue Tier Reserve. Description and survey code. Scale Bar = 10mm.

a. Thorax. btT2#4

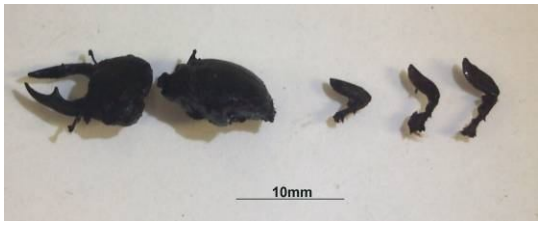


b. Thorax. btT2#5



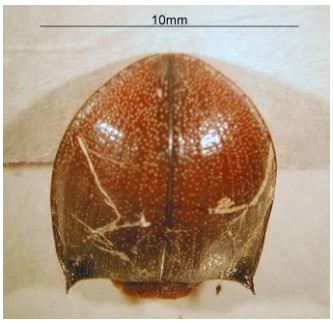
c. Thorax 1. btA2Q2

d. Thorax 2. btA2Q2



e. Head, elytra, legs. btT1#1

f. Elytra. btT2#5



g. Elytra 1. btT2#4

h. Elytra 2. btT2#4

i. Elytra 3. btT2#4

j. Elytra. btT2#6

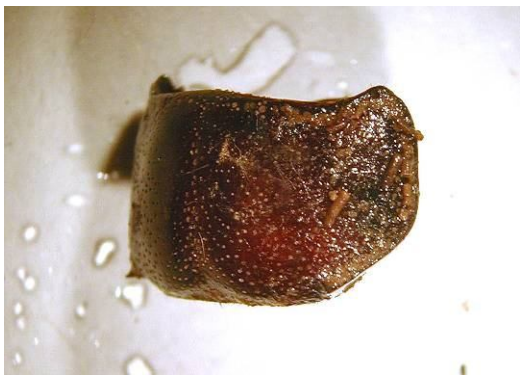
k. Elytra. btT1#7

l. Elytra. btT#9

m. Elytra. btT2#3

Plate 3.a-m. *Hoplogonus simsoni* fragments found at the Tasmanian Land Conservancy Blue Tier Reserve. Description and survey code. Scale Bar = 10mm

a. Male: mandibles and head. pyA1Q4



b. Thorax. pyA1Q4

c. Thorax. pyA2Q2

d. Thorax. pyA2Q3

e. Elytra. pyA2Q3

f. Elytra. pyA3Q5

Plate 4.a-f. *Hoplogonus vanderschoori* fragments found at the Tasmanian Land Conservancy West Pyengana Reserve. Description and survey code. Scale Bar = 10mm

a. *Lissotes rudis* (Lucanidae) male. btA2Q3

b. *Lissotes* spp. (Lucanidae) female. btA3Q1

c. *Lissotes* spp. (Lucanidae) immature female. btA2Q4

d. *Syndesus cornutus* (Lucanidae) male. btT2#7

e. *Adelium* spp. (Tenebrionidae). pyA3Q5

f. *Adelium* spp. (Tenebrionidae). btT1#6

g. *Telura alta* (Scarabaeidae). btA2Q3

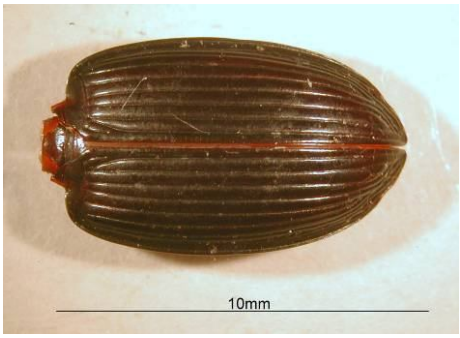
h. *Dorcadida* spp. (Cerambycidae). pyA2Q5

Plate 5.a-h. Non-*Hoplogonus* Beetles found at the Tasmanian Land Conservancy Blue Tier and West Pyengana Reserves. Identification and survey code. Scale Bar = 10mm

a. *Chylnus ater* (Carabidae). btT1#8.

b. Carabidae spp., elytra. btT2#1.

c. Carabidae spp., elytra. btT2#3.



d. Carabidae spp., elytra. btT2#3.

e. Elateridae spp., part of thorax. btT2#2

f. *Elatichrosis exarata* (Elateridae) Elytra. btT1#4.

Plate 6.a-e. Non-*Hoplogonus* Beetle fragments found at the Tasmanian Land Conservancy Blue Tier Reserve. Identification and survey code. Scale Bar = 10mm