Monitoring the effectiveness of the Skemps Snail management plan

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Summary

Skemps snail (Charopidae sp "Skemps") is listed as Rare on the schedules of the *Tasmanian Threatened Species Protection Act 1995.* Although coupe-based and other surveying for this species has been conducted on an as-required basis, there has never been an attempt to comprehensively survey the species' habitat requirements.

This report documents the results of four weeks' sampling for the species in May and August 2016. The aim of the survey as outlined in the Project Proposal was "to sample areas within the potential range of the species, targeting different levels and types of retention, to determine how the presence and abundance of the species varies in relation to retention methods. The results will be used to evaluate whether or not viable snail populations have been maintained in a network of native forest throughout the plan area and hence the effectiveness of the management approach."

The current management approach is to implement actions that will assist the maintenance of populations throughout its range, primarily through the protection of known sites and the maintenance of potential habitat. The set of management prescriptions for the species can be found in the Threatened Fauna Adviser 2014 (Appendix 1). This current report details the presence and abundance of the species in relation to production; a subsequent peer review publication will explore these results further to address whether the management approach is effectively maintaining viable populations of the species.

Five major habitat types were surveyed:

* riparian sites surrounded by mature forest
* riparian sites surrounded by regenerating forest that is at least 20 years old
* riparian sites surrounded by plantations
* non-riparian sites within regenerating forest that is at least 20 years old
* non-riparian sites within plantations

Key findings are:

1. Of the five most tested site types, Skemps snail was most often found at riparian sites surrounded by mature forest. It was not found at non-riparian sites within plantations.

2. Skemps snail was found at 2 of 10 non-riparian sites within regenerating forest, the same rate as at retained riparian sites within such forests.

3. Skemps snail was not found in any narrow (<40 m) retained riparian areas irrespective of surrounding treatments, and more surveying is needed to determine whether it can occur in these.

4. Broad vegetation types associated with the presence of the species consisted of rainforest, *Dicksonia antarctica* gullies or wet eucalypt forest.

5. Where Skemps snail occurred in regenerating forest, it was found in forests with some older trees (c. 100 years) that had survived previous selective logging or fire.

6. Although it was expected that the snail would vary greatly in population density from site to site, the species was normally found to be at least fairly common where present.

7. The species was found both under rocks and under woody debris of various sizes.

8. The species appears to be sensitive to fire and other disturbances that affect the quality of woody debris, but may be less disturbance-sensitive at rocky sites. This requires more testing.

9. The species may be more restricted than the currently mapped expected range, but this requires more testing.

Survey bycatch included two new localities for *Roblinella roblini* (Petterd, 1879), an apparently very rare snail previously known from only two localities.

Background

Skemps snail (Charopidae sp "Skemps") is one of many localised species in Tasmania's most diverse native land snail family, the Charopidae. Skemps snail resembles, and is probably an unusual member of, the genus *Scelidoropa* Hyman and Stanisic 2005. Members of this genus are widespread and diverse in Tasmania and their shells frequently have colour patterns of alternating reddish and white colour rays. Skemps snail is unusual compared to other members of the group in having a very flat shell with no colour rays. Instead the shell is uniformly yellow, yellow-grey or white.

Skemps snail was first collected at Myrtle Bank by R.M. Johnston in 1876, but misidentified as a variety of *Pernagera architectonica* Brazier 1871. There were further collections at Nunamara (T. Stephens, c. 1910) and Mt Arthur (unknown collector, 1970s) but Skemps snail was not recognised as an undescribed species until it was collected at the Skemps property by the author in 1995.

At the Skemps property the species had a much defined pattern of occurring very commonly along the wet bases of two major mixed forest gullies, and not on the surrounding slopes. Three incidental collections of the species, two of them made during surveys for *Anoglypta launcestonensis* (see Bonham, 1996), also fitted this riparian pattern and hence it was suggested that the species was exclusively riparian.

The species' narrow range, the intense rate and perceived threat of plantation development within that range, and the belief that the species may be exclusively riparian, led to its nomination in 1998 for listing on the schedules of the Tasmanian Threatened Species Protection Act 1995. It was then listed as it was deemed to meet Criterion A in the then-current guidelines for listing as "Rare" ("taxon of limited distribution and numbers, threatened by on-going processes occurring over sufficient of its range to suggest it would satisfy the indicative critera for "Vulnerable" unless the threatening process was abated.") (Threatened Species Scientific Advisory Committee, 1999).

Subsequent surveys by the author and FPA ecologists since listing of the species has established that:

* The species is not exclusively riparian and can occur broadly through some wet forest coupes, especially on the western slopes of Mt Arthur.

* The species occurs at altitudes up to at least 950 metres on Mt Arthur.

* The species is not confined to only a small number of sites but has been found at several sites within its potential range. Treating records within one kilometre of previous records as duplicates, the number of known sites with well-defined location data increased from four at the time of nomination to sixteen as of April 2016. (There are also three historical sites, at Mt Arthur, Nunamara and Myrtle Bank, without well-defined location data.)

* The species can occur in forests with some history of logging and/or burning, although there are no records from young silvicultural regrowth. However, there has not been any systematic surveying of young silvicultural regrowth, as distinct from retained older forests surrounded by such regrowth. A record from forest estimated in the field at 50 years old with some evidence of a fire in the last 30 years has been reported (Threatened Species Unit (2011), Bonham (2002)). However, after further examination of the site, the overstorey at the time of that record is more likely to have been about 80 years old.

Study Aims

The approach taken through the Tasmanian forest practices system to mitigate the impacts of forest practices on Skemps snails involves application of management prescriptions in areas with potential habitat within the potential range of the species. This management approach is based on available information and is agreed between DPIPWE and the FPA. The management prescriptions have been implemented through Forest Practices Plans developed for any forest practices, such as harvesting, roading, and plantation management, since 2000 (Forest Practices Board, 2002)

The potential habitat description for Skemps snail (agreed with DPIPWE) used for management purposes is as follows -
Potential habitat for the Skemps snail is wet sclerophyll forest, closed broadleaf shrubbery, mixed forest, rainforest, and wet or damp forest gullies in predominantly dry forest. (FPA Biodiversity Values Database)

The primary management objective for this species is to implement actions that will assist the maintenance of populations throughout its range, primarily through the protection of known sites and the maintenance of potential habitat. The set of management prescriptions for the species can be found in the *Threatened Fauna Adviser 2014* (Appendix 1).

Key coupe-level prescriptions include:

- retention of streamside reserves (40 m on Class 1, 30 m Class 2, 20 m Classes 3 and 4).
- retention of a minimum of 20% of the coupe, including suitable non-riparian areas, unless it has been established by survey that populations in the coupe are low, or that high density populations are confined to areas already set aside.

- a range of prescriptions to reduce the intensity of burning in coupes containing the species.

Landscape-level prescriptions that apply to the potential range of the species include –

- Retention of a contiguous network of native forest, which contains potential habitat of the species (e.g., through the network of formal and informal reserves such as Wildlife Habitat Strips, streamside reserves and other such reserves).
- Planning coupes to achieve (1) maximum dispersal of coupes, and (2) retention of large areas of undisturbed native forest (at least 25 years old) between coupes.

As stated in the original Project Proposal:

> *"The aim of the current study is to sample areas within the potential range of the species, targeting different levels and types of retention, to determine how the presence and abundance of the species varies in relation to retention methods. The results will be used to evaluate whether or not viable snail populations have been maintained in a network of native forest throughout the plan area and hence the effectiveness of the management approach."*

Site Selection

Initial phase (May 2-13, continued August 15-26)

Except for two Mt Arthur sites, sites within areas retained as part of the management prescriptions were chosen from an initial set of 86 sites preselected by the Forestry Tasmania (FT) Conservation Planner, Marie Yee, from spatial data derived from photo-interpretation, maintained by FT. Using sites preselected by a non-specialist was an advantage in eliminating potential for bias in the fine-scale selection of survey sites. The initial preselected sites covered most of the current potential range of the species (Figure 1) and included areas of riparian mature forest in the following categories:

* "mature" (**M-type**) sites (within larger retained areas of mature native forest rather than being within a riparian reserve)

* "plantation" (**P-type**) sites (within retained riparian reserves within either softwood or hardwood plantations)

* "regen" (**R-type**) sites (within retained areas surrounded by native forest that is at least 20 years old but classified as regrowth. In practice, such regrowth was found to sometimes have apparently been generated by fire with no visible evidence of harvest, even selective harvest)

* "young regen" (**Y-type**) sites (within retained areas surrounded by young regenerating native forest from recent silvicultural harvesting)

One site (67) that was originally classified as R-type has been reclassified as P-type in these results as that more accurately describes the site.

The original survey plan was to survey M-type sites within a given part of the species' range, and if the species was found, to then survey any available sites of the three above treatment types in the surrounding area. The basis for this survey plan was that it was thought the species might have a patchy geographic occurrence through its range.

It was soon discovered that this survey plan was impractical. It was only possible to survey at most four sites per full field day rather than the intended five, and the fine scale patchy occurrence of the species at site level meant that a negative result at an M-type site did not necessarily mean it would be absent from surrounding coupes. Also, M-type sites were often difficult to access, and finally, exclusively surveying treatment sites matched to a successful M-type site could bias the comparison of site types against treatment sites.

It was therefore decided to assume the species to be present in areas close to or within the minimum convex polygon of the known records, and to only use the original requirement to test occurrence by sampling mature sites first when surveying well outside the known range.

During this sampling phase, one retained riparian site in an aggregated-retention coupe (A-type) and one matched treatment site within the retained aggregate (AB-type) were also surveyed on Mt Arthur. The two added Mt Arthur sites were off Whites Mill Road in the coupe MA107A. This coupe had been sampled twice in 2002 with large numbers of Skemps snails found both times. It was harvested soon afterwards with some large areas of forest (aggregates) left unlogged within the harvested coupe for the snail. One riparian site (effectively a streamside reserve) and one non-riparian site within the aggregate (corresponding closely to the site of the original finds in this coupe) were surveyed.

Second phase (August 15-26)

During the August surveying, further M-type, R-type and P-type riparian sites were surveyed from the original list to bring each category up to at least ten searched sites. (12 sites were searched for M-type sites as two searched on Koomela Road may have been outside the species' range.)

Matched treatment sites for each R-type and P-type sites were also surveyed (referred to as RB-type and PB-type respectively). These treatment sites were placed within the regrowth or plantation area surrounding the riparian zone. In each case the matched site was placed close to one of the surveyed R- or P-type sites, usually 100 metres away. The target location for the matched treatment sites was pre-determined arbitrarily (eg "100 metres north of original site") at a point convenient to survey and outside the riparian zone.

Overall figures and unsurveyed sites

The breakdown of the preselected sites by type and the total number actually surveyed in May and August is given in Table 1.

Table 1 Number of preselected sites by type and the total number actually surveyed. .

	Available	Searched
M (Mature)	23	12
P (Plantation)	37	10
R (Regen)	17	10
Y (Young Regen)	9	4
A (Aggregate)	1	1
PB (Plantation – treatment)	10	10
RB (Regen – treatment)	10	10
AB (Aggregate - treatment)	1	1
Total	108	58

Of the 50 pre-specified sites not surveyed, some specific reasons for not surveying given sites included:

* the type of native forest habitat found at the site appeared unsuitable for species based on past experience (36, 37, 61, 78)

*plantation habitat had completely covered the streamside reserve leaving no native forest (64)

* sites were considered highly likely to be out of range based on previous surveying (1-4) or presence of the species was not established at the mature sites in area (5, 6, 8, 9, 11-14).

* site had been buried by a landslip (21)

Time restrictions prevented sampling of all the remaining potentially suitable sites.The remaining sites that were not chosen were generally either logistically too far from roads (given the amount of time available) or superfluous to sampling a reasonable geographic spread of the target site types.

Site 7 was commenced but soon abandoned when it was considered to be too degraded to support the species (mainly based on the abundance of exotic slugs), and site 19 was found to have been entirely burned and only briefly searched for snails without success.

Survey Methods

In general, the supplied (or for PB and RB type sites, pre-determined) co-ordinates for each site were located as accurately as possible by GPS and used as the site centre. The site centre was moved to the nearest suitable point in cases where the expected site centre was unsuitable habitat or was too close to the edge of the retained area.

Searching was conducted within a loose 15 m radius of the centre point, with the aim of covering as much of this radius as possible. This was preferred to a 10 m square as the species appears to occur patchily across the habitat at a fine scale, and sometimes clusters within a small area of a surveyed site. Available habitats such as log and rock shelters (of all safely searchable sizes) and leaf litter were searched.

A range of environmental variables were recorded (including aspect, slope, canopy cover, tree and groundcover species present, and extent of coarse woody debris, rocks and other shelters, as well as levels of apparent disturbance) (see Appendix 4 for the field work data sheet) and were recorded in a Microsoft Access database for the project. From this database a Microsoft Excel spreadsheet of all the data can be exported. Photographs of the vegetation and streamside were taken and copies kept, including by the author, and photograph numbers are included in the database. For consistency, at every site, percentage cover of species (overstorey, understorey and ground cover) and measures of substrata were recorded by the primary searcher.

Each site was searched for approximately one hour, normally by two searchers, one of them normally without prior experience of searching for the species or other very small snails. Overall, assistant searchers found 29% of all Skemps snails found. However, the following complications were encountered when comparing search effort across sites:

* For this species, some sites are simply much more rapidly searchable than others. If a site lacked deep rock piles and had relatively few logs, then all likely shelters could often be searched within the hour. (This was especially true for plantation sites.) However at site 53B (for example), the three Skemps snails found were all found in piles of small rocks 5 cm or more below the ground surface, and perhaps continuing searching of such piles over several hours would have resulted in many more Skemps snails being found.

* Six different assistant searchers worked on this project (three of them for a full week and the remainder for parts of one week).

* One assistant searcher working on the project for one day (Marie Yee) had some prior experience of searching for small snails.

* At eight sites searched during the last three days (10, 18B, 33B, 45B, 49, 53, 53B, 65) two assistant searchers were present. Search time was reduced to 50 minutes at these sites to adjust for this, based on the average assistant success rate for assistant searchers to this point.

* The three assistant searchers who each searched for a full week found very similar proportions of the Skemps snails found in that time. Also the proportion of small (<5 mm wide) snails found by each of these assistants increased only gradually through the week, and did not differ greatly between the earliest and latest sites. However, one assistant searcher in the final week (Heath Hall) found small snails at a rapidly increasing rate over three days of surveying, and found 13/27 Skemps snails that were found during this time.

Of these factors, the first is the most significant. Given the large average numbers of Skemps snails found at sites where they were present, it is unlikely that variations in searchability or searcher skill had much impact on presence/absence data. However, great caution is needed in drawing conclusions about relative population density at different sites based on a one-hour sample, as some sites may have had very high rates of undercounting.

Results

Presence/absence and abundance

Skemps snails were found at 14 of the 58 sites at which a full search was conducted. In total 90 live adults, eleven live juveniles, 36 dead adults and nine dead juveniles were found. The species was found alive at all 14 successful sites. Live adults were present at thirteen of these 14 sites, and were the majority of specimens at eight of them.

The average Skemps snail tally per successful site was 10.4 specimens, with a low of 2 and two sites with more than 20. (There were 24 specimens at site 34 near the Tasman Highway on the Sideling, and 22 at site 49 on Shillady Road). 12 of the 14 successful sites produced five or more specimens.

Successful sites were rainforest, mixed forest or wet eucalypt forest. Some of the rainforest and mixed forest sites were dominated by *Dicksonia antarctica* with only very sparse emergent trees. The successful wet eucalypt forest sites all included trees estimated to be at least 100 years old, but those that were regenerating treatment sites or aggregated retention treatment sites displayed signs of historical partial harvesting, fire or both.

Skemps snail was found at **5 of 12** M-type riparian sites, **3 of 10** P-type riparian sites, **2 of 10** R-type riparian sites, **1 of 4** Y-type riparian sites, and **0 of 1** riparian sites surrounded by aggregated retention. One unsuccessful Y-type site (83) and one unsuccessful R-type site (57) also had plantations growing within 50 m on one side. Two of the unsuccessful M-type riparian sites were outside the species' verified range. Among non-riparian pair sites, it was found at **2 of 10** matched R-type sites, **0 of 10** P-type sites and **1 of 1** aggregated retention sites.

Among the 25 riparian sites, the species was found at **0 out of 10** sites where the retained unharvested forest vegetation was less than 40 metres wide, but **6 of 15** where it was at least 40 metres wide.

There were no substantial range extensions for the species. Sites 10 and 15 near Koomela Road appeared to be highly suitable for the species but it was not found there; it is possible this area is out of the species' range. The only range extension recorded was at site 32, one kilometre outside the minimum convex polygon of previous records. This is also the new easternmost record for the species. Within the species' already known range, distance from previous records did not seem to be a factor affecting whether the species was found or not.

Appendix 2 gives a list of results for Skemps snail by site, with some comments.

Characteristics of sites and individuals

Nearly all Skemps snails found were under rocks, logs or pieces of thick (typically myrtle) bark. One live adult was found in litter in a pile of twigs (site 72), another was found under thick bark on top of a large log (site 17) and one dead adult was found in moss on top of a dolerite boulder (site 102). One specimen at site 18 was collected accidentally and was probably inside the dead shell of a larger snail, *Stenacapha hamiltoni*.

Skemps snails tended not to be found under very large logs (>50 cm wide) and were quite often found under thin logs that had not greatly decayed. Although *D.antarctica* logs have often been recorded as a habitat for Skemps snails at the Skemps property near Myrtle Bank, none were found under *D. antarctica* logs in this survey. The slicing of *D. antarctica* logs for track construction at Skemps property may make them more suitable for the species.

Live Skemps snails were typically dormant or (in rare cases) slightly emerged when found, in spite of the very wet conditions during surveying in May. It is possible the species is more active at night, but it is probably always cryptic and unlikely to be often encountered crawling on the open forest floor.

Skemps snails were often loosely clustered at a given site. At sites 17, 40, 43B, 48, 55B and 72 all or nearly all the specimens found were in a relatively small area of the site. For instance at site 48, 13 of 15 specimens were within about three metres of each other (with two or three under the same piece of shelter in some cases) and it took most of the search time to find another two specimens on the other side of the site. At sites 43B and 55B (the two R-type non-riparian sites where the species was found within older regrowth forest) specimens were found in small drainage lines on which *Cyathea* ferns were growing.

There was little variation between specimens but a white-shelled colour form (as compared to the normal yellow-brown colour) was sometimes observed, most often at the Tasman Highway sites. Similar white forms of most *Scelidoropa* species are seen from time to time.

Findings for other snails

Numbers of other snails were also recorded by site; totals for live and dead specimens are given in **Appendix 3**. The most significant records are of the small charopid *Roblinella roblini* (Petterd, 1879). This species has been only recorded from two localities previously (Bonham, 2007): Distillery Creek gorge near Waverley (its type locality, where it was rediscovered in 2005-06), and a site near Valentine Creek near the Sideling (where a single specimen was collected in 2006 during searches for Skemps snail). In this survey a single live adult was found under a myrtle log in rainforest at site 83 (near Patersonia) and a single dead adult under rock rubble in rainforest at site 15 (Koomela Road). The latter site is in a large informal reserve and both these sites appear significantly more secure than the two previously known sites.

Anoglypta launcestonensis was surprisingly scarce at the survey sites given that at least 14 sites appeared to be suitable habitat, and the family Punctidae was also greatly under-represented because of limited targeting of leaf litter and the wetness of the litter during the survey (small punctids become cryptic during heavy rain).

The ratio of specimens found to sites where the species was found was much lower for the other 21 native species recorded than for Skemps snail, and these species generally displayed a relationship between average specimen count per site when present and number of sites where present (see Figure 1). While the focus on finding Skemps snail could have exaggerated this pattern, the species is an outlier compared to the normal relationship between local abundance and frequency of presence for other species, both in this survey and generally for Tasmanian land snails.

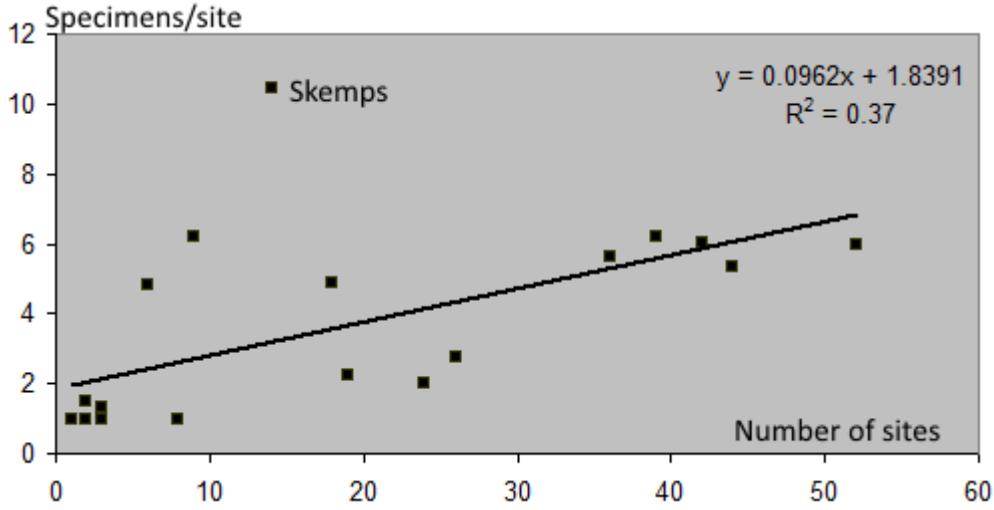

Fig 1 Specimen density by number of sites for 22 species of native snail seen during Skemps snail survey

Mean native species richness per site was 7.58 for mature forest sites (n=12), 7.8 for R-type sites (riparian within regrowth, n=10), 7.5 for RB-type sites (non-riparian regrowth, n=10),

6.2 for P-type sites (riparian within plantation, n=10) and 4.1 for PB-type sites (non-riparian plantation, n=10). Of the two pairs of sample methods, the data suggest that plantation sites have lower native snail diversity than riparian sites within plantations, but do not suggest a substantial difference between regrowth sites and riparian sites within regrowth.

There was one species-richness outlier among the mature forest sites - site 32, at which only three native species were recorded, although Skemps snail was common at this site.

Discussion

The number of sites surveyed in this study is still relatively small given the lack of prior systematic surveying for this species, and the diversity of site types and histories observed. The pattern of Skemps snail presence and absence appears to be complex. Further research may show that some of the patterns observed are not real and are just artefacts of the small number of sites so far surveyed.

The survey found that the species remains present broadly through its known range. Presence was not demonstrated at any of five riparian sites or three non-riparian sites searched in the Patersonia Road area (c. 12 km^2 of habitat) but this may be just a reflection of disturbance levels at most of the specific sites searched. It is possible that intensive historic pine plantation development will be found to have caused local extinctions covering up to a few square kilometres within the forest estate, but this requires further testing.

The results show that the species is likely to be maintained, at least to some degree, in wide (40 m+ total width) riparian strips and larger informal reserves throughout its range. They do not yet demonstrate any ability to persist at coupe level in clearfelled coupes lacking riparian strips of such a size, or if such strips happen to lack suitable habitat.

No surveying of non-riparian sites within young or purely silvicultural regrowth was conducted. The non-riparian regrowth sites surveyed in practice contained forest at least 40 years old, and those where Skemps snail was found included some much older trees. There is therefore no evidence yet either way on whether or not Skemps snail successfully recolonises purely silvicultural regrowth from modern clearfell, burn and sow methods.

While this survey provided two new examples of the species occurring within older regrowth forests, it did not change the known pattern of such occurrences. Such cases have so far involved mixed-age forests where some trees have survived the event(s) that regenerated much of the site (fire and/or selective logging). The area around site 55B had been heavily but selectively logged but there was very little evidence of past fire visible. Site 53B showed extensive signs of past fire but had deep rock piles in which the snail occurred.

If the patchy nature of Skemps snail occurrence found in this survey is confirmed as normal for this species, then it is consistent with the species being disturbance-sensitive and easily eliminated (by fire especially) from some otherwise suitable habitats. However, if more

searching finds the species in small riparian strips or very disturbed areas, then it could just be that the species is naturally patchy at site level.

The consistent finding of the species at sites in the large informal reserve along the Tasman Highway on the Sideling is a positive for the species' conservation as the species had not been recorded in this area before. It was also often found at sites very close to the highway in spite of any potential for weeds, exotic species or vehicle-related pollution to affect it in such areas.

The two searches at Whites Mill Road highlight the importance of managing all potential habitat for the species within a coupe and not just riparian zones. In some coupes, riparian zones may lack high-quality rock or log shelters, or may have a past history of disturbance that has not affected the whole coupe. Furthermore, this survey did not find evidence that retained riparian areas within older regrowth are more supportive for the species than non-riparian areas of older regrowth.

Site 102 was the only site for which detailed information about numbers prior to the adjacent logging existed. In 2002, the species had been recorded at a rate of 15 specimens per person-hour (Bonham, 2002). In this survey it was recorded at a rate of 6.5 specimens per person-hour. The difference is unlikely to be caused by the adjacent logging and is more likely to be a case of regression to the mean from a particularly high previous value.

Aside from the question of streamside reserve size, evidence of good recent management practices for the species was seen at site 40 (Eagle Road). Harvesting operations had not resulted in fire or other obvious damage to the retained habitat and Skemps snail was found in average numbers within the wet eucalypt forest in the retained forest.

Management implications

Habitat description:

The study results suggest the classification of suitable habitat is appropriate. It is recommended however that the description be re-ordered and slightly reworded as follows:

Potential habitat for the Skemps snail is rainforest (including Dicksonia *gullies), mixed forest, wet sclerophyll forest, closed broadleaf shrubbery, and wet or damp forest gulliesin predominantly dry forest.*

Streamside reserves:

The question of streamside reserve size and its interaction with harvesting methods and surrounding forest types requires more detailed research. For the time being the results are strongly consistent with a total streamside reserve width (both sides combined) of at least 40 metres being effective, and anything less being insufficient to conserve the species within a

coupe. Individual site results suggest that fire incursions into rainforests in streamside reserves may eliminate the species, even if not all the retained forest is burnt.

Areas to set aside:

In selecting areas within a coupe to make up the 20% of the coupe that is set aside (unless the species is absent or in low numbers), the following currently applies:

The retained areas should target parts of the coupe previously unharvested (or only lightly selectively harvested more than 25 years ago) and/or unburnt in the last 25 years, and focus on parts of the forest with a dense broadleaf understorey.

The following revision is proposed:

The retained areas should target parts of the coupe that meet as many as possible of the following criteria:

** previously unharvested (or only selectively harvested more than 25 years ago)*

** without evidence of burning, or else burnt as long ago and as lightly as possible*

** rocky, especially with dense scree of rocks covered with moss and lichens*

** with an understory of rainforest trees,* Dicksonia *or* Cyathea *ferns, or broad-leaved shrubs*

Definition of low-density populations

The current prescriptions allow for the 20% set-aside requirement to be waived where:

it has been established through sufficient surveying that the species either does not occur within the proposed planning unit, or only occurs in low population densities, or that any high-population-density areas within the coupe are confined to areas where harvesting is excluded.

It is recommended that "low population densities" be defined as an average of one specimen per person-hour or less for less experienced searchers, or 2.5 specimens per person-hour or less for expert searchers. It is also recommended that at least three sites per coupe be surveyed, each for at least one person-hour, unless the area of suitable habitat within the coupe is very small.

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Appendix 1: Current prescriptions for Skemps Snail

The primary management objective is "to implement actions that will assist the maintenance of populations throughout its range, primarily through the protection of known sites and the maintenance of potential habitat."

The following prescriptions are included in the 2014 *Threatened Fauna Advisor:*

- Within the known range of the Skemps Snail, a contiguous network of native forest, which contains potential habitat of the species, should be provided. For most areas of State forest, this has been achieved through the network of formal and informal reserves such as Wildlife Habitat Strips, streamside reserves and other such reserves (this can include 'biodiversity spines' on State forest).
- Coupes should be planned at a strategic level (e.g. several coupes intended for harvesting over a 3-10 year period in the same forest block) such that (1) maximum dispersal of coupes can be achieved, and (2) larger areas of undisturbed native forest (at least 25 years old) are retained between coupes.
- Retain intact streamside reserves on all stream classes (40 m for class 1, 30 m for class 2, 20 m for class 3, and 20 m for all class 4s).
- Retention of intact native vegetation along other drainage features is also encouraged.
- Avoid, wherever practical, disturbance to retained streamside reserves, especially in relation to minimising the impact of fire on retained vegetation; where this is unavoidable (i.e. to achieve adequate regeneration), scallops of native vegetation should be maintained on the junction of class 3 and 4 streams into the coupe or the junction of the class 4 and the coupe boundary, as far as practicable.
- Removal of accidentally felled trees from within retained streamside reserves is acceptable provided that disturbance to the understorey and stream bed and banks is minimised.
- Avoid permanent road infrastructure across streams, especially sections with dense closed understorey and sections of permanent flow.
- A minimum of 20% of the potential habitat within the proposed planning unit should be excluded from clearfell operations. This applies unless it has been established through sufficient surveying that the species either does not occur within the proposed planning unit, or only occurs in low population densities, or that any high-population-density areas within the coupe are confined to areas where harvesting is excluded. Surveys must be conducted by a person or persons competent in surveying for small land snails and identifying the species. The retained areas can include streamside reserves (as described in the section above) but must also include areas of non-riparian habitat (ideally contiguous with the retained potential habitat within streamside reserves), where potential habitat is distributed in non-riparian areas. The

retained areas should target parts of the coupe previously unharvested (or only lightly selectively harvested more than 25 years ago) and/or unburnt in the last 25 years, and focus on parts of the forest with a dense broadleaf understorey.

- In addition, Wildlife Habitat Clumps (WHCs) should be retained at the rate recommended by the Forest Practices Code (for further details see Fauna Tech Note 7). WHCs should target patches of potential habitat for the Skemps Snail and, where there is a choice, they should target habitat older than 25 years. The placement of WHCs as small patches of retained habitat within the harvest area is acceptable where the distribution of prime potential habitat is compatible with this. While distributing WHCs across the harvested area is desirable, consolidation of patches is acceptable if prime potential habitat is concentrated in a particular area. Potential habitat set aside for the Skemps Snail is intended for long-term retention. WHCs should be identified on the planning map and flagged in the field prior to commencement of the operation. WHCs should be protected from disturbance from forestry activities. Low intensity fuel reduction burning and top disposal burning should be minimised but are acceptable.
- High intensity or frequent fires should be avoided within the range of the Skemps Snail. Regeneration activities that include fire should be undertaken such that the volume of coarse woody debris from within harvested areas is not significantly reduced. If this cannot be achieved, further advice should be sought from the Forest Practices Authority.
- Avoid burning wetter forest types at a frequency of less than 25 years.
- Avoid burning within 20 m of any permanent stream or retained riparian area.
- Utilise lower intensity burning wherever possible, to minimise the risk of long-term structural changes to patches of dense wet forest understorey.

Appendix 2: Basic site data including Skemps Snail results and comments

(LA = live adult, DA = dead adult, LJ = live juvenile, DJ = dead juvenile)
(M = mature forest surrounding, P = plantation surrounding, R = regen surrounding, Y = young regen surrounding, Agg = aggregate, B = within surrounding habitat type rather than within riparian zone)

Site	Locality	Type	LA	LJ	DA	DJ	Comments
10	Koomela Road	M	0	0	0	0	appeared suitable, perhaps out of range
15	Koomela Road	M	0	0	0	0	appeared suitable, perhaps out of range
17	**Meredith Road, Sideling**	**P**	**5**	**0**	**0**	**0**	SS scattered under mostly small logs, one under bark on large log
17B	Meredith Road, Sideling	PB	0	0	0	0	eucalypt plantation
18	**Meredith Road, Sideling**	**P**	**1**	**0**	**3**	**1**	**two SS in rotten log, two under small log, one inside Stenacapha shell**
18B	Meredith Road, Sideling	PB	0	0	0	0	eucalypt plantation
24	Meredith Road, Sideling	M	0	0	0	0	site possibly degraded by fires
29	Meredith Road, Sideling	P	0	0	0	0	thin retained riparian strip - poor log quality probably as a result of logging impacts
29B	Meredith Road, Sideling	PB	0	0	0	0	eucalypt plantation
30	Meredith Road, Sideling	P	0	0	0	0	
30B	Meredith Road, Sideling	PB	0	0	0	0	old eucalypt plantation
31	Tasman Highway, Sideling	R	0	0	0	0	few suitable rocks and habitat somewhat disturbed by weeds
31B	Tasman Highway, Sideling	RB	0	0	0	0	
32	**Tasman Highway, Sideling**	**M**	**9**	**0**	**3**	**0**	**SS under logs and rocks**
33	Tasman Highway, Sideling	P	0	0	0	0	site appeared disturbed by past fires that would have opened up understorey although not all site burnt
33B	Tasman Highway, Sideling	PB	0	0	0	0	second-rotation pine plantation
34	**Tasman Highway, Sideling**	**R**	**18**	**2**	**3**	**1**	**SS common under rocks, mostly upslope c.10-20 m from creek**
34B	Tasman Highway, Sideling	RB	0	0	0	0	
35	**Tasman Highway, Sideling**	**M**	**6**	**3**	**6**	**0**	**SS common under rocks, one under log**
38	Weelaty Road, Sideling	Y	0	0	0	0	near known record but only small portion of habitat appeared suitable, few logs
39	Eagle Road, Sideling	M	0	0	0	0	unusual habitat on basalt
40	**Eagle Road, Sideling**	**Y**	**5**	**2**	**2**	**0**	**SS under logs of varying sizes but loosely clustered in one portion of site**
43	Lone Star Ridge Road	R	0	0	0	0	site possibly too open
43B	Lone Star Ridge Road	R	0	0	0	0	site appeared suitable despite being regrowth but species not found
45	Lone Star Road, North Lisle	P	0	0	0	0	habitat swampy with very few logs
45B	Lone Star Road, North Lisle	PB	0	0	0	0	eucalypt plantation replanting on former pine plantation

46	Lone Star Road, North Lisle	M	0	0	0	0	large numbers of exotic slugs at site, also some evidence of old burns
48	**Shillady Road**	**P**	**11**	**1**	**2**	**1**	**13 SS under logs and bark in cluster, two under small log**
Site	Locality	Type	LA	LJ	DA	DJ	Comments
48B	Shillady Road	PB	0	0	0	0	young eucalypt plantation
49	**Shillady Road**	**M**	**12**	**1**	**4**	**5**	**SS mostly under logs and bark, one in soil around rocks**
50	**Bessels Road, Lisle**	**M**	**5**	**0**	**3**	**0**	**SS under mossy rocks, mostly near stream**
53	Bessels Road, Lisle	R	0	0	0	0	
53B	**Bessels Road, Lisle**	**RB**	**1**	**1**	**1**	**0**	**SS deep in rockpiles on drainage line**
55	**Virginia Road, Lisle**	**R**	**0**	**1**	**1**	**0**	**site disturbed by old mining. Two specimens under small logs**
55B	**Virginia Road, Lisle**	**RB**	**6**	**0**	**2**	**0**	**mixed-age regrowth, heavily selectively logged in past, little evidence of fire. SS under rocks on or near drainage line except one under log**
56	Virginia Road, Lisle	Y	0	0	0	0	microhabitats apparently very suitable
57	Virginia Road, Lisle	R	0	0	0	0	microhabitats apparently suitable
57B	Virginia Road, Lisle	RB	0	0	0	0	
62	Lisle Road	P	0	0	0	0	streamside reserve very degraded with all original overstorey gone
62B	Lisle Road	PB	0	0	0	0	pine plantation
65	Watts Road, Lisle	M	0	0	0	0	site disturbed by old selective logging, snig tracks, etc
67	Watts Road, Lisle	P	0	0	0	0	site degraded by adjacent plantation, exotic slugs common
67B	Watts Road, Lisle	PB	0	0	0	0	pine plantation
70	Bessels Road, Lisle	R	0	0	0	0	site not especially "wet" forest, with few logs
70B	Bessels Road, Lisle	RB	0	0	0	0	
72	**Bessels Road, Lisle**	**M**	**3**	**0**	**2**	**0**	**four SS under narrow log, one under twigpile**
74	Bessels Road, Lisle	R	0	0	0	0	surrounding regrowth forest showing old fire damage to close to creek
74B	Bessels Road, Lisle	RB	0	0	0	0	
77	Patersonia	R	0	0	0	0	
77B	Patersonia	RB	0	0	0	0	open site, mostly dry forest, probably not suitable habitat
79	Patersonia	M	0	0	0	0	site possibly degraded by old fires, nearby farmland
81	Patersonia	P	0	0	0	0	site disturbed by past fires and harvesting
81B	Patersonia	PB	0	0	0	0	eucalypt plantation
83	Patersonia	Y	0	0	0	0	
85	Mt Arthur Road	R	0	0	0	0	
85B	Mt Arthur Road	RB	0	0	0	0	mixed-age forest similar to sites 53B and 55B where species was found
101	Whites Mill Road	(Agg)	0	0	0	0	site lacked significant rock or log cover
102	**Whites Mill Road**	**(Agg-B)**	**8**	**0**	**4**	**1**	**SS mostly under rocks, one in moss on top of rock**

Appendix 3 Numbers by site of all snail species recorded (*=exotic species)

	Rhytididae	Rhytididae	Rhytididae	Caryodidae	Caryodidae	Punctidae	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	**Charopidae**	Charopidae	Charopidae	Charopidae	Charopidae	Charopidae	Helicarionidae	Cystopeltidae	Arionidae	Agrolimacidae	Limacidae	Limacidae		
Site	Victaphanta lampra	Prolesophanta sp "Strzelecki"	Prolesophanta dyeri	Caryodes dufresnii	Anoglypta launcestonensis	Pedicamista sp "Chisholm"	Planilaoma luckmanii	Discocharopa mimosa	Discocharopa lottah	Allocharopa sp "Mersey"	Elsothera limula	Elsothera sp "Weldborough"	Scelidoropa sp "Hollybank"	Scelidoropa sp "Lefroy"	**Charopidae sp "Skemps"**	Dentherona subrugosa	Roblinella roblini	Thryasona cf marchianae	Thryasona diemenensis	Stenacapha hamiltoni	Helicarion cf cuvieri	Cystopelta petterdi	Arion intermedius*	Deroceras reticulatum*	Lehmannia nyctelia/valentiana*	Limax maximus*	Native species	Native specimens
10	4			7								9	5						10	3							6	38
15	4			5								4	5			3	1			4						1	7	26
17	1											4	2		**5**	2				1							6	15
17B	7																			7		1					3	15
18	7			5							1	20	7		**5**	5			2	5						1	9	57
18B											12											3	1	1		5	2	15
24				3	1							7				3			5	2				3			6	21
29	1			1								1							2	10							5	15
29B		1										8				2				11		2				4	5	24
30						1						4	1			3				3							5	12
30B	5			1								12	1						5	5		4					7	33
31	3			2						1		6				22			3	7		1					8	45
31B		2								1		4				4			1	17		1					7	30
32												5			**12**					3							3	20
33	3						1					12							4	6							5	26
33B	1	1										32										2	2		1		4	36

Site	Victaphanta lampra	Prolesophanta sp "Strzelecki"	Prolesophanta dyeri	Caryodes dufresnii	Anoglypta launcestonensis	Pedicamista sp "Chisholm"	Planilaoma luckmanii	Discocharopa mimosa	Discocharopa lottah	Allocharopa sp "Mersey"	Elsothera limula	Elsothera sp "Weldborough"	Scelidoropa sp "Hollybank"	Scelidoropa sp "Lefroy"	**Charopidae sp "Skemps"**	Dentherona subrugosa	Roblinella roblini	Thryasona cf marchianae	Thryasona diemenensis	Stenacapha hamiltoni	Helicarion cf cuvieri	Cystopelta petterdi	Arion intermedius*	Deroceras reticulatum*	Lehmannia nyctelia/valentiana*	Limax maximus*	Native species	Native specimens
34				2						1		8	2		**24**				2							6	39
34B	2	1		2								1	1						7	7		1					8	22
35		1		1						1		4			**15**	3			4	2							8	31
38	2							1											3	2							4	8
39	4			4						1		2	2			5		2	10	4							9	34
40	1			3								21			**9**	3			11	3							7	51
43	8		1	17		1						2	3			2			16	11		1					10	62
43B				12							3			1		2		24	2	10							7	54
45	3										4									2		2					4	11
45B	18																		1	1		1					4	21
46	4			3						1	4		2			5			2	4		1		12			9	26
48	5			7							1	7	2		**15**			2	3	1							9	43
48B	1			3							13		1							2							5	20
49	6			11							17		2		**22**	28			14	6		1					9	107
50				1								4	5		**8**	2		7	2								7	29
53	10	2		12							1	2				8			12	10	10						9	67
53B	7	3	1	9											**3**	15			24	3	2						9	67
55	5			3							2	3	4		**2**	3			18	5							9	45
55B	9		1	12						1	1	5	1		**8**	2				1							10	41
56	2	4		4								6		1		4			1	5						1	8	27
57	5			5								12				5				5	4						6	36
57B	7			5								3				4			1	5	4	2		1			8	31
62	4	2										3				1				12		7	3			2	6	29

Site	Victaphanta lampra	Prolesophanta sp "Strzelecki"	Prolesophanta dyeri	Caryodes dufresnii	Anoglypta launcestonensis	Pedicamista sp "Chisholm"	Planilaoma luckmanii	Discocharopa mimosa	Discocharopa lottah	Allocharopa sp "Mersey"	Elsothera limula	Elsothera sp "Weldborough"	Scelidoropa sp "Hollybank"	Scelidoropa sp "Lefroy"	**Charopidae sp "Skemps"**	Dentherona subrugosa	Roblinella roblini	Thryasona cf marchianae	Thryasona diemenensis	Stenacapha hamiltoni	Helicarion cf cuvieri	Cystopelta petterdi	Arion intermedius*	Deroceras reticulatum*	Lehmannia nyctelia/valentiana*	Limax maximus*	Native species	Native specimens
62B												6								12		1					3	19
65	8	1		8							1	4	3			7			14	12		1					10	59
67	2	4											1						8	10		2		4	6		6	27
67B	5	9											2						1	8		7					6	32
70	4			1							1	1						1	18	4				1			7	30
70B	10											4				1			3	7		1					6	26
72	6			9							1	5			**5**	11			9								7	46
74	8			8							9	2	1			5			4		8						8	45
74B	7	3		20				1					1			1			3	3	1					3	9	40
77	11	3		1								2				1			4	2							7	24
77B	1										13							8	5	2							5	29
79	13	1								1	1	2	1			7		1	8	6							10	41
81	6						2					3	13						5	6		1					7	36
81B		1																		1			2	1		6	2	2
83		1										1				4	1		1	6		2					7	16
85		1		2	2		1	1								3				7		2				1	8	19
85B	6	2		1												4			4	10						2	6	27
101	1			6					1		3		3			16		3	1	11		1					10	46
102	8			7									1		**13**	7		8	1	20							8	65
Sites	44	19	3	36	2	2	3	3	1	8	18	39	26	2	14	36	2	9	42	52	6	24	4	7	2	10	22	
Specimens	235	43	3	203	3	2	4	3	1	8	88	241	72	2	146	203	2	56	254	312	29	48	8	23	7	26		1958

Appendix 4: Skemps snail field work data sheet

Skemps snail (*Charopidae* sp. "Skemps") project

Date_____ Site #_____ Observer_____

E _____ N _____ Alt _____

Search time_____ Aspect _____ Slope_____

Floristic Forest Code: _____

Riparian plot? Y / N Width of SSR where applicable (both sides of stream):_____m

Condition (disturbed/slightly disturbed/undisturbed)

Moisture condition (dry/damp/moist/wet)

Forest type outside SSR (where applicable):_____

Forest age/growth structure outside SSR (where applicable): mature / regrowth / <20y, other: _____

Overstorey species_____ %cover_____

Understorey species: _____

_____ %cover_____

Ground cover species: _____

_____ %cover_____

Average depth of leaf litter _____(cm) % leaf _____ %Twig (<10cm diam)_____

% Moss cover _____ % Rock cover _____ % CWD (> 10 cm diam)_____

% Bark cover_____ % Ground cover_____ % Other……..

Picture Taken: Y / N Picture Name: _____

Species	Present?	Comments (keep a tally of alive 'A' and dead 'D' animals)
Skemps snail	Y / N	
	Y / N / NA	
	Y / N / NA	
Other comments:		