A SURVEY OF DUNG BEETLES
FROM THE
MOGGILL CREEK CATCHMENT, BRISBANE

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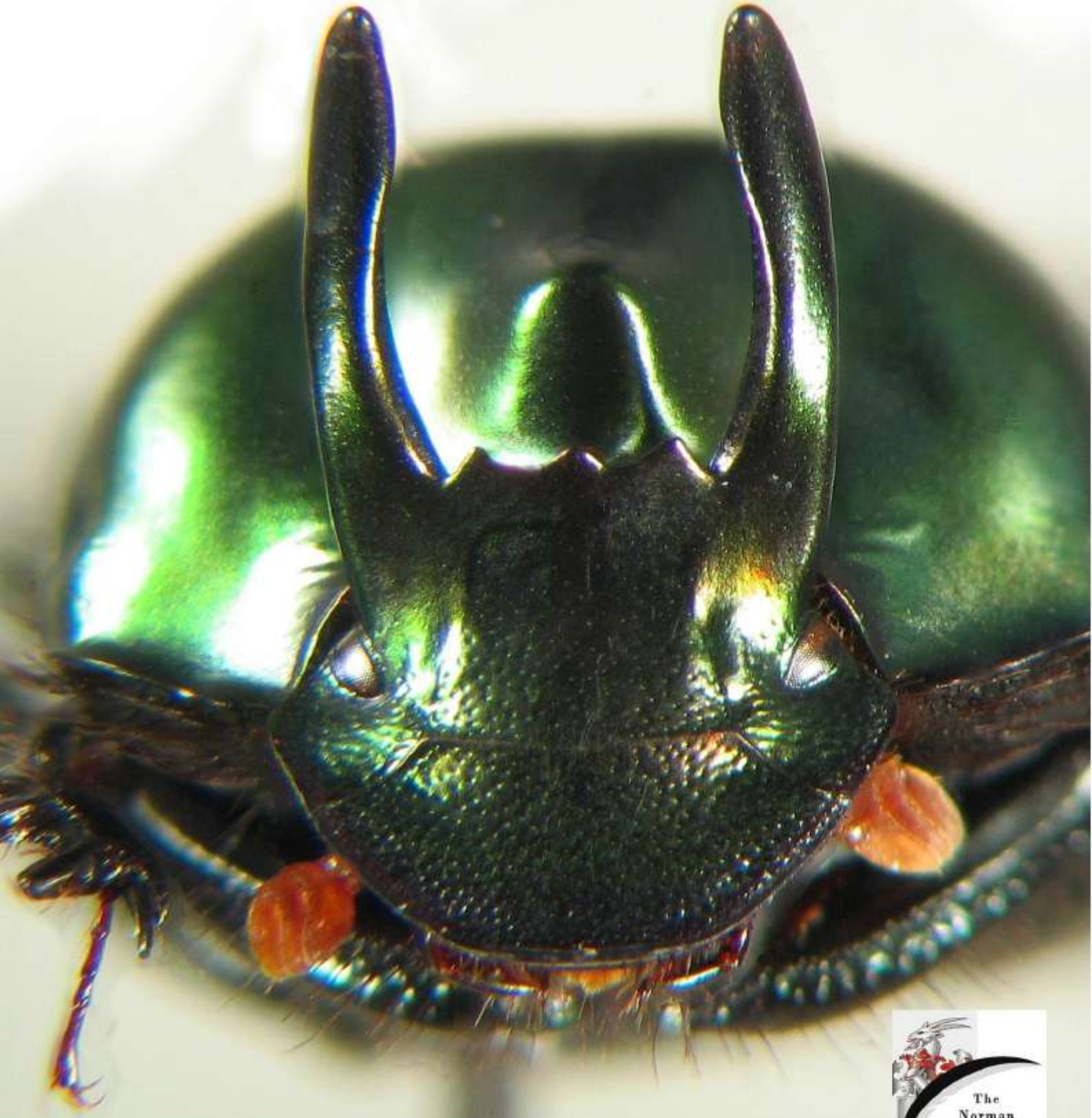

A Consultancy Report to the Moggill Creek Catchment Group, June 2011

The Norman Wettenhall Foundation

REPORT ON A SURVEY OF DUNG BEETLES (COLEOPTERA: SCARABAEINAE) FROM THE MOGGILL CREEK CATCHMENT BRISBANE

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June 2011

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COVER IMAGE

Front view of a male
of *Onthophagus tweedensis*,
a common species in the Moggill Catchment
(Photo: Geoff Thompson, Queensland Museum)

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SUMMARY

1. The catchment of Moggill Creek occupies 57.7 km^2 of western Brisbane and has a gradient of development from dense suburban housing through semi-rural to virgin bushland. It has more bushland than any other catchment in Brisbane.

2. Dung beetles are a beneficial group of insects which disperse mammal dung into the soil, thus preventing disease transmission and fly breeding while at the same time providing nutrients and aeration to the soil.

3. Bait trapping of dung beetles was carried out from November 2010 to March 2011 in the Moggill Creek Catchment by 11 community volunteers from the Moggill Creek Catchment Group and the writers of this report. 536 individual trap samples were generated from 100 sample sites.

4. A total of 1835 specimens were collected and sorted into 31 different species. Thirty were native dung beetles and one was an introduced African species. Eight of the native species had never been recorded from within the Moggill Creek catchment before.

5. Adding the Queensland Museum‟s prior records of dung beetles from the area brings the grand total for the Catchment to 36 species (31 native and 5 African). This is 7.8% of the Australian total fauna of ca. 462 species. The commonest was the native *Onthophagus rubicundulus* which comprised one third of all specimens and was found at 61 of the 100 sites.

6. For each species the report gives (a) notes for recognition, (b) distribution outside the Moggill Catchment, and (b) brief statement of known biology.

7. Eighteen species showed their peak abundance in early summer and 12 species had their peak in late summer.

8. Ten species strongly favoured dense vegetation and seven species favoured open areas

9. Several species favoured mushroom over dung and two species were strongly associated with it (*Onthophagus dunningi* and *Boletoscapter furcatus*). Among the dung specialists, 8 species strongly favoured horse dung and 9 species strongly favoured wallaby dung.

10. Maps of the sites where each native dung beetle species was recorded in the Catchment are given.

FUNDING

This survey was carried out as part of a proposal entitled “Dung Beetles of the Moggill Creek Catchment” which was funded on behalf of the Moggill Creek Catchment Group by the Norman Wettenhall Foundation. We are most grateful to the Foundation for its support of this project.

Onthophagus tuckonie

Onthophagus capella

Boletoscapter furcatus

Monoplistes leai

Amphistomus storeyi

Onthophagus dandalu

Some dung beetles from the Moggill Creek Catchment

THE MOGGILL CREEK CATCHMENT

The Moggill Creek catchment occupies 57.6 square kilometres of Brisbane's western suburbs. It includes all or larger parts of the suburbs of Kenmore, Kenmore Hills, Brookfield and Upper Brookfield and small sections of Pullenvale and Pinjarra Hills. Within the catchment, and bordering the northern and western margins of the suburbs, lie substantial areas of undeveloped bushland within Brisbane Forest Park on the slopes of both Mt Coot-tha and the D'Aguilar Range. In general the Catchment shows a gradient in development intensity from the closely settled suburbs of Kenmore and Kenmore Hills in the east, through the central, semi-rural areas of Brookfield and Gold Creek, to the practically virgin eucalypt forests on the hills along the western and northern boundaries. It contains more bushland than any other catchment in Brisbane City. Eucalypt forests are the major vegetation type but small patches of rainforest are present along the major creeks and in sheltered gullies. Many of the creek flats are cleared pastures used sometimes for cattle, but more often for recreational horses which are a common activity in the Catchment.

Moggill Creek rises in Upper Brookfield and flows into the Brisbane River in the suburb of Kenmore. Its main tributaries include Gold Creek, Wonga (Savage‟s) Creek, Gap Creek and McKay Brook. A large water storage body, the Gold Creek Reservoir, exists on the upper part of Gold Creek. The Moggill Creek Catchment is divided into 13 Sections for convenience and these are shown on the map below.

INTRODUCTION TO DUNG BEETLES

The dung beetles comprise a large worldwide group of stout-bodied beetles which specialise in feeding on dung of animals. They are a sub-group of the very large group of beetles which go under the general name of "scarabs". Other familiar sorts of scarabs that don‟t feed on dung include Christmas beetles, rhinoceros beetles, cane beetles and stag beetles. Technically, the true dung beetles belong to the subfamily Scarabaeinae within the family Scarabaeidae.

Dung beetles find dung by smell using their highly sensitive antennae which can detect the direction in which freshly deposited dung lies. Most have wings and can fly to dung, but a few species, mostly in rainforest, have lost the powers of flight and walk in search of dung. Some species are active only at night, others only in the daytime.

Dung beetles use dung as a food source for their larvae (the grub stage). After arrival at a dung mass they dig burrows in the ground and transport dung down into underground nest chambers where they lay a single egg in each dung chamber. The eggs hatch to larvae which eat the dung and eventually transform into a new generation of adult dung beetles.

Most species make their nest burrows directly at the site of the dung and these are called **"dung buriers"**. Others form the dung into balls which they carry or roll away from the original dung source before making their nest burrows. These are called the **"ball rollers".** A few small species don‟t collect their own dung but lay their eggs in nest burrows made by other dung beetles, like cuckoos, and these are the **"nest parasites".** In Australia a few species have evolved to use rotten mushroom material instead of dung for feeding their larvae.

Dung beetles are considered highly beneficial to ecosystems. They remove dung from the soil surface and thus reduce its role in both disease/parasite transfer and in fly breeding. They ensure that the dung nutrients are incorporated into the soil and their burrowing activities provide valuable soil aeration.

There are about 450 native Australian dung beetles. These evolved to use the dry, pelletized dung of native mammals. European man brought cattle to Australia and they produce large masses of semi-liquid dung, quite different from that of native Australian mammals. The native dung beetles could not cope adequately with dung of this nature and a serious problem arose with the non-dispersal of cattle dung in Australia. In the 1970s and 1980s, to alleviate this problem, CSIRO introduced to Australia a suite of African and Mediterranean dung beetles which were adapted to cattle dung, and there are now 23 of these foreign species established here.

Dung beetles are beneficial insects which are diverse and well-studied around the world. They are easy to sample using baited traps and are relatively easy to identify. For these reasons they have been widely used as an environmental monitoring group in many parts of the world, including Australia where there is a national database of 100,000 dung beetle records available that can be used to place local surveys into national context.

THE MOGGILL CREEK CATCHMENT SURVEY

(i) Introduction

The authors were engaged to carry out a survey of both native and introduced dung beetles in the Moggill Creek Catchment during the summer of 2010/1011. The principal objectives were to establish which species occurred in the area, what the distributions of the individual species were within the catchment, and to find out a little of the biology of the different species especially as regards dung feeding preferences and vegetation associations of the various species.

The project was carried out as a community participation exercise. Survey trapping was carried out partly by a group of 11 enthusiastic community residents, who largely trapped on their own properties, and partly by the authors who trapped largely on public reserves. All final specialist identifications were carried out by the authors. All identifications and collection data for the 1835 specimens obtained in the field trapping are entered in an Excel database which is available on disc to complement this written report.

(ii) The community volunteer collectors

The local residents who volunteered to trap dung beetles on their properties and nearby areas are as follows: Dale Borgelt (Gap Creek Road); William Davies (Carbine Road); Deb Ford (upper Haven Road); Jan and Gordon Grigg (end of Gold Creek Road and Hillbrook Road); Trevor Hopper (lower Haven Road); Helen Ovens (end of Gold Creek Road); Suzanne Philp (Gap Creek Reserve and near); Richard Woodhead (lower Haven Road); Joanna Yesberg (Tuckett Street, Brookfield State School, Rafting Ground Road); Jeanette Young (Moons Lane); April Youngberry (Kenmore High School and near). The details of all their trap sites can be seen in Appendix 1 and the species they collected are in Appendix 2. We are enormously grateful for their efforts, during what was a very wet summer.

(iii) Training workshops

Two hands-on training workshops were conducted by the authors for community participants in the survey. Both were held on Saturday mornings at the Moggill Creek Catchment Group‟s headquarters cottage at Gold Creek Reservoir. The first was held on October 23, 2010 at the beginning of the survey, and gave an overall introduction to dung beetles and their biology as well as demonstration of techniques for bait making and trapping. The second workshop was held on February 26, 2011, towards the end of the field sampling, and dealt with sorting samples and identification. About a dozen participants attended each workshop.

(iv) Trapping methods

Dung beetles are easily trapped by using the odour of fresh dung to lure them into a container sunk into the ground as a small pitfall trap. For the Moggill survey we used 350 ml plastic cups as the pitfall receptacle. These were sunk in the ground using a trowel so that their mouth was flush with the ground surface. Balls of bait about 60 mm in diameter were wrapped in squares of kitchen cloth (Chux®) and tied off with short lengths of plastic-covered garden tie-wire. These baits could be suspended in the mouth of the pitfall by tying the bait to a wire peg, with a looped end, pushed into the soil beside the cup. About 20 mm deep of detergent water was poured into each pitfall cup and a rectangular rain-shelter of polycarbonate roofing was pushed into the ground so that it leaned at an angle over the baited trap. A data label was placed in each cup at time of setting. Beetles fly or walk to the bait and fall into the cup where they quickly drown in the detergent water.

Dung beetle trapping apparatus

A set dung trap with bait and rain-cover in place.

Traps were set and then maintained in position for approximately 24 hours so that they would attract beetle species that are active at any time of day or night. The fluid was then poured off through a tea strainer and the beetles transferred, with the data label, to a plastic container of 80% methylated spirits or laboratory ethanol.

(v) Baits used in the survey

Three different bait materials were used in the Moggill survey, viz. macropod dung, horse dung and rotten mushroom. Both the dung-type baits were made up in bulk beforehand, wrapped in plastic to prevent dehydration, and stored in a deep freeze until use. The macropod baits were all supplied by Monteith/Kenyon and were made from fresh dung collected early in the morning from the kangaroo and wallaby enclosure at Lone Pine Sanctuary. Lone Pine management is gratefully thanked for allowing dung harvesting for this purpose for many years. All horse dung baits were supplied by Richard Woodhead, sourced from his own horses in Haven Road. Mushroom baits were prepared by individual trappers from shop-bought button mushrooms allowed to rot for a few days in a plastic bag in the sun.

(vi) The sampling program

Because trapping was done mainly by volunteer collectors, not only during the disruptive summer holiday period but also during Queensland‟s even more disruptive record flood season, there was never the expectation that a scientifically and statistically stringent trapping regime could be maintained. We really aimed at getting as much trapping done at as many sites as people felt they could cope with, with the hope that this exercise would give us enough samples for a preliminary assessment of the overall dung beetle fauna of the region.

Trappers were asked to select sites to give geographic and habitat coverage within their local area and to try to trap these for a 24-hour period at about the middle of each month from October to March. For bait preference studies, the community volunteer collectors trapped each site with three traps running simultaneously at least 5 metres apart, baited with macropod dung, horse dung and mushroom, respectively. The separate trapping series conducted by Monteith/Kenyon used two traps at each site, baited with macropod dung and mushroom, respectively.

At each trapping occasion, a simple suite of location, vegetation, soil, bait and temporal data were recorded on a data form. These data were linked to a sample number which was cut off from the form and placed in each individual pitfall trap. These forms were submitted with the numbered

specimen samples and were used for data entry into the master Excel Table. An example of the simple field data form is reproduced below:

SITE SAMPLES 501-503	Locality/Site Name	COORDINATES (*if known*)	*Sample No's- Cut off and put in the trap when it's set and then it will go in the sample vial with specimens*
Date Trap Set: Time:	Date Trap Emptied: Time:	Baits Used (*please circle*) *Horse Wallaby Mushroom*	**Sample No. 501 MUSHROOM**
Location: pick one *Ridge top* *Slope* *Valley floor*	Soil Type: pick one *Sandy* *Gravelly* *Loamy*	Vegetation Type: pick one *Sparse* *Medium* *Dense*	**Sample No. 502 WALLABY**
Name of Person Submitting Sample: Address: Phone:			**Sample No. 503 HORSE**
PLACE THIS COMPLETED FORM IN A SEALED BAG WITH THE SAMPLE VIALS			

(vii) The sampling sites

A total of exactly 100 sites were sampled during the survey, 63 by the community volunteers and 37 by Monteith/Kenyon. Another 13 dung beetle sites in the Catchment are available from Queensland Museum dung beetle records prior to the recent survey, bringing the total sites from which data is available to 113. These are all listed with names, codes and coordinates in Appendix 1.

RESULTS OF THE SURVEY

(i) Collections made

A total of 536 individual trap collections were made. Of these, 306 samples contained dung beetles, 220 did not have any dung beetles and 10 were disturbed by brush turkeys or bandicoots and the sample (sometimes the whole trap) was lost.

There were 1835 specimens of dung beetles in all the samples. These were all identified by Geoff Monteith and databased by Tania Kenyon. The 330 traps operated by the community volunteers yielded 1236 dung beetles belonging to 27 species. These are tabulated in detail for each collector in Appendix 2. The Monteith/Kenyon traps caught 599 specimens of 22 species.

(ii) Final census of species in the Moggill Creek Catchment

Appendix 3 gives the final summary of all dung beetle species recorded from the Moggill Creek Catchment. The overall survey last summer detected 30 native species and only one African species, the ubiquitous *Onthophagus gazella*. Of the native species, the following eight species are new records from the Catchment: *Lepanus politus, Lepanus ustulatus, Onthophagus australis,, O. CQ8, O. granulatus, O. semimetallicus, O. thoreyi, O. walteri.* This is a quite significant achievement of the survey. Highlights are detection of a population of the rare mushroom feeding

species, *Onthophagus walteri*, at Rafting Ground Rd, and the new species, *Onthophagus CQ8*, formerly known from just a few sites near Brisbane, but which obviously has thriving colonies in the open paddocks around Haven Road.

The middle column of Appendix 3 lists the 28 species of dung beetles which were known from the Moggill catchment, on the basis of Queensland Museum records, prior to the current survey. Of these, the following 5 species were not re-collected during the current intensive survey: *Onthophagus tenebrosus, Euoniticellus intermedius, Liatongus militaris, Onitis alexis, Sisyphus spinipes*. The last four are African species which have been taken, within the catchment, only on the University Veterinary Farm at Pinjarra Hills.

Merging the Queensland Museum data with that from the recent survey gives a grand total of 31 native species and 5 African species from the Catchment. This slightly exceeds the 28 native and 5 African species detected in the Cubberla-Witton Creek Catchment during a less intensive survey there the previous summer. The Cubberla-Witton Catchment is contiguous with Moggill Creek Catchment but is much more urbanised that is Moggill Creek. These figures for species richness of native species (28 in Cubberla and 31 in Moggill) are quite impressive because the highest figures in Australia for species richness of native species in similar sized areas are 33 for both Lamington NP and Undara NP and 35 for Forty Mile Scrub, the last two areas being in tropical Queensland.

The species varied greatly in commonness. The most common was the tiny *Onthophagus rubicundulus* with 636 specimens, or a little more than a third of all the beetles collected, belonging to this species. The next most common species were *Onthophagus incornutus* and *Onthophagus CQ8* with far fewer, 160 and 120 specimens respectively. The rarest species were *Onthophagus walteri* (2 specimens) and *Onthophagus manya* (1 specimen).

(iii) Sites for each species

Appendix 4 lists the sites, by code, where each species was collected. Once again *Onthophagus rubicundulus* was the most frequently encountered, being taken at 61 of the survey‟s 100 trap sites. Other species taken at many sites were *O. capella* (34 sites) *O. dunningi* (32 sites), and *O. incornutus* (28 sites).

(v) Occurrence in the Moggill Creek Catchment Sections

The Moggill Creek catchment is divided into 13 Sections for administrative purposes as shown in the map on p.4. The number of sample sites in each Section (see tabulation below) were very unequal, partly because some had none of the volunteer collectors resident. Thus Section 5 (Haven Road, etc – 27 sites), Section 9 (central Gold Creek -29 sites) and Section 12 (Gap Creek-17 sites) had many collection points while Sections 8 (Savage‟s Road) and 11 (upper McKay Brook) had no sample sites at all. This disparity in sample sites is also reflected in the dung beetle species records for each Section which are presented in Appendix 5. The sections with most trap sites also have the most beetle species, reaching a maximum of 23 species in Section 5. But it is notable that Section 1 (Rafting Ground Road, etc.), which had only 11 sample sites, achieved nearly the maximum of species diversity with 22 species. Futures surveys should try to sample those areas poorly represen ted in the current survey‟s sampling.

Catchment Section	1	2	3	4	5	6	7	8	9	10	11	12	13
No. of Sample Sites	11	6	8	1	27	4	7	0	25	4	0	17	2
Species per Section	22	7	9	3	23	8	19	0	22	6	0	17	4

(vi) Species frequency at the sample sites

The relative trapping frequency of each species, expressed in terms of the number of sample sites at which each was detected, is shown in Appendix 6. *Onthophagus rubicundulus* shows the maximum of 61 sites, while *Lepanus politus, Onthophagus manya, O. quadripustulatus* and *Onthophagus walteri* were all trapped at only one site.

(vii) Seasonal occurrence of species

Most dung beetles have their peak of activity and abundance during the warm, wet summer months when the dung retains moisture and the ground is soft for easy digging of nest burrows. It is well known that some species are most active in the early part of the warm season, while others tend to be nesting and breeding in late summer and autumn. Our survey trapping only spanned the months of October to March but the different species still showed distinctly different patterns of peak activity during that period (see Appendix 7). Although the greatest number of species trapped was in January with 26 species, the month with the greatest number of species at their peak of activity (expressed as average number of specimens per trap) was in December with 14, much higher than the 5 species at their peak in January. Of interest was the fact that 6 of the surveyed species did not reach their peak activity until the last trapping month of March. Future trapping surveys should attempt to collect activity data through all months of ther year.

(viii) Association with vegetation density

Dung beetles are well known to have distinct preferences for a particular density of vegetation. This is well expressed in eastern Australia where the contrasting habitats of rainforest and eucalypt forest often occur in close proximity, yet the dung beetles of the rainforest will rarely fly in open forest and *vice versa*.

Particiants in the Moggill survey were asked to score the vegetation of the trap sites in one of three simple categories: “dense”, “medium” or “sparse”, with the expectation that these would accord to approximately rainforest, eucalypt forest and open pasture, respectively. Appendix 8 shows the associations of the species with these three vegetation categories based on the relative specimens per trap values in each vegetation type. Most species exhibit clear vegetation preferences. The small component of strict rainforest species in the Moggill Catchment are *Amphistomus storeyi, Cephalodesmius quadridens, Diorygopyx tibialis* and *Onthophagus CQ2* and all these species were never taken outside of “dense” vegetaion. On the other hand the open pasture specialists, *Onthophagus CQ8, Onthophagus dandalu, Onthophagus granulatus* and the African *Onthophagus gazella* were rarely taken outside that habitat.

(ix) Association with soil type

Because dung beetles have to dig into soil for nest construction they have evolved different preferences for soil type, particularly regarding the aspect of gross soil texture. Participants were asked to score the soil of each trap site as “gravelly”, „loamy” or “sandy”. Sandy soils are rare in the Moggill Creek valley and only 9 trap samples were scored as from sandy soils, compared to 188 “gravelly” and 338 “loamy”. Relative preferences of the species for soil type are shown in Appendix 9, though no inference is made for sandy soils because of the low sample number. Eleven species show preference for gravelly soils and nine show preference for loamy soils.

(x) Bait preference of the species

As explained in the sampling methodology, the volunteer collectors used triplets of three traps at each site, baited respectively with macropod dung, horse dung and mushroom, while the Monteith/Kenyon trapping used pairs of traps baited with macropod dung and mushroom. There were 315 traps set in triplets (105 with each bait type) and there were 236 traps set in pairs (118 with each bait type). The results for the triplets are shown in Table 1 of Appendix 10 while the results for the pairs are shown in Table 2.

Most species show a fairly clear preference for bait type. The most distinct component are the mushrooom feeders, particularly *Onthophagus dunningi* and *Boletoscapter furcatus*, and only two specimens of the 144 collected of those two species went to any bait other than mushroom. In the three way comparison 8 species favoured horse dung and 9 species favoured macropod dung but in most of those species there is also a reasonable proportion going to the other bait, so it appears that the beetles are not distinguishing very strongly between the two. Both macropod and horse dung are relatively dry and fibrous, compared to the fine textured, wet dung of cattle. Future experimental trapping should also utilise cow dung to make the comparisons more complete.

The only introduced African .dung beetle taken during the survey was the ubiquitous *Onthophagus gazella*, though it is almost certain that others occur there because at least another four African species are known from the closely adjacent University Vet Farm at Pinjarra Hills. The lack of cow dung baits may be the reason these others were not detected in the survey.

(xi) Maps of the Moggill dung beetle species

Maps of all known distribution points for all 36 dung beetle species known in the Moggill Creek Catchment are given in Appendix 11. The locality points are shown as red discs and include those from both the current survey and from earlier records from the Queensland Museum collection. Maps are presented in the same numbered species sequence used in Appendix 3 and in the following Synopsis section. Because of the small scale of the individual maps closely adjacent site records are often shown by a single red disc.

SYNOPSIS OF THE DUNG BEETLE SPECIES OF THE MOGGILL CATCHMENT

(i) Introduction

There are currently 340 named species of native dung beetles in Australia and 99 additional new species are known but have not yet been named. In addition there are the 23 species of African and Mediterranean species which have been introduced to Australia. This brings the overall Australian fauna to 462. The 36 species we have detected in the Moggill Creek catchment thus represent 7.8% of the total Australian fauna.

All dung beetles are in the scarab subfamily Scarabaeinae which is divided into a number of lower classificatory units called Tribes. The native Australia dung beetles fall into 3 tribes, all of which occur in the Moggill Catchment, and the introduced dung beetles include another 4 tribes. Appendix 12 gives a full checklist of all Australian dung beetles with the tribal categories included. The Moggill Catchment species are highlighted to show their place in the overall Australian fauna. The following section gives a synopsis of all the Moggill Catchment species with a brief statement of their appearance and size, their distribution outside of the catchment and any relevant notes.

(ii) The ball-rollers (Tribe Canthonini)

1. *Amphistomus storeyi* Matthews, 1974

DESCRIPTION: Size small (4-5mm); dirty brown species, with rough, hairy tubercles on thorax and elytra; no horns on head; hind legs long and curved, in male with a long curved spur on femur.
DISTRIBUTION: Occurs from near Gympie down to Brisbane.
NOTES: A nocturnal, wingless, rainforest species.

2. *Boletoscapter furcatus* Matthews, 1974

DESCRIPTION: Size medium (5-7mm); uniformly smooth, dull dirty brown; surface covered with short curved hairs which hold dirt; forked process projecting from front edge of head, short in female.
DISTRIBUTION: Occurs along the coast from the Atherton Tableland south to Brisbane.
NOTES: A winged, open forest, mushroom feeder.

3. *Cephalodesmius quadridens* Macleay, 1871

DESCRIPTION: Size medium (6-9mm); uniformly dull, dirty brown; surface covered with short curved hairs which hold dirt; no head horns, but front margin of head with four sharp points.
DISTRIBUTION: Occurs from near Gympie south to the NSW border.
NOTES: A wingless, rainforest species which cultures macerated leaves and vegetable matter in underground burrows to make synthetic dung.

4. *Diorygopyx tibialis* (Macleay, 1871)

DESCRIPTION: Size medium (5-9mm); uniformly smooth, shiny, black; without hairs on surface; no head horns; pygidium with a deep transverse groove along upper edge.
DISTRIBUTION: Occurs from Bulburin SF, near Miriamvale, south to near Lismore in NSW
NOTES: A rainforest ball roller which makes nests under rocks. Usually wingless but very rare winged specimens occur. Nocturnal.

5. *Lepanus australis* Matthews, 1974

DESCRIPTION: Size very small (2-2.5mm); uniformly shiny black, hairless; no head horns; pygidium without pits or groove.
DISTRIBUTION: Occurs from St Lawrence in Queensland south to eastern Victoria
NOTES: A small winged ball roller. Usually in open forest. May be part of a species complex.

6. *Lepanus politus* (Carter, 1936)

DESCRIPTION: Size very small (2-2.5mm); yellowish brown, hairless; no head horns; pygidium with a deep pit in the middle.
DISTRIBUTION: Occurs from the Queensland Wet Tropics south to just south of Sydney.
NOTES: A small winged ball roller. May be part of a species complex.

7. *Lepanus ustulatus* (Lansberge, 1874)

DESCRIPTION: Size medium (5-6.5mm); shiny black, hairless, with red shoulders, and sometimes with red tips to elytra; no head horns; pygidium with a sinuous ridge across the top.
DISTRIBUTION: Occurs from the Atherton Tableland south to near Taree in NSW.
NOTES: A winged ball roller which prefers mushroom. Mostly in rainforest.

8. *Monoplistes leai* Paulian, 1934

DESCRIPTION: Size small (4-4.5mm); uniformly shiny black, hairless; no head horns; middle and hind legs strongly curved and each with a strong, curved spine projecting beyond the end.
DISTRIBUTION: Occurs from near Gympie south to Buladelah in NSW.
NOTES: A winged, dung feeding ball roller from both open forests and rainforests.

(iii) The nest parasites (Tribe Dichotomini)

9. *Demarziella interrupta* (Carter, 1936)

DESCRIPTION: Size small (3-3.5mm); dark brown; parallel sided; no head horns; elytra with pattern of raised longitudinal ridges.
DISTRIBUTION: Occurs from the Atherton Tableland south to Dorrigo in NSW.
NOTES: A winged nest parasite. Mostly in open forest.

10. *Demarziella metallica* (Carter, 1936)

DESCRIPTION: Size small (3.5-4mm); shiny metallic green; parallel sided; no head horns; raised ridges on elytra often broken into segments.
DISTRIBUTION: Occurs from near Gympie south to Seal Rocks in NSW.
NOTES: A winged rainforest nest parasite.

(iv) The dung buriers (Tribe Onthophagini)

11. *Onthophagus arrilla* Matthews, 1972

DESCRIPTION: Size medium (6-7mm); shiny black with red shoulders; hairless; no head horns; male with very long curved front legs.
DISTRIBUTION: Occurs from Bulburin SF, near Miriam Vale. south to Bulahdelah, NSW.
NOTES: A winged, dung feeding burier; mostly in rainforest, but occasionally in heavier open forest.

12. *Onthophagus auritus* Erichson, 1842

DESCRIPTION: Size medium (6-11mm); head and thorax greenish black; pygidium densely hairy; male with back of head raised into two pointed lobes separated by a narrow deep cleft.
DISTRIBUTION: Occurs from Mackay south to Tasmania and Adelaide.
NOTES: A winged, open forest dung burier. Daytime-active.

13. *Onthophagus australis* Guerin-Meneville, 1838

DESCRIPTION: Size medium-large (7-12mm); body uniformly greenish or bronzy; pygidium with sparse hairs; male with two horns separated by a flat rectangular plate along back margin of head.
DISTRIBUTION: Occurs from Carnarvon and Maryborough south to Tasmania and Adelaide.
NOTES: A winged, open forest dung burier. Daytime-active.

14. *Onthophagus bornemisszai* Matthews, 1972

DESCRIPTION: Size medium (6-7mm); dorsal surface yellowish brown, with small dark flecks, covered with erect bristles; no head horns; surface of elytra very flat in middle with sharp angle along the sides.
DISTRIBUTION: Occurs from Gympie south to the Victorian border.
NOTES: A winged, dung burier from rainforest and shaded open forest sites. Daytime-active.

15. *Onthophagus capella* Kirby, 1818

DESCRIPTION: Size large (10-17mm); uniformly black, hairless; two bumps in middle of prothorax; male with two curved horns with a flat plate between them along the back margin of head.
DISTRIBUTION: Ranges from near Cooktown south to eastern Victoria.
NOTES: A large, winged open forest dung burier. Nocturnal.

16. *Onthophagus CQ2*

DESCRIPTION: Size medium (6-10mm); colour dark greenish black; pygidium with a very few flattened hairs on either side of the midline; male with two straight, divergent horns on head, separated by a square erect plate.
DISTRIBUTION: Occurs from near Bowen south to Bulahdelah, NSW.
NOTES: A rainforest dung burier.

17. *Onthophagus CQ8*

DESCRIPTION: Size small (3-4mm); shiny black with thorax having a slight violet tinge; no head horns; male has elongated forelegs.
DISTRIBUTION: Found in a limited area in, and close to, Brisbane. Common in the macropod paddock at Lone Pine Sanctuary.
NOTES: A winged, dung burier from open pasture situations. Daytime active.

18. *Onthophagus dandalu* Matthews, 1972

DESCRIPTION: Size medium (6-9mm); wing covers black with rough surface; pronotum and head very shiny, bright coppery in colour; single conical horn on pronotum in male, a pair of bumps in female; pygidium densely hairy.
DISTRIBUTION: Occurs from Mackay west to Carnarvon Gorge and south to western Victoria.
NOTES: An open forest, winged species that feeds on dung, carrion and mushrooms. Daytime-active. Common at dog droppings in the suburbs.

19. *Onthophagus dunningi* Harold, 1869

DESCRIPTION: Size medium (5-9mm); elytra black; thorax and head dull greenish black; not hairy; male with a single forward horn on pronotum and sometimes on front edge of head; female with a strong ridge across the pronotum.
DISTRIBUTION: Ranges from near Bowen south to eastern Victoria.
NOTES: An open forest, winged mushroom feeder. Daytime-active.

20. *Onthophagus granulatus* Boheman, 1858

DESCRIPTION: Size medium (6-7mm); surface yellowish brown with small flecks; surface hairy; many small granules on surface of pronotum;
DISTRIBUTION: Ranges from near Mackay south to Victoria.
NOTES: A winged, dung burier which prefers open pastures. Daytime-active.

21. *Onthophagus incornutus* Macleay, 1871

DESCRIPTION: Size small (4-7mm); dark greenish with yellowish markings; dense band of hairs along sides of elytra; fore legs very long with apical brushes in males; two low head tubercles in male.
DISTRIBUTION: Has an isolated population on the Atherton Tableland, then ranges from Mackay south to Sydney.
NOTES: A winged, open forest dung burier.

22. *Onthophagus manya* Matthews, 1972

DESCRIPTION: Small (3.5-4.2mm); body black with slight violet tinge to pronotum; male pronotum with slight depression in centre; female with two ridges across head.
DISTRIBUTION: Ranges from near Mareeba south to Brisbane.
NOTES: A rare winged species of unknown habits. Mostly from open forests.

23. *Onthophagus neostenocerus* Goidanich, 1926

DESCRIPTION: Size large (9-13mm); uniformly black and hairless; eyes very large; male with two long straight parallel horns on head.
DISTRIBUTION: Ranges from Bulburin, near Miriamvale, south to Newcastle, NSW.
NOTES: A nocturnal, winged, dung burier from rainforests and heavier open forests.

24. *Onthophagus quadripustulatus* (Fabricius, 1775)

DESCRIPTION: Size small (3.5-4mm); shiny black with red patches on shoulders; male with two low triangular mounds on head and forelegs very long.
DISTRIBUTION: Ranges from the tip of Cape York south to NE NSW.
NOTES: A daytime-active, winged, open forest dung burier which prefers open pastures.

25. *Onthophagus rubicundulus* Macleay, 1871

DESCRIPTION: Size small (3-4mm); dull, matte brown with small pale patches; covered with short flattened hairs; male with two large, flattened horns sloping back from the middle of the head.
DISTRIBUTION: Has an isolated population on the Atherton Tableland then ranges from Rockhampton south almost to Sydney.
NOTES: A small winged, dung burier from rainforests and shaded situations.

26. *Onthophagus semimetallicus* Lea, 1923

DESCRIPTION: Size medium (5-7mm); uniformly black with slight bronze tints; not hairy; male with two low triangular horns on head; pygidium with shallow rings impressed on surface.
DISTRIBUTION: Ranges from the tip of Cape York south to the NSW border.
NOTES: A winged, daytime-active dung burier from shaded situations in open forests, especially near to stream margins.

27. *Onthophagus tenebrosus* Harold, 1871

DESCRIPTION: Size large (9-13mm); black; front of head drawn out and shovel-like; male with two large irregular elevations on pronotum; front legs very long.
DISTRIBUTION: Ranges from Carnarvon Gorge and Maryborough south to Victoria and Adelaide.
NOTES: A winged, dung burier from open forest. Favours sandy soils. Very rare in Brisbane area.

28. *Onthophagus thoreyi* Harold, 1868

DESCRIPTION: Size medium (8-11mm); body black with faint greenish tinge; male with two long erect horns on head which curve inwards at their apices.
DISTRIBUTION: Ranges from near Cairns south to the NSW border
NOTES: A winged, daytime-active dung burier from open forests.

29. *Onthophagus tuckonie* Matthews, 1972

DESCRIPTION: Size small (3-4mm); shiny black with red patches on the shoulders; not hairy; no head horns; male with long curved hind legs which have a curved extension on the end.
DISTRIBUTION: Ranges from near Proserpine south to Brisbane.
NOTES: A winged, daytime-active dung burier from rainforests and heavier open forests.

30. *Onthophagus tweedensis* Blackburn, 1903

DESCRIPTION: Size medium (8-11 mm); black with brilliant green pronotum and head; pygidium with very sparse hairs; male with two erect straight horns on head joined by a serrated plate between their bases (see front cover of this report).
DISTRIBUTION: Ranges from near Miriam Vale south to Taree in NSW
NOTES: A winged, daytime-active dung burier from open forests.

31. *Onthophagus walteri* Macleay, 1887

DESCRIPTION: Size medium (7-10mm); black with very shiny greenish pronotum; no head horns; pronotum with two swellings separated by depressed area; pygidium with long white hairs.
DISTRIBUTION: Ranges from middle of Cape York Peninsula south to Brisbane.
NOTES: A winged, daytime-active mushroom feeder. Very rare near Brisbane.

APPENDIX 1: LIST OF ALL SAMPLE SITES FROM 2010/11 SURVEY

List of 100 dung beetle sample sites used during the community survey of the Moggill Creek Catchment during the summer of 2010/11. Each set of sites is listed under the name of the person/s who did the trapping at those sites. 63 sites were trapped by volunteers from the Brookfield community and 37 sites were trapped by Geoff Monteith (Queensland Museum) and Tania Kenyon (University of Queensland). Each site is given a code prefixed by the initials of the collector. Each code is followed by the number, in parentheses, of the Catchment Section in which the site falls. The 13 additional sites in the Moggill Catchment from which previous dung beetle data was available from the Queensland Museum‟s collection database are listed at the end.

SITE NAME	SITE CODE (SECTION)	LATITUDE	LONGITUDE
April Youngberry Sites			
Kenmore High School	AY-1 (2)	27.51118	152.929379
Misty Morn	AY-2 (2)	27.513259	152.929816
Dale Borgelt Sites			
40 Gap Creek Rd A	DB-1 (12)	27.492912	152.925149
40 Gap Creek Rd B	DB-2 (12)	27.493143	152.925071
40 Gap Creek Rd Hill East	DB-3 (12)	27.492916	152.925578
40 Gap Creek Rd House Site	DB-4 (12)	27.492655	152.925321
40 GapCkRd KookaburraSt Frontage	DB-5 (12)	27.493116	152.925187
Deb Ford Sites			
524 Haven Rd A	DF-1 (5)	27.49383611	152.8751917
524 Haven Rd B	DF-2 (5)	27.49419444	152.8746222
524 Haven Rd C	DF-3 (5)	27.49528611	152.8756667
524 Haven Rd D	DF-4 (5)	27.495589	152.874452
524 Haven Rd E	DF-5 (5)	27.49566944	152.874675
524 Haven Rd F	DF-6 (5)	27.496395	152.875293
524 Haven Rd G	DF-7 (5)	27.496654	152.875554
524 Haven Rd H	DF-8 (5)	27.496666	152.8747222
524 Haven Rd I	DF-9 (5)	27.49679167	152.8752389
524 Haven Rd J	DF-10 (5)	27.49694	152.88027
544 Haven Rd K	DF-11 (5)	27.496111	152.87444
Jan & Gordon Grigg Sites			
639 Gold Ck Rd, mango tree	JG-1 (9)	27.463019	152.88755
470 GoldCkRd, Bev's Cnr	JG-2 (9)	27.46676	152.897683
470 GoldCkRd, opp Rudd's cott.	JG-3 (9)	27.467227	152.894824
639 Gold CkRd,Below Tanks	JG-4 (9)	27.462983	152.886861
Gold Ck Rd Opp 612	JG-5 (9)	27.465582	152.889854
639 Gold Ck Rd,bottom drive	JG-6 (9)	27.463988	152.886474
639 Gold Ck Rd House	JG-7 (9)	27.462748	152.887244
Hillbrook Rd Halfway Up	JG-8 (9)	27.459808	152.888462
660 Gold Ck Rd	JG-9 (9)	27.463652	152.887545
Hillbrook Rd Top	JG-10 (9)	27.457314	152.889495

Helen Ovens Sites

450 Gold Creek Rd A	HO-1 (9)	27.471953	152.892898
450 Gold Creek Rd B	HO-2 (9)	27.47122	152.891815
7/450 Gold Creek Rd A	HO-3 (9)	27.47079	152.89326
7/450 Gold Creek Rd B	HO-4 (9)	27.471416	152.892998
7/450 Gold Creek Rd C	HO-5 (9)	27.47166	152.892676
7/450 Gold Creek Rd D	HO-6 (9)	27.472467	152.892834
7/450 Gold Creek Rd E	HO-7 (9)	27.471077	152.893263
7/450 Gold Creek Rd F	HO-8 (9)	27.471244	152.892941
7/450 Gold Creek Rd G	HO-9 (9)	27.470558	152.893478

Jeanette Young Sites

153 Moons Lane Creekside	JEY-1 (1)	27.505179	152.907704
153 Moons Lane Front paddock	JEY-2 (1)	27.505854	152.907543
153 Moons Lane Hillside	JEY-3 (1)	27.504988	152.907779

Joanna Yesberg Sites

44 Tuckett St	JOY-1 (3)	27.501	152.924
47 Rafting Ground Rd A	JOY-2 (1)	27.512864	152.920157
47 Rafting Ground Rd B	JOY-3 (1)	27.513126	152.919412
47 Rafting Ground Rd C	JOY-4 (1)	27.512763	152.919388
68 Tuckett St Kenmore Hills	JOY-5 (4)	27.4982	152.9225
Brookfield State School	JOY-6 (3)	27.49686111	152.9129667
Tuckett Park	JOY-7 (3)	27.501769	152.92565
Tuckett St Park near creek	JOY-8 (3)	27.5024	152.9258

Richard Woodhead Sites

164 UpperBrookfield RdA-	RW-1 (5)	27.493998	152.891977
164 UpperBrookfield RdB-	RW-2 (5)	27.491234	152.892302
164 UpperBrookfield RdC-	RW-3 (5)	27.490227	152.892201

Suzanne Philp Sites

Gap Creek Reserve	SP-1 (12)	27.494086	152.920159
Philp Back Paddock	SP-2 (12)	27.49505	152.919572

Trevor Hopper Sites

Brookfield Haven Rd	TH-1 (5)	27.49583333	152.89075
Brookfield Treed Area	TH-2 (5)	27.49283333	152.8885
Creek - Haven Rd	TH-3 (5)	27.49583333	152.7240833
Paddock - Horse and Goat	TH-4 (5)	27.49452778	152.8892778

William Davies Sites

98CarbineRd Upper Brookfield A	WD-1 (5)	27.48791	152.870207
98CarbineRd Upper Brookfield B	WD-2 (5)	27.488814	152.869982
98CarbineRd Upper Brookfield C	WD-3 (5)	27.489295	152.869198
98CarbineRd Upper Brookfield D	WD-4 (5)	27.489457	152.869043
98CarbineRd Upper Brookfield E	WD-5 (5)	27.48949	152.869104

Geoff Monteith & Tania Kenyon Sites

opp.872 Upper Brookfield Rd 1	GT-1 (6)	27.47246	152.83451
opp.872 Upper Brookfield Rd 2	GT-2 (6)	27.47238	152.83467

opp.872 Upper Brookfield Rd 3	GT-3 (6)	27.47222	152.835
opp.872 Upper Brookfield Rd 4	GT-4 (6)	27.47214	152.83519
Curlew Cct Boscombe Rd 1	GT-5 (12)	27.4817	152.91715
Curlew Cct Boscombe Rd 2	GT-6 (12)	27.48165	152.91752
End of Boscombe Rd 1	GT-7 (10)	27.4706	152.9154
Gap Ck at Deerhurst 1	GT-8 (12)	27.49486	152.91921
Gap Ck at Deerhurst 2	GT-9 (12)	27.49449	152.91965
Gap Ck at Deerhurst 3	GT-10 (12)	27.49426	152.91968
Gap Ck at Deerhurst 4	GT-11 (12)	27.49441	152.91979
Grigg House 1	GT-12 (9)	27.46277	152.88748
Grigg House 2 ridge behind	GT-13 (9)	27.462502	152.88755
Grigg House 3 lower drive	GT-14 (9)	27.46337	152.88627
Jones Rd 1	GT-15 (10)	27.46846	152.90982
Jones Rd 2	GT-16 (10)	27.46883	152.9102
Jones Rd 3	GT-17 (10)	27.4693	152.91091
Kookaburra St 1	GT-18 (12)	27.49069	152.92284
Kookaburra St 2	GT-19 (12)	27.49097	152.92285
Kookaburra St 3	GT-20 (12)	27.4905	152.923061
Mabb St Reserve 1	GT-21 (2)	27.50685	152.93075
Mabb St Reserve 2	GT-22 (2)	27.5067	152.93106
Mabb St Reserve 3	GT-23 (2)	27.50645	152.93111
MCCGHouse lower site (Gold Ck)	GT-24 (7)	27.4627	152.8838
MCCGHouseupper site (Gold Ck)	GT-25 (7)	27.4635	152.8844
Rafting Ground Reserve 1	GT-26 (1)	27.52016	152.92519
Rafting Ground Reserve 2	GT-27 (1)	27.51939	152.92654
Rafting Ground Reserve 3	GT-28 (1)	27.51995	152.92621
Scenic Rd Park	GT-29 (2)	27.5235	152.9262
Smith's Scrub 1	GT-30 (5)	27.48509	152.8803
Smith's Scrub 2	GT-31 (5)	27.48483	152.88072
Smith's Scrub 3	GT-32 (5)	27.48466	152.88111
Tuckett St 1	GT-33 (3)	27.50172	152.92583
Tuckett St 2	GT-34 (3)	27.50241	152.92592
Tuckett St 3	GT-35 (3)	27.50232	152.92543
Tuckett St 4	GT-36 (3)	27.50248	152.92562
Vet Farm Paddock	GT-37 (1)	27.53202	152.91952

Extra Sites from Queensland Museum Database

Gold Ck Reservoir, Site 1	QM-1 (7)	27.465	152.875
Gold Ck Reservoir, Site 2	QM-2 (7)	27.468	152.872
Gold Ck Reservoir, Site 3	QM-3 (7)	27.463	152.877
Gold Ck Reservoir, Site 4	QM-4 (7)	27.462	152.873
Gold Ck Reservoir	QM-5 (7)	27.463	152.882
Gold Ck Road, Site 1	QM-6 (9)	27.469	152.894
Gold Ck Road, Site 2	QM-7 (9)	27.467	152.888
Gold Creek, Hillbrook Rd	QM-8 (9)	27.460	152.889
Haven Rd, Sands property	QM-9 (5)	27.497	152.918
Gap Creek	QM-10 (12)	27.497	152.918
Gap Creek Road	QM-11 (13)	27.474	152.925
Gap Ck Crossing, upper	QM-12 (13)	27.481	152.927
UQ Vet Farm	QM-13 (1)	27.529	152.923

APPENDIX 2: COLLECTIONS BY VOLUNTEER COLLECTORS

Table of species and specimens of dung beetles collected by community volunteers during the Moggill Creek Catchment Survey.

DUNG BEETLE SPECIES	Dale Borgelt	William Davies	Deb Ford	Jan Grigg	Trevor Hopper	Helen Ovens	Susanne Philp	Richard Woodhead	Jeanette Young	April Youngberry	Joanna Yesberg
BALL ROLLERS											
Boletoscapter furcatus			11			23					2
Cephalodesmius quadridens				5							
Diorygopyx tibialis											
Lepanus australis	1		3					6			
Lepanus ustulatus	2										
Monoplistes leai			1	1							
NEST PARASITES											
Demarziella interrupta			41	2				3			
Demarziella metallica	3		1	6			4				
DUNG BURIERS											
Onthophagus arrilla	2			20			8				
Onthophagus auritus			15	1		1					
Onthophagus australis			15	5					1		
Onthophagus bornemisszai	1		2	17		1	1	1			
Onthophagus capella	5	1	8	24		3	24	2	1		3
Onthophagus CQ2				10							
Onthophagus CQ8		22			82		1	15			4
Onthophagus dandalu		5	6	8	1	1	1	1	4	9	14
Onthophagus dunningi			28	4		7		1		3	8
Onthophagus granulatus		2		1				1	3		1
Onthophagus incornutus	1	2	34	3	22	22		4	39		33
Onthophagus manya			1								
Onthophagus neostenocerus			1	6			6				
Onthophagus rubicundulus	125		14	155	5	23	22	8	5		18
Onthophagus semimetallicus					2			1	1		
Onthophagus thoreyi			17	3		3					7
Onthophagus tuckonie	34			17			8		5		
Onthophagus tweedensis			3	23		14					
Onthophagus walteri											2
AFRICAN SPECIES											
Onthophagus gazella		1			21				6		1
TOTAL SPECIMENS	**174**	**33**	**201**	**311**	**133**	**98**	**75**	**43**	**65**	**12**	**91**
TOTAL SPECIES	**9**	**6**	**17**	**19**	**6**	**10**	**9**	**11**	**9**	**2**	**11**

APPENDIX 3: CENSUS OF MOGGILL CATCHMENT DUNG BEETLES

Table of all Moggill Creek Catchment dung beetles from both the 2010/11 survey and previous records. Also listed are results from prior survey of adjacent Cubberla-Witton Catchment during summer of 2009/10.

DUNG BEETLE SPECIES W = wingless species; M= mushroom specialist; C=cultures synthetic dung	**MOGGILL CREEK CATCHMENT RECORDS**			**CUBBERLA-WITTON CATCHMENT**
	2010/11 SURVEY (No. of specimens)		SPECIES PREVIOUSLY RECORDED FROM MOGGILL CATCHMENT IN QUEENSLAND MUSEUM RECORDS	SPECIES RECORDED DURING 2009/2010 CATCHMENT SURVEY
	Staff	Volunteers		
BALL ROLLERS				
Amphistomus storeyi W	11		X	
Boletoscapter furcatus M	11	36	X	X
Cephalodesmius quadridens W,C	18	5	X	X
Diorygopyx tibialis W	5		X	
Lepanus australis	9	10	X	X
Lepanus politus	1			X
Lepanus ustulatus M	9	2		X
Monoplistes leai	10	2	X	X
NEST PARASITES				
Demarziella interrupta	11	46	X	X
Demarziella metallica	51	14	X	X
DUNG BURIERS				
Onthophagus arrilla	43	30	X	X
Onthophagus auritus		17	X	X
Onthophagus australis		21		X
Onthophagus bicarinaticeps				X
Onthophagus bornemisszai	5	23	X	X
Onthophagus capella	16	71	X	X
Onthophagus consentaneus				X
Onthophagus CQ2	5	10	X	X
Onthophagus CQ8		124		X
Onthophagus dandalu	7	50	X	X
Onthophagus dunningi M	46	51	X	X
Onthophagus granulatus		8		X
Onthophagus incornutus		160	X	X
Onthophagus manya		1	X	X
Onthophagus neostenocerus	30	13	X	X
Onthophagus quadripustulatus	1		X	X
Onthophagus rubicundulus	261	375	X	X
Onthophagus semimetallicus	1	4		X
Onthophagus tenebrosus			X	
Onthophagus thoreyi		30		
Onthophagus tuckonie	45	64	X	X
Onthophagus tweedensis	3	40	X	X
Onthophagus walteri M		2		
AFRICAN SPECIES				
Euoniticellus intermedius			X	X
Liatongus militaris			X	X
Onthophagus gazella		29	X	X
Onitis alexis			X	X
Sisyphus spinipes			X	X
TOTAL SPECIES	22	27	28	**Cubberla-Witton Grand Total** 28 Native 5 African
SURVEY TOTAL	30 Native, 1 African			
MOGGILL CATCHMENT GRAND TOTAL	31 Native and 5 African			

APPENDIX 4: LIST OF SITES FOR EACH DUNG BEETLE SPECIES

List of dung beetle species collected during the Moggill Creek Catchment survey showing the sites at which each was collected. Sites are referred to by the Site Code for each. Locations and names for the coded sites are given in the Excel table of primary data and in Appendix 1. Additional sites and species from the Queensland Museum database are included.

***Amphistomus storeyi* (5 sites)**
GT-3, GT-30, GT-31, GT-32, QM-4

***Boletoscapter furcatus* (16 sites)**
DF-1, DF-11, DF-4, DF-5, DF-7, DF-9, GT-16, GT-17, GT-7, HO-2, HO-5, HO-6, HO-8, JOY-3, QM-1, QM-13,

***Cephalodesmius quadridens* (6 sites)**
GT-25, GT-30, GT-33, JG-5, QM-1, QM-4

***Diorygopyx tibialis* (2 sites)**
QM-7, GT-14, GT-33

***Lepanus australis* (13 sites)**
DB-3, DF-6, DF-9, GT-18, GT-19, GT-20, GT-21, GT-23, GT-6, RW-1, QM-2, QM-4, QM-5

***Lepanus politus* (1 site)**
GT-6

***Lepanus ustulatus* (4 sites)**
DB-3, GT-15, GT-2, GT-3

***Monoplistes leai* (10 sites)**
DF-5, GT-10, GT-2, GT-3, GT-5, GT-6, JG-7, QM-4, QM-5, QM-12

***Demarziella interrupta* (15 sites)**
DF-10, DF-11, DF-5, DF-6, DF-7, DF-9, GT-20, GT-5, GT-6, GT-7, GT-9, JG-8, RW-1, QM-1, QM-1,

***Demarziella metallica* (30 sites)**
DB-2, DB-3, DF-6, GT-11, GT-14, GT-18, GT-19, GT-20, GT-21, GT-21, GT-25, GT-26, GT-27, GT-3,
GT-32, GT-33, GT-5, GT-8, GT-9, JG-1, JG-10, JG-4, SP-1, QM-3, QM-4, QM-5, QM-6, QM-9, QM-10, QM-12

***Onthophagus arrilla* (19 sites)**
DB-2, DB-5, GT-14, GT-15, GT-18, GT-2, GT-3, GT-5, GT-6,GT-8 ,
GT-9, JG-1, JG-4, JG-5, JG-6, SP-1, QM-4, QM-5, QM-10

***Onthophagus auritus* (6 sites)**
DF-5, DF-7, DF-9, HO-7, JG-7, QM-7

***Onthophagus australis* (8 sites)**
DF-10, DF-7, DF-8, DF-9, JEY-2, JG-2, JG-4, JG-5

***Onthophagus bornemisszai* (20 sites)**
DB-2, DF-3, DF-9, GT-18, GT-26, GT-30, GT-32, GT-5, HO-8, JG-1, JG-4, JG-5, JG-6, JG-9,
RW-3, SP-1, QM-3, QM-4, QM-5, QM-6

***Onthophagus capella* (38 sites)**
DB-2, DB-3, DF-1, DF-11, DF-5, DF-9, GT-11, GT-19, GT-20, GT-24, GT-33, GT-6, GT-8,
GT-9, HO-1, HO-3, HO-8, JEY-3, JG-1, JG-10, JG-3, JG-4, JG-5, JG-6, JG-7, JG-8,
JG-9, JOY-2, JOY-5, RW-3, SP-1, SP-2, WD-3, QM-3, QM-4, QM-6, QM-7, QM-10

***Onthophagus CQ2* (7 sites)**
GT-14, GT-24, GT-25, JG-3, JG-5, JG-6, JG-9

***Onthophagus CQ8* (12 sites)**
JOY-2, JOY-3, RW-1, RW-2, SP-1, TH-4, TH-5, WD-1, WD-2, WD-3, QM-5, WD-5

***Onthophagus dandalu* (24 sites)**
AY-2, DF-2, DF-6, DF-9, GT-37, HO-3, JEY-1, JEY-2, JEY-3, JG-2, JG-8, JOY-1
JOY-2, JOY-5, JOY-8, RW-3, SP-2, TH-1,WD2, WD-4, QM-1, QM-3, QM-7, QM-10

***Onthophagus dunningi* (32 sites)**
AY-2, DF-1, DF-2, DF-4, DF-5, DF-6, DF-7, DF-9, GT-13, GT-16, GT-17, GT-18, GT-19, GT-2, GT-27, GT-3,
GT-37, GT-4, GT-5, GT-6, GT-7, GT-8, HO-1, HO-6, HO-7, HO-8, JG-10, JG-3, JG-8, JOY-2, JOY-3, RW-3

***Onthophagus granulatus* (6 sites)**
JEY-3, JG-2, JOY-2, RW-1, WD-1, WD-2

***Onthophagus incornutus* (33 sites)**

DB-3, DF-1, DF-10, DF-11, DF-2, DF-5, DF-6, DF-9, HO-3, HO-4, HO-5, HO-6, HO-7, JEY-1, JEY-2, JEY-3, JG-3, JOY-2, JOY-3, JOY-4, JOY-6, RW-1, RW-2, RW-3, TH-1, TH-2, TH-3, WD-3, QM-3, QM-4, QM-9, QM-10, GT-1

***Onthophagus manya* (4 sites)**

DF-1, QM-1, QM-3, QM-8

***Onthophagus neostenocerus* (23 sites)**

DF-9, GT-18, GT-19, GT-2, GT-20, GT-21, GT-22, GT-23, GT-24, GT-26, GT-33, GT-34, GT-35, GT-6, GT-8, GT-9, JG-3, JG-4, JG-5, JG-6, SP-1, QM-7, QM-10,

***Onthophagus quadripustulatus* (2 sites)**

GT-37, QM-3

***Onthophagus rubicundulus* (71 sites)**

DB-2, DB-3, DB-5, DF-11, DF-2, DF-5, DF-6, DF-7, DF-9, GT-10, GT-12, GT-14, GT-17, GT-18, GT-19, GT-2, GT-20, GT-20, GT-21, GT-22, GT-24, GT-25, GT-26, GT-27, GT-3, GT-30, GT-31, GT-32, GT-33, GT-34, GT-35, GT-5, GT-6, GT-8, GT-9,HO-1, HO-2, HO-3, HO-5, HO-6, HO-7, JEY-1, JEY-1, JEY-2, JG-1, JG-10, JG-3, JG-4, JG-5, JG-6, JG-7, JG-8, JG-9, JOY-1, JOY-3, JOY-5, JOY-6, RW-1, RW-2, SP-1, TH-2, QM-1, QM-3, QM-4, QM-5, QM-6, QM-7, QM-9, QM-10, QM-11, QM-12

***Onthophagus semimetallicus* (4 sites)**

GT-21, JEY-2, RW-3, TH-1

***Onthophagus tenebrosus* (1 site)**

QM-1

***Onthophagus thoreyi* (10 sites)**

DF-1, DF-11, DF-5, DF-8, DF-9, HO-3, HO-5, JG-1, JOY-2, JOY-3

***Onthophagus tuckonie* (25 sites)**

DB-2, DB-3, DB-5, GT-11, GT-18, GT-20, GT-21, GT-22, GT-23, GT-26, GT-27, GT-33, GT-35, GT-6, GT-8, GT-9, JEY-1, JEY-2, JG-4, JG-5, JG-6, JG-9, SP-1, QM-10, QM-13

***Onthophagus tweedensis* (15 sites)**

DF-5, GT-12, GT-6, HO-2, HO-3, HO-5, HO-6, HO-8, JG-10, JG-3, JG-8, QM-1, QM-3, QM-11, QM-12

***Onthophagus walteri* (1 site)**

JOY-4

***Onthophagus gazella* (10 sites**

JEY-2, TH-3, JEY-3, TH-4, JOY-2, TH-5, TH-1, WD-3, TH-2, QM-13

AFRICAN SPECIES: ***Euoniticellus intermedius, Liatongus militaris, Onthophagus nigriventris, Sisyphus spinipes.***
all in QM database from only the UQ Veterinary Farm (QM-13)

APPENDIX 5: RECORDS FROM EACH SECTION OF THE MOGGILL CREEK CATCHMENT (see Section map on p.4)

SPECIES ↓ SECTIONS→	1	2	3	4	5	6	7	8	9	10	11	12	13	Sectns/Sp.↓
Amphistomus storeyi					■	■	■							3
Boletoscapter furcatus	■				■		■		■	■				5
Cephalodesmius quadridens			■		■		■		■					4
Diorygopyx tibialis			■						■					2
Lepanus australis		■			■		■					■		4
Lepanus politus												■		1
Lepanus ustulatus						■				■		■		3
Monoplistes leai					■	■	■		■			■	■	6
Demarziella interrupta	■				■		■		■	■		■		6
Demarziella metallica	■	■	■		■	■	■		■			■	■	9
Onthophagus arrilla						■	■		■	■		■		5
Onthophagus auritus					■				■					2
Onthophagus australis	■				■				■					3
Onthophagus bornemisszai					■		■		■			■		4
Onthophagus capella	■		■	■	■		■		■			■		7
Onthophagus CQ2							■		■					2
Onthophagus CQ8	■				■							■		3
Onthophagus dandalu	■	■	■	■	■		■		■			■		8
Onthophagus dunningi	■	■			■	■			■	■		■		7
Onthophagus granulatus	■				■				■					3
Onthophagus incornutus	■		■		■		■		■			■		6
Onthophagus manya					■		■		■					3
Onthophagus neostenocerus	■	■	■		■	■	■		■			■		8
Onthophagus quadripustulatus	■						■							2
Onthophagus rubicundulus	■		■	■	■	■	■		■	■		■	■	10
Onthophagus semimetallicus	■	■			■									3
Onthophagus tenebrosus							■							1
Onthophagus thoreyi	■				■				■					3
Onthophagus tuckonie	■	■	■						■			■		5
Onthophagus tweedensis					■		■		■			■	■	5
Onthophagus walteri	■													1
Euoniticellus intermedius	■													1
Liatongus militaris	■													1
Onthophagus gazella	■				■									2
Onitis alexis	■													1
Sisyphus spinipes	■													1
TOTAL SPECIES PER SECTION→	**22**	**7**	**9**	**3**	**23**	**8**	**19**	**0**	**22**	**6**	**0**	**17**	**4**	

APPENDIX 6: SPECIES FREQUENCY AT TRAP SITES

Relative frequency of the 31 dung beetle species at 100 trap sites in the Moggill Creek Catchment area. The number of trap sites at which each of the Moggill Catchment dung beetles was detected is shown graphically with actual numbers of sites given for each. Based on 1835 specimens taken in 536 traps between November 2010 and March 2011.

DUNG BEETLE SPECIES	NUMBER OF SURVEY SITES AT WHICH EACH SPECIES WAS DETECTED																						
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	46-48	49-51	52-54	55-57	58-60	61-63		
Amphistomus storeyi		4																					
Boletoscapter furcatus						14																	
Cephalodesmius quadridens		4																					
Diorygopyx tibialis	2																						
Lepanus australis					10																		
Lepanus politus	1																						
Lepanus ustulatus		4																					
Monoplistes leai			7																				
Demarziella interrupta						13																	
Demarziella metallica									23														
Onthophagus arrilla							16																
Onthophagus auritus		5																					
Onthophagus australis			8																				
Onthophagus bornemisszai						15																	
Onthophagus capella														34									
Onthophagus CQ2			7																				
Onthophagus CQ8				11																			
Onthophagus dandalu								20															
Onthophagus dunningi													32										
Onthophagus granulatus		6																					
Onthophagus incornutus											28												
Onthophagus manya	1																						
Onthophagus neostenocerus								20															
Onthophagus quadripustulatus 1																							
Onthophagus rubicundulus																							61
Onthophagus semimetallicus		4																					
Onthophagus thoreyi				10																			
Onthophagus tuckonie									23														
Onthophagus tweedensis				11																			
Onthophagus walteri	1																						
Onthophagus gazella			9																				

APPENDIX 7: SEASONAL OCCURRENCE OF SPECIES

Tabulation of seasonal occurrence of dung beetles in the traps during the Moggill Creek Catchment survey. Total numbers trapped are shown for each species in each of the five months from November to March of the 2010/11 summer. Total number of traps employed in each month is given. Maximum abundance is when the beetles/trap value is highest.

SHOWS MONTHS WHEN		maximum abundance

MONTHLY TRAP PERIOD	NOV	DEC	JAN	FEB	MAR
No. of TRAPS	112	128	145	95	50
DUNG BEETLE SPECIES					
Amphistomus storeyi	1	5		3	2
Boletoscapter furcatus	2	21	8	12	4
Cephalodesmius quadridens	3	5	7		7
Diorygopyx tibialis			2		
Lepanus australis	2	3	5	4	4
Lepanus politus			1		
Lepanus ustulatus		3	2	5	1
Monoplistes leai	2	9		1	
Demarziella interrupta		12	10	2	33
Demarziella metallica	13	12	11	6	7
Onthophagus arrilla	18	32	16	2	3
Onthophagus auritus		14	2		1
Onthophagus australis	1	14	3	1	1
Onthophagus bornemisszai	12	11	5		
Onthophagus capella	11	52	18	4	
Onthophagus CQ2	3	4	3		
Onthophagus CQ8	31	6	87		
Onthophagus dandalu	22	20	13		2
Onthophagus dunningi	15	31	22	3	22
Onthophagus granulatus		6	2		
Onthophagus incornutus	28	64	37	10	1
Onthophagus manya	1				
Onthophagus neostenocerus	1	23	12	6	1
Onthophagus quadripustulatus			1		
Onthophagus rubicundulus	184	277	128	14	26
Onthophagus semimetallicus	2	1		1	1
Onthophagus thoreyi	9	18		3	
Onthophagus tuckonie	20	51	35	1	2
Onthophagus tweedensis	13	18	12		
Onthophagus walteri			2		
Onthophagus gazella	16	3	6	4	
Species present each month	23	25	26	18	17
Total specimens per month	410	715	450	82	118
Av. specimens per trap	3.66	5.59	3.10	0.86	2.36
No. of spp. at max. trap rate	4	14	5	1	6

APPENDIX 8: ASSOCIATION WITH VEGETATION DENSITY

Table showing correlation of each Moggill Catchment dung beetle species with the vegetation categories of "dense", "medium" and "sparse" as scored for each trap site by participants in the dung beetle survey. Correlation based on comparison of beetles/trap value drawn from 536 trap samples which yielded 1835 individual beetles of 31 species.

STRONGLY ASSOCIATED WITH VEGETATION TYPE	
MODERATELY ASSOCIATED WITH VEGETATION TYPE	
NIL OR WEAK ASSOCIATION WITH VEGETATION TYPE	

DUNG BEETLE SPECIES	VEGETATION DENSITY OF TRAP SITE					
	DENSE (179 traps)		MEDIUM (223 traps)		SPARSE (134 traps)	
	Cells show total specimens and (spms/trap)					
Amphistomus storeyi	11	(0.061)	0	(0)	0	(0)
Boletoscapter furcatus	0	(0)	23	(0.103)	24	(0.179)
Cephalodesmius quadridens	23	(0.128)	0	(0)	0	(0)
Diorygopyx tibialis	5	(0.028)	0	(0)	0	(0)
Lepanus australis	14	(0.078)	5	(0.022)	0	(0)
Lepanus politus	1	(0.006)	0	(0)	0	(0)
Lepanus ustulatus	9	(0.050)	2	(0.009)	0	(0)
Monoplistes leai	8	(0.045)	3	(0.013)	1	(0.007)
Demarziella interrupta	11	(0.061)	46	(0.206)	0	(0)
Demarziella metallica	37	(0.207)	24	(0.108)	4	(0.030)
Onthophagus arrilla	49	(0.274)	18	(0.081)	6	(0.045)
Onthophagus auritus	0	(0)	15	(0.067)	2	(0.015)
Onthophagus australis	2	(0.011)	17	(0.076)	2	(0.015)
Onthophagus bornemisszai	18	(0.101)	9	(0.040)	1	(0.007)
Onthophagus capella	16	(0.089)	60	(0.269)	11	(0.082)
Onthophagus CQ2	15	(0.084)	0	(0)	0	(0)
Onthophagus CQ8	1	(0.006)	1	(0.004)	122	(0.910)
Onthophagus dandalu	0	(0)	18	(0.081)	39	(0.291)
Onthophagus dunningi	29	(0.162)	47	(0.211)	21	(0.157)
Onthophagus granulatus	1	(0.006)	3	(0.013)	4	(0.030)
Onthophagus incornutus	21	(0.117)	91	(0.408)	48	(0.358)
Onthophagus manya	0	(0)	1	(0.004)	0	(0)
Onthophagus neostenocerus	20	(0.112)	23	(0.103)	0	(0)
Onthophagus quadripustulatus	0	(0)	0	(0)	1	(0.007)
Onthophagus rubicundulus	261	(1.458)	290	(1.300)	85	(0.634)
Onthophagus semimetallicus	1	(0.006)	1	(0.004)	3	(0.022)
Onthophagus thoreyi	0	(0)	20	(0.090)	10	(0.075)
Onthophagus tuckonie	56	(0.313)	50	(0.224)	3	(0.022)
Onthophagus tweedensis	6	(0.034)	32	(0.143)	5	(0.037)
Onthophagus walteri	0	(0)	0	(0)	2	(0.015)
Onthophagus gazella	3	(0.017)	5	(0.022)	21	(0.157)
TOTAL BEETLES	**618**		**804**		**413**	
Average beetles per trap	**3.453**		**3.605**		**3.082**	
Species per vegetation type	**24**		**24**		**21**	

APPENDIX 9: ASSOCIATION WITH SOIL TYPE

Comparison of numbers of each species of Moggill dung beetle taken on different soil types. Soil textures at trap sites were recorded under the three simple categories of "gravelly" (188 samples), "loamy" (338 samples) and "sandy" (9 samples). Associations are inferred from the specimens/trap value. Associations with sandy soil category are not inferred because of low sample number on that substrate.

STRONGLY ASSOCIATED WITH SOIL TYPE	
MODERATELY ASSOCIATED WITH SOIL TYPE	
NOT COLLECTED ON SOIL TYPE	

Soil Type	GRAVELLY		LOAMY		SANDY	
No. of traps	188		338		9	
DUNG BEETLE SPECIES	Cells show total specimens and (spms/trap)					
Amphistomus storeyi	11	(0.058)	0	(0)	0	(0)
Boletoscapter furcatus	22	(0.116)	19	(0.049)	6	(0.666)
Cephalodesmius quadridens	18	(0.096)	5	(0.015)	0	(0)
Diorygopyx tibialis	5	(0.027)	0	(0)	0	(0)
Lepanus australis	3	(0.016)	16	(0.047)	0	(0)
Lepanus politus	0	(0)	1	(0.003)	0	(0)
Lepanus ustulatus	7	(0.037)	4	(0.012)	0	(0)
Monoplistes leai	6	(0.032)	5	(0.015)	1	(0.111)
Demarziella interrupta	45	(0.239)	12	(0.036)	0	(0)
Demarziella metallica	22	(0.117)	42	(0.124)	1	(0.111)
Onthophagus arrilla	14	(0.074)	59	(0.174)	0	(0)
Onthophagus auritus	15	(0.080)	2	(0.006)	0	(0)
Onthophagus australis	15	(0.080)	6	(0.018)	0	(0)
Onthophagus bornemisszai	7	(0.037)	20	(0.059)	1	(0.111)
Onthophagus capella	18	(0.096)	67	(0.198)	2	(0.222)
Onthophagus CQ2	4	(0.021)	11	(0.033)	0	(0)
Onthophagus CQ8	22	(0.116)	102	(0.302)	0	(0)
Onthophagus dandalu	21	(0.112	36	(0.107)	0	(0)
Onthophagus dunningi	54	(0.287)	41	(0.121)	2	(0.222)
Onthophagus granulatus	2	(0.011	6	(0.018)	0	(0)
Onthophagus incornutus	43	(0.229)	116	(0.343)	1	(0.111)
Onthophagus manya	1	(0.005)	0	(0)	0	(0)
Onthophagus neostenocerus	7	(0.037)	36	(0.107)	0	(0)
Onthophagus quadripustulatus	1	(0.005)	0	(0)	0	(0)
Onthophagus rubicundulus	111	(0.590)	520	(1.538)	5	(0.555)
Onthophagus semimetallicus	2	(0.011)	3	(0.009)	0	(0)
Onthophagus thoreyi	22	(0.116)	8	(0.024)	0	(0)
Onthophagus tuckonie	7	(0.037)	101	(0.299)	1	(0.111)
Onthophagus tweedensis	28	(0.149)	13	(0.038)	2	(0.222)
Onthophagus walteri	0	(0)	2	(0.006)	0	(0)
Onthophagus gazella	2	(0.011)	26	(0.077)	1	(0.111)
TOTAL SPECIES	29		27		11	
TOTAL SPECIMENS	535		1277		23	
Average SPECIMENS/TRAP	2.835		3.470		2.556	

APPENDIX 10: BAIT PREFERENCES OF MOGGILL DUNG BEETLES

TABLE 1: Relative attraction to horse dung, wallaby dung and mushroom by Moggill dung beetles. Based on **three way comparison** trapping. Derived from 1037 specimens of 27 species taken in 315 traps including 105 traps of each bait type. Table shows total numbers of specimens of each beetle species at each bait type.

SPECIES STRONGLY FAVOURING MUSHROOM
FAVOURING DUNG, BUT NO PREFERENCE
SPECIES STRONGLY FAVOURING HORSE DUNG
SPECIES STRONGLY FAVOURING WALLABY DUNG

DUNG BEETLE SPECIES	HORSE DUNG (105 traps)	MUSHROOM (105 traps)	WALLABY DUNG (105 TRAPS)
Boletoscapter furcatus	0	34	2
Cephalodesmius quadridens	1	0	4
Lepanus australis	1	3	6
Lepanus ustulatus	1	0	1
Monoplistes leai	0	0	2
Demarziella interrupta	33	1	12
Demarziella metallica	4	0	9
Onthophagus arrilla	7	0	21
Onthophagus auritus	14	0	3
Onthophagus australis	18	0	3
Onthophagus bornemisszai	14	0	8
Onthophagus capella	41	0	26
Onthophagus CQ2	4	0	6
Onthophagus CQ8	23	0	35
Onthophagus dandalu	39	0	11
Onthophagus dunningi	3	49	0
Onthophagus granulatus	6	0	2
Onthophagus incornutus	66	0	74
Onthophagus manya	0	0	1
Onthophagus neostenocerus	2	0	11
Onthophagus rubicundulus	110	2	191
Onthophagus semimetallicus	2	0	2
Onthophagus thoreyi	14	0	16
Onthophagus tuckonie	17	0	18
Onthophagus tweedensis	27	0	13
Onthophagus walteri	0	2	0
Onthophagus gazella	13	0	11
Total specimens at each bait	**460**	**91**	**488**

Table 2 on following page

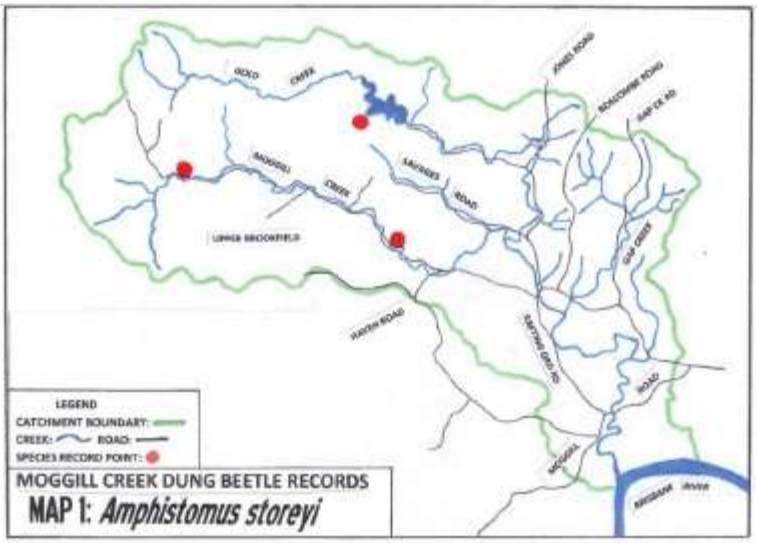
TABLE 2: Relative attraction to wallaby dung or mushroom bait by Moggill dung beetles. Based on **two way comparison traps**. Derived from 574 specimens of 21 species taken in 208 traps including 104 traps of each bait type. Table shows total numbers specimens of each beetle species at each bait type.

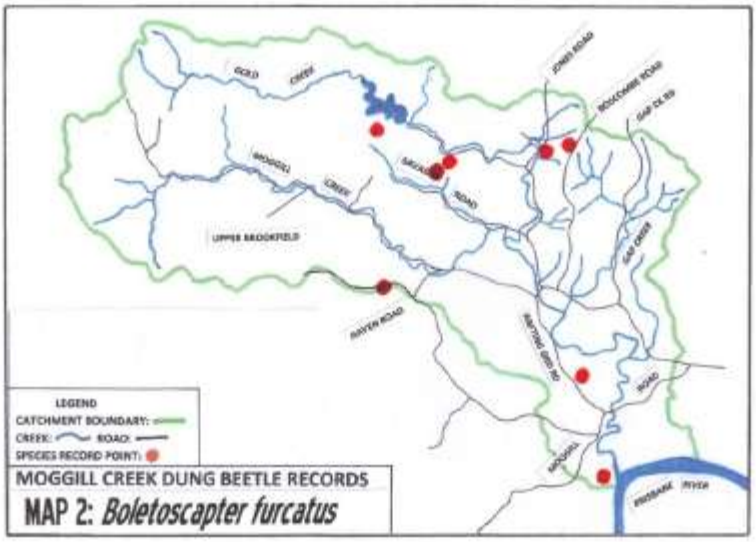
SPECIES STRONGLY FAVOURING MUSHROOM	
SPECIES STRONGLY FAVOURING WALLABY DUNG	
NO STRONG PREFERENCE	

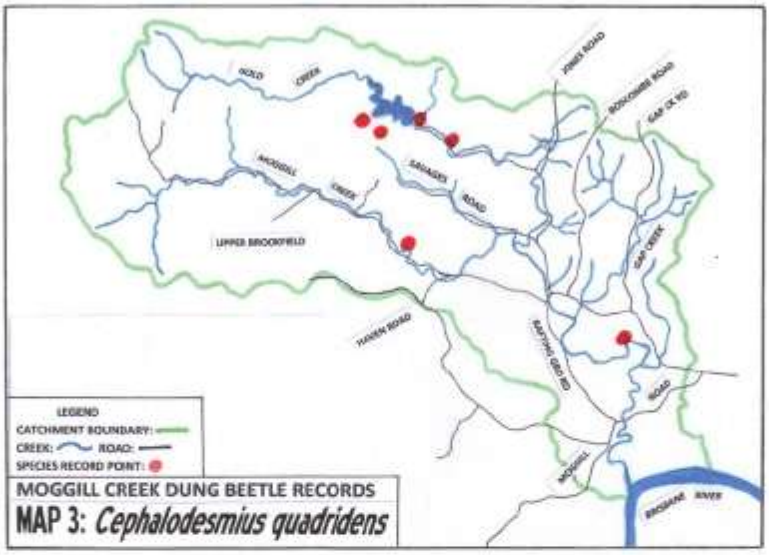
DUNG BEETLE SPECIES	**MUSHROOM (104 traps)**	**WALLABY DUNG (104 traps)**
Amphistomus storeyi	1	10
Boletoscapter furcatus	11	0
Cephalodesmius quadridens	13	4
Diorygopyx tibialis	1	1
Lepanus australis	4	5
Lepanus politus	1	0
Lepanus ustulatus	7	2
Monoplistes leai	0	10
Demarziella interrupta	2	9
Demarziella metallica	1	48
Onthophagus arrilla	0	41
Onthophagus bornemisszai	0	5
Onthophagus capella	0	15
Onthophagus dandalu	7	0
Onthophagus dunningi	45	0
Onthophagus neostenocerus	3	26
Onthophagus quadripustulatus	0	1
Onthophagus rubicundulus	13	240
Onthophagus semimetallicus	0	1
Onthophagus tuckonie	0	45
Onthophagus tweedensis	0	2
Total specimens at each bait	**109**	**465**

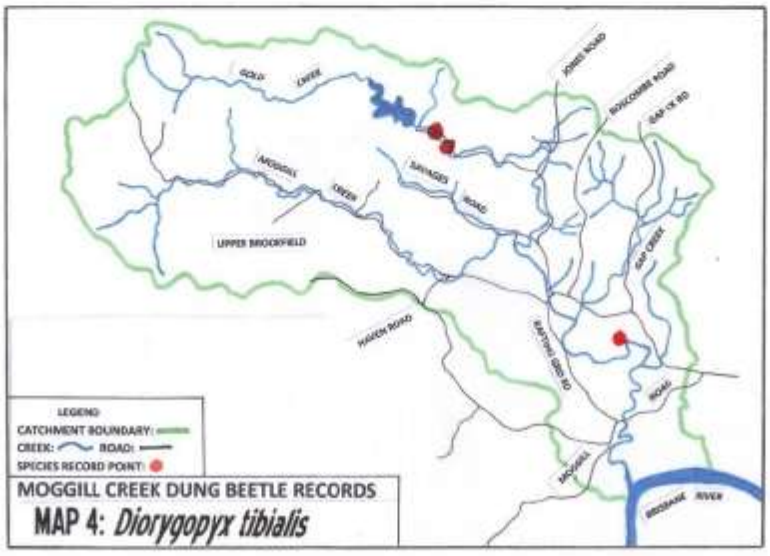
APPENDIX 11: MAPS OF MOGGILL CATCHMENT DUNG BEETLES

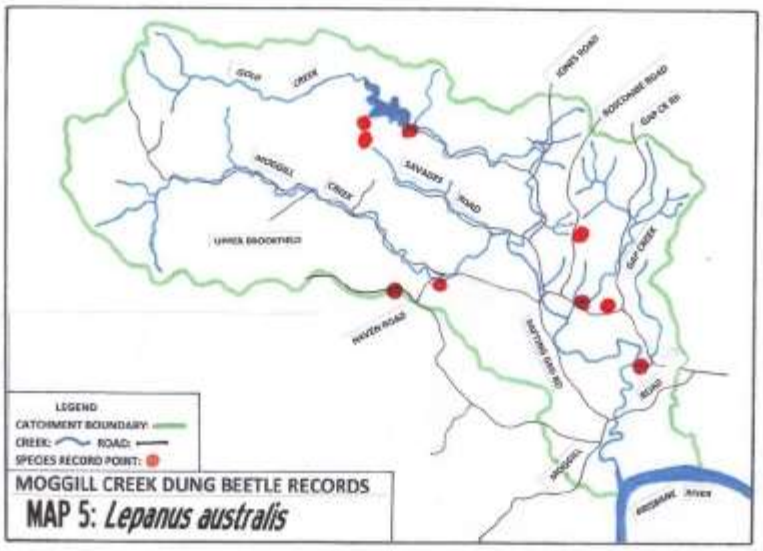
Maps of all known records for each of the 36 species of dung beetles recorded from the Moggill Creek Catchment. Species are presented in the sequence used in the census of species in Appendix 3. The boundary of the Moggill Creek Catchment is shown in green. Sites for each species are shown as red discs. Closely adjacent sites are shown by one disc.

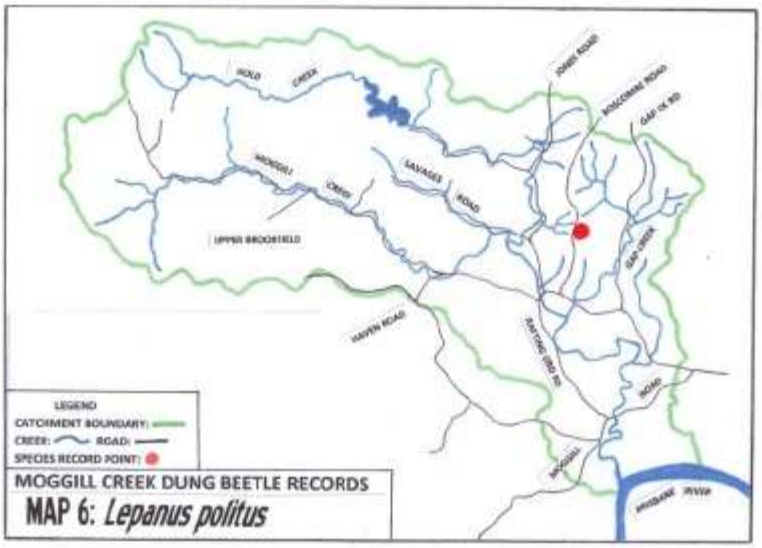


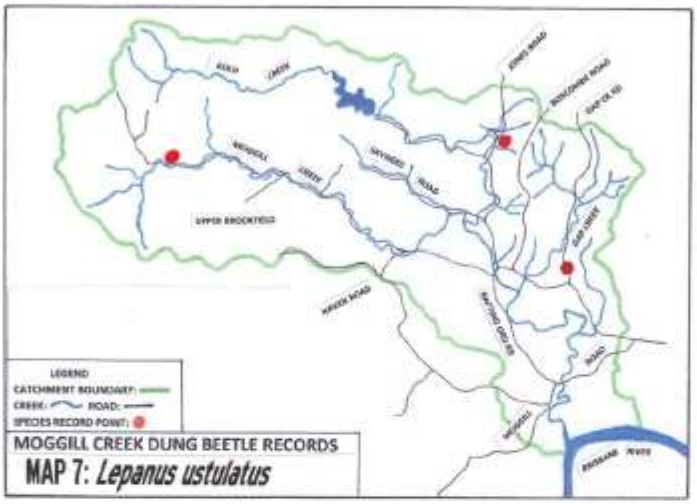



GOLD CREEK
JONES ROAD
ROSCOMBE ROAD
GAP CK RD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
HAVEN ROAD
BAYNES GRID RD
MOGGILL ROAD
BRISBANE RIVER
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 3: Cephalodesmius quadridens


GOLD CREEK
JONES ROAD
ROSCOMBE ROAD
GAP CK RD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
HAVEN ROAD
BAYNES GRID RD
MOGGILL ROAD
BRISBANE RIVER
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 4: Diorygopyx tibialis


LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 5: Lepanus australis


LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 6: Lepanus politus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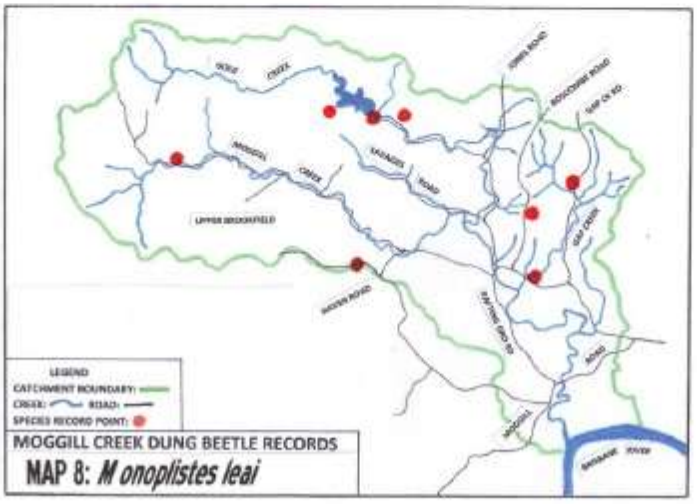
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 7: Lepanus ustulatus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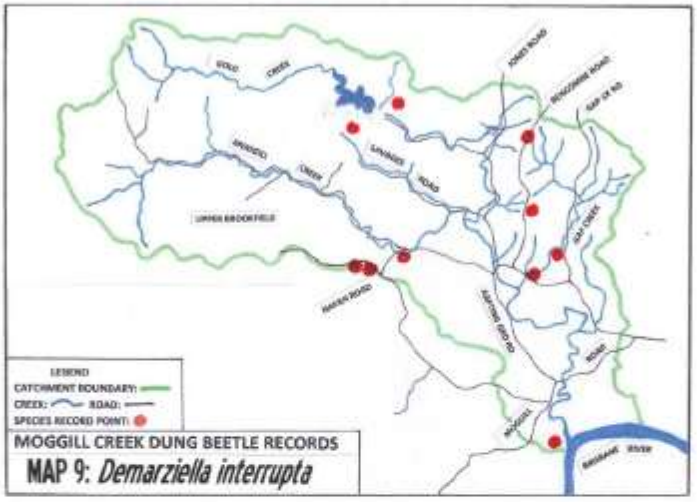
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 8: M onoplistes leai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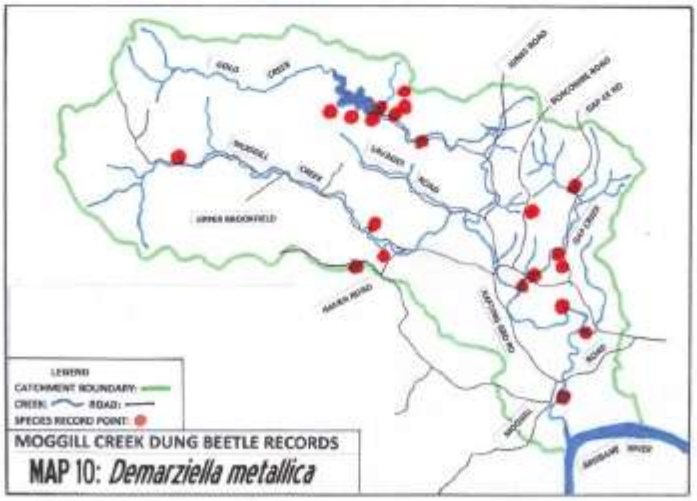
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 9: Demarziella interrupta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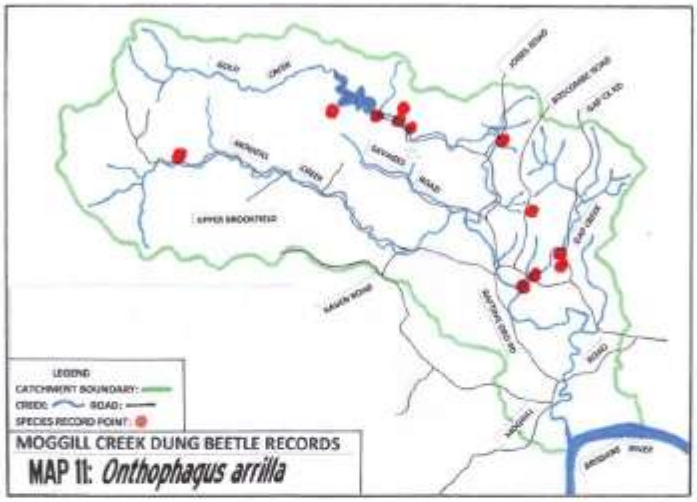
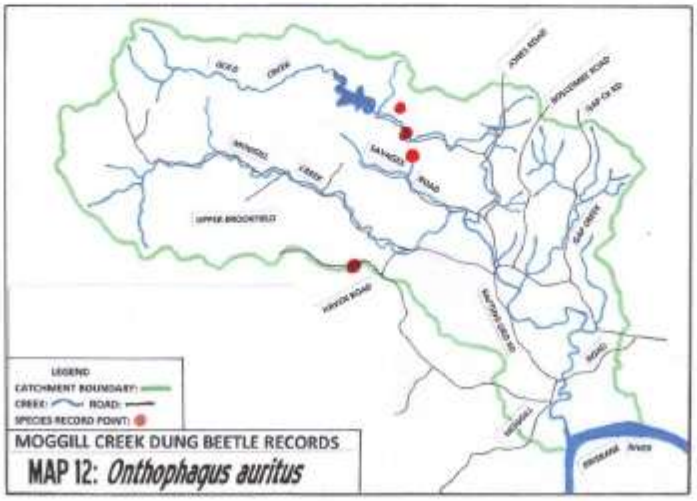
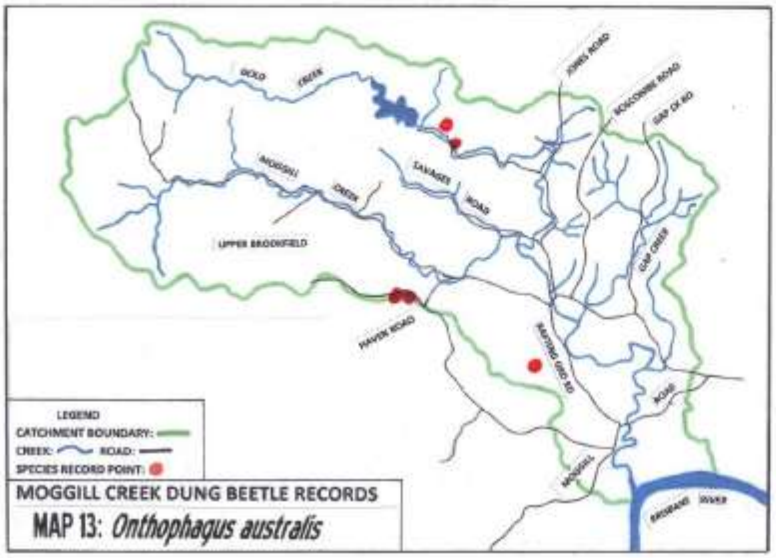
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 10: Demarziella metallica

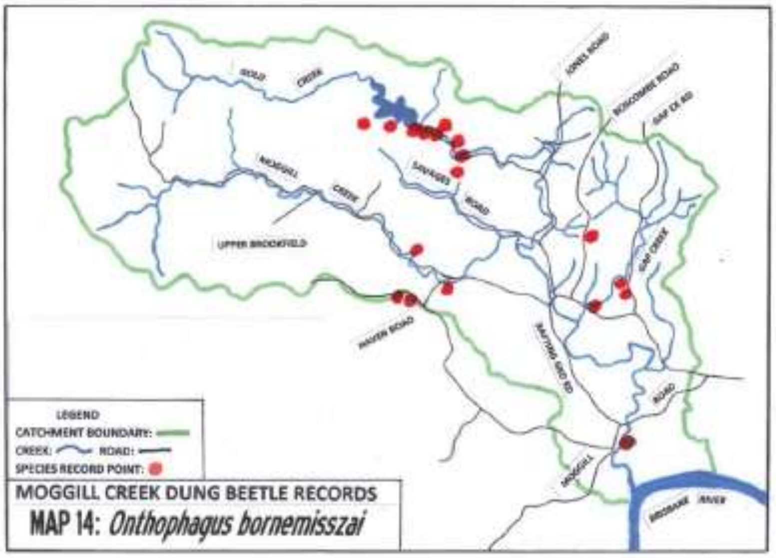

LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 11: Onthophagus arrilla


LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 12: Onthophagus auritus



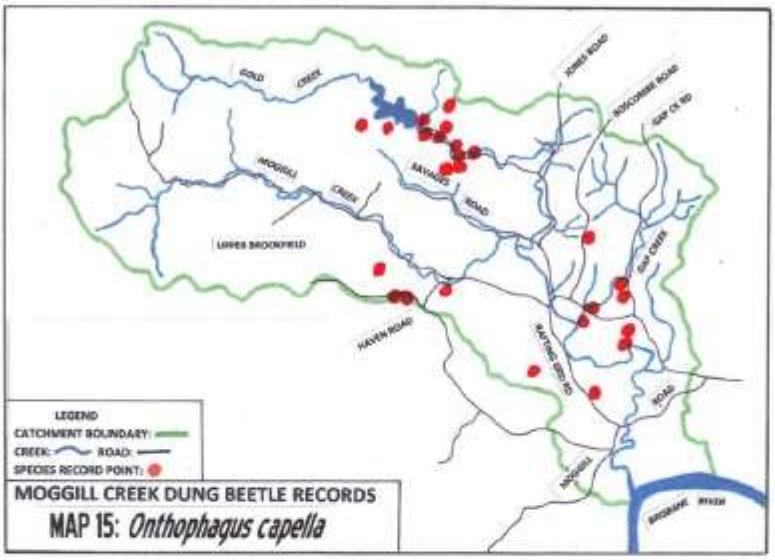
MOGGILL CREEK DUNG BEETLE RECORDS

MAP 13: *Onthophagus australis*



MOGGILL CREEK DUNG BEETLE RECORDS

MAP 14: *Onthophagus bornemisszai*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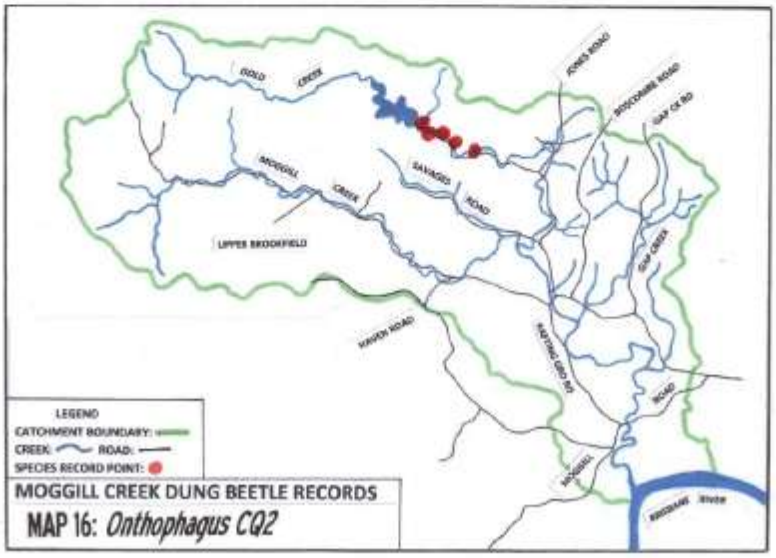
JONES ROAD
MOGGILL CREEK
SAVAGES ROAD
LOWER BROOKFIELD
GAP CREEK
HAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 15: Onthophagus capella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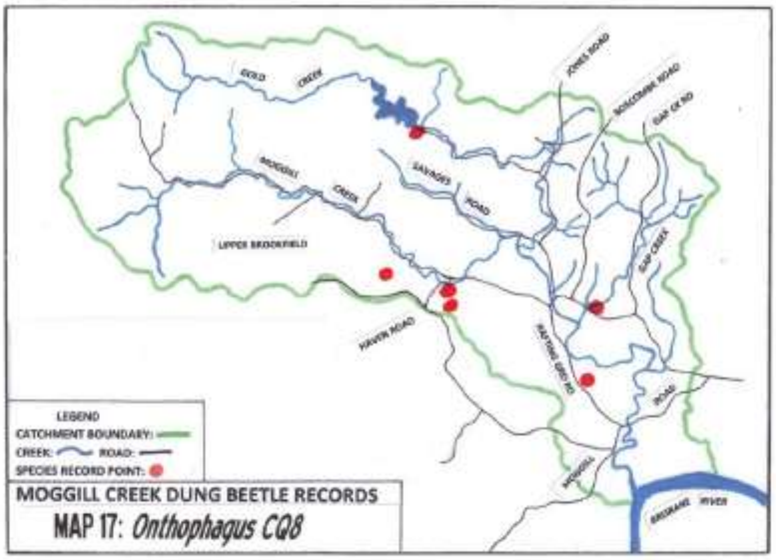
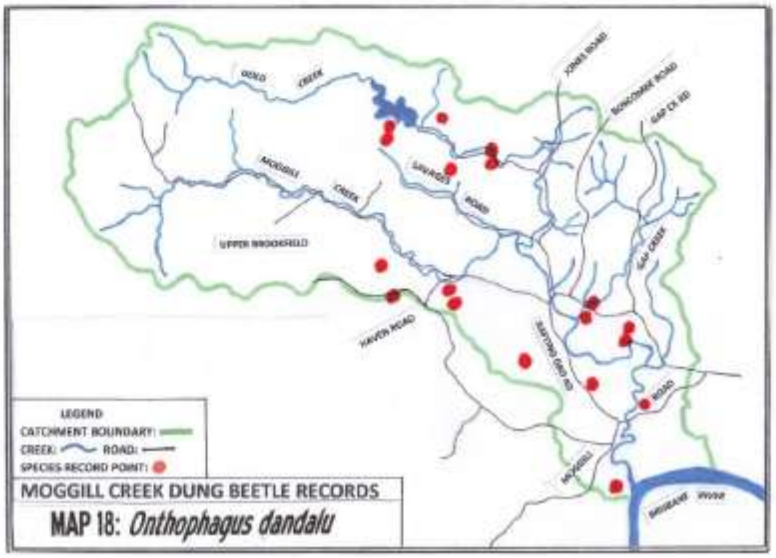
MOGGILL CREEK
SAVAGES ROAD
LOWER BROOKFIELD
GAP CREEK
HAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 16: Onthophagus CQ2



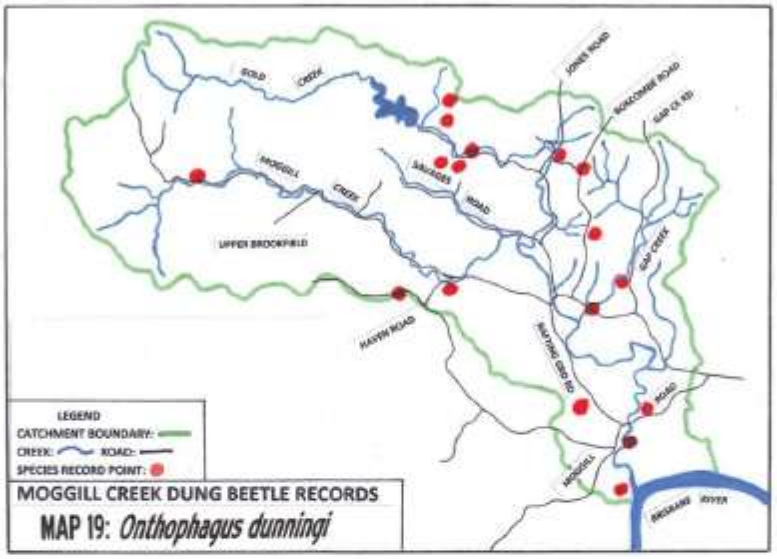
MOGGILL CREEK DUNG BEETLE RECORDS

MAP 17: ***Onthophagus CQ8***



MOGGILL CREEK DUNG BEETLE RECORDS

MAP 18: ***Onthophagus dandalu***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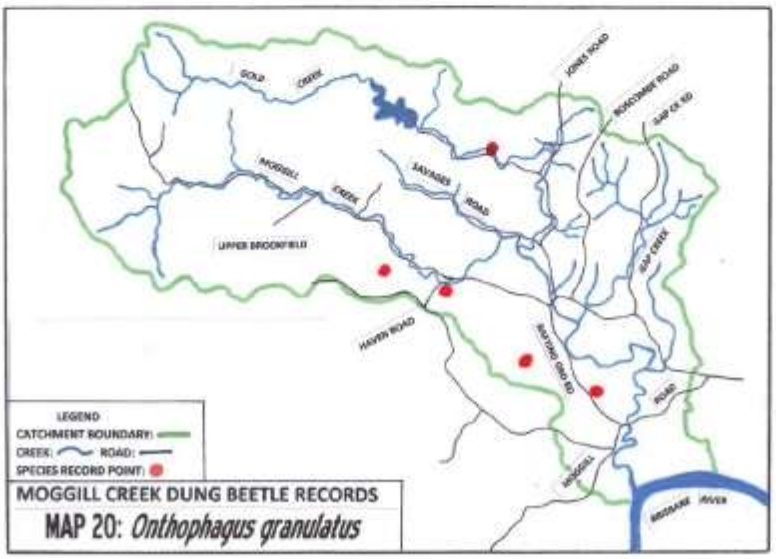
JONES ROAD
ROSCOMMEE ROAD
GAP CK RD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
HAVEN ROAD
MAYFIELD RD
ROAD
MOGGILL
BRISBANE RIVER
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 19: Onthophagus dunningi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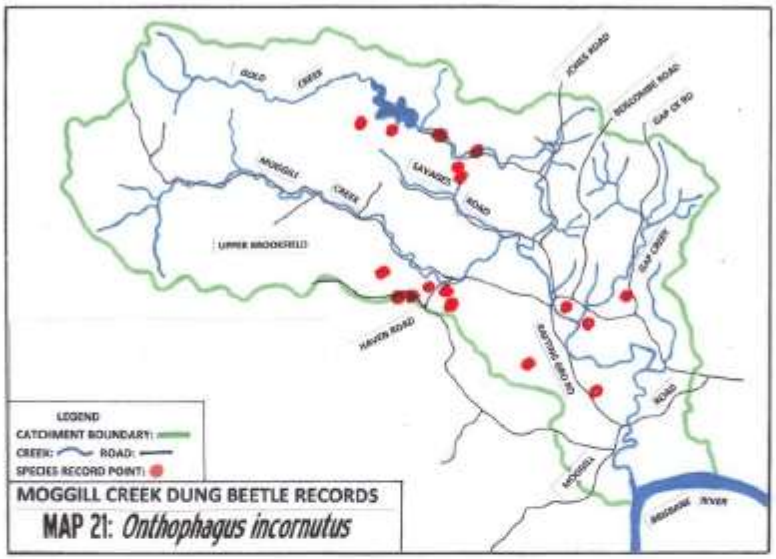
ROSCOMMEE ROAD
GAP CK RD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
HAVEN ROAD
MAYFIELD RD
ROAD
MOGGILL
BRISBANE RIVER
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 20: Onthophagus granulatus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MOGGILL CREEK
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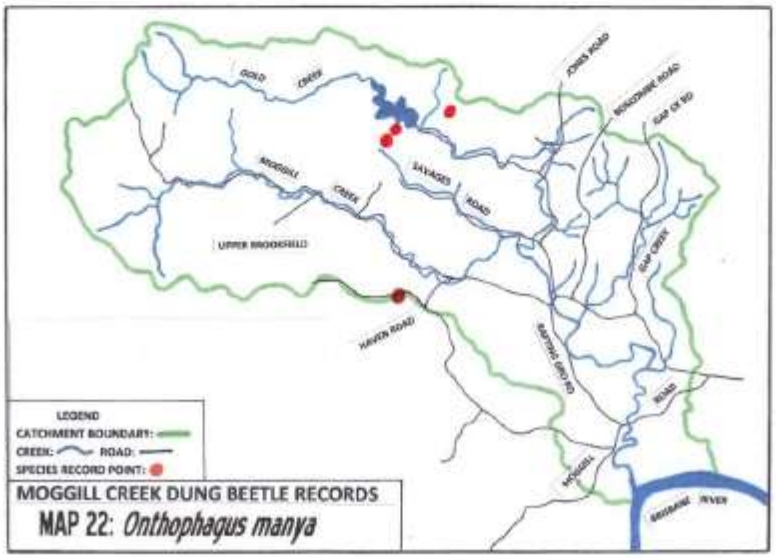
GAP CREEK
HAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 21: Onthophagus incornutus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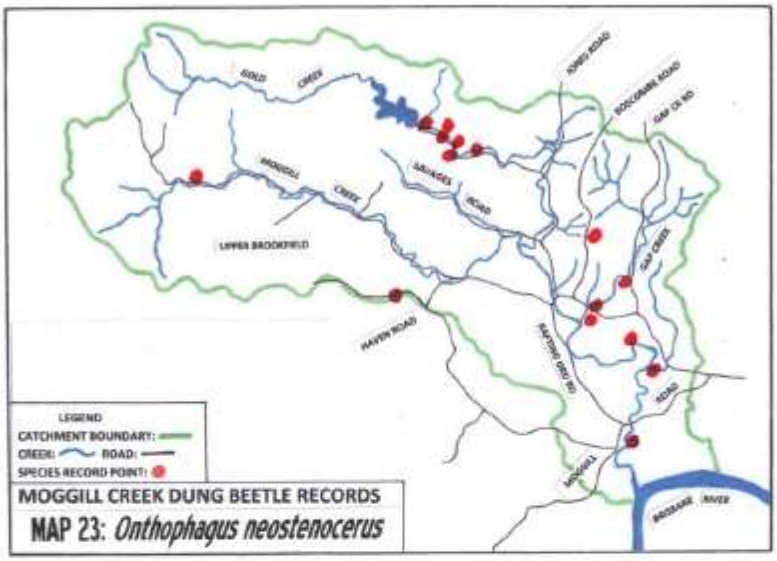
JONES ROAD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
HAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 22: Onthophagus manya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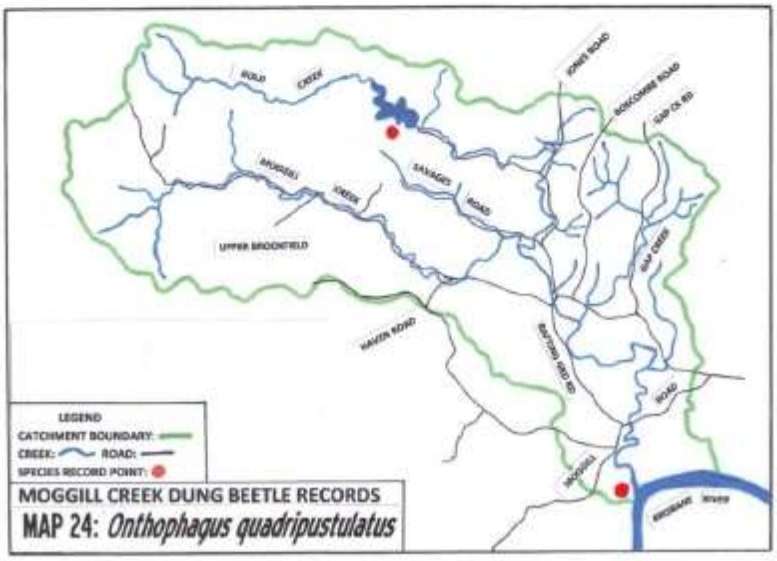
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 23: Onthophagus neostenocerus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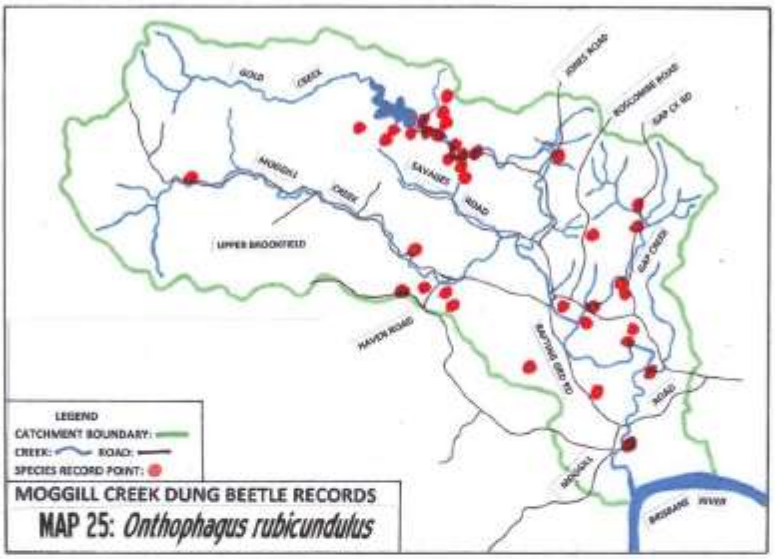
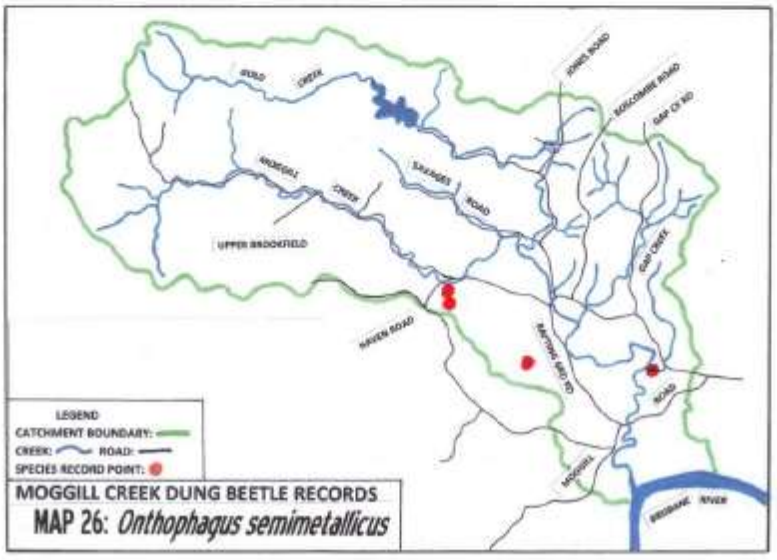
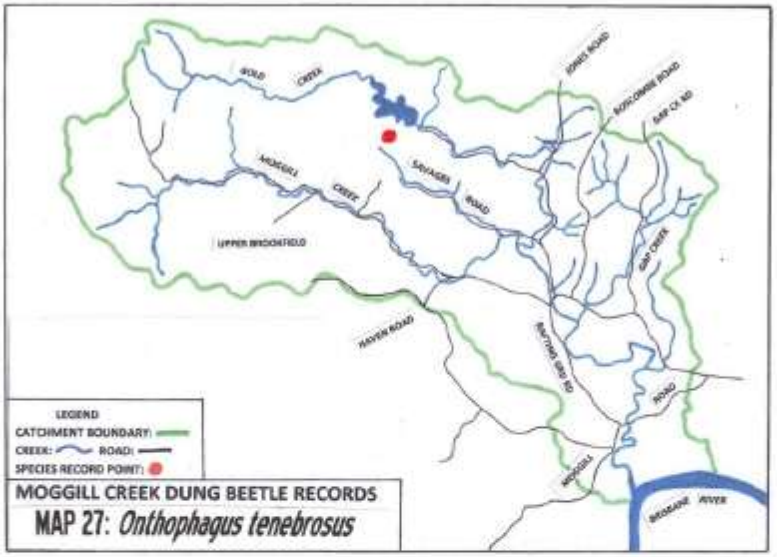
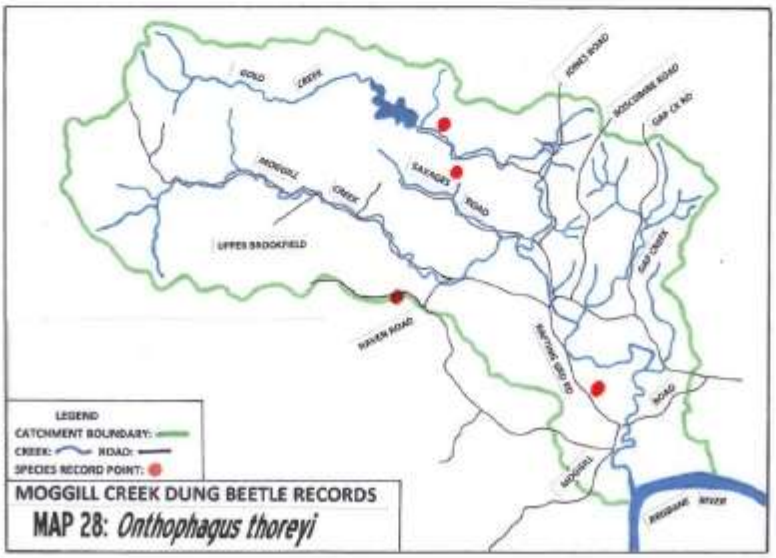
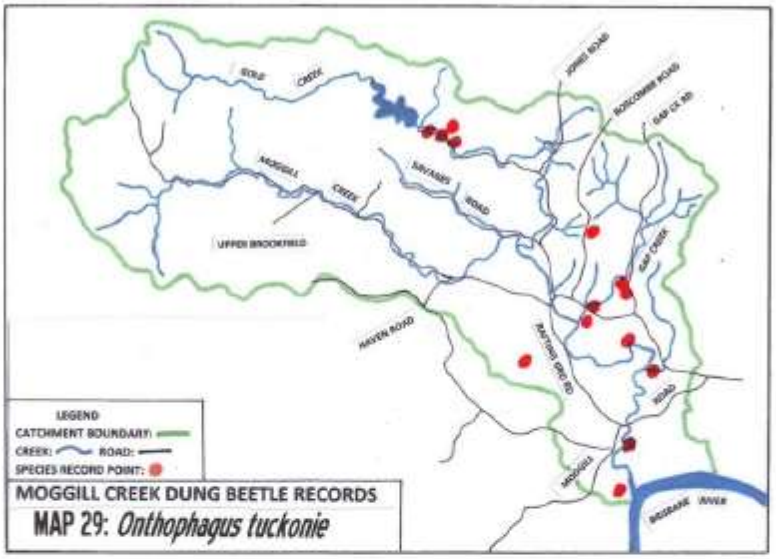
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 24: Onthophagus quadripustulatus


JONES ROAD
ROSCOMBE ROAD
GAP CK RD
GAP CREEK
ROAD
UPPER BROOKFIELD
RAVEN ROAD
MOGGILL
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 25: Onthophagus rubicundulus


JONES ROAD
ROSCOMBE ROAD
GAP CK RD
GAP CREEK
ROAD
UPPER BROOKFIELD
RAVEN ROAD
MOGGILL
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 26: Onthophagus semimetallicus


LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 27: Onthophagus tenebrosus


LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 28: Onthophagus thoreyi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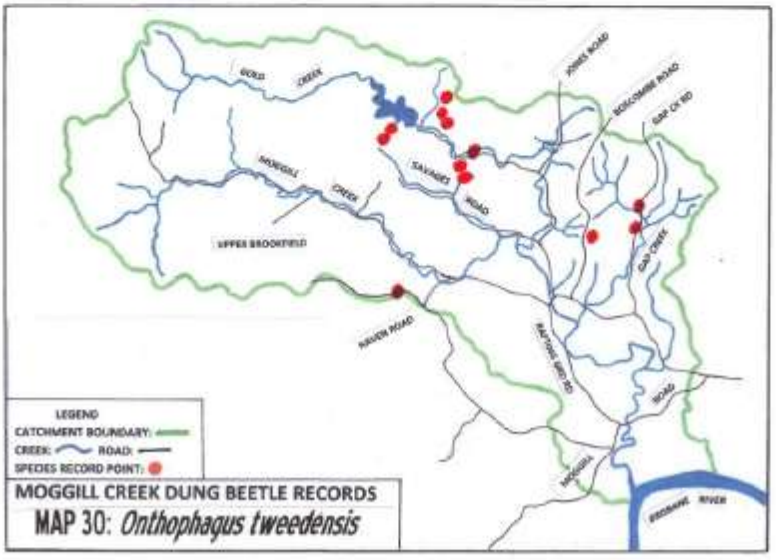
GAP CK RD
SAVAGES
ROAD
GAP CREEK
UPPER BROOKFIELD
RAVEN ROAD
ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 29: Onthophagus tuckonie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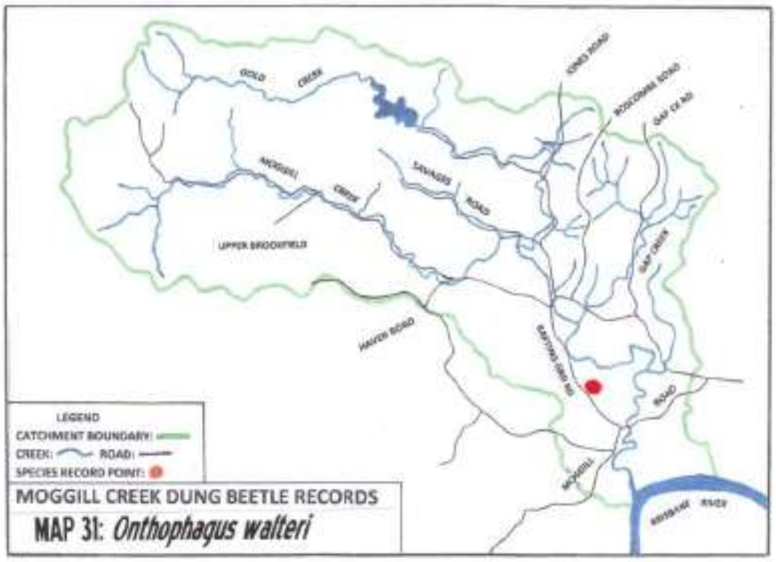
ROSCOMMON ROAD
GAP CK RD
SAVAGES
ROAD
GAP CREEK
UPPER BROOKFIELD
RAVEN ROAD
ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 30: Onthophagus tweedensis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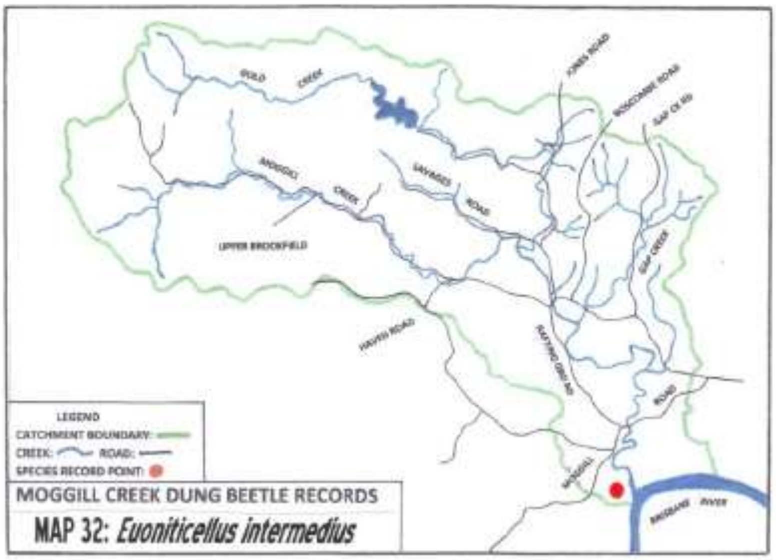
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
HAVEN ROAD
GAP CREEK
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 31: *Onthophagus walteri*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MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
HAVEN ROAD
GAP CREEK
LEGEND
CATCHMENT BOUNDARY:
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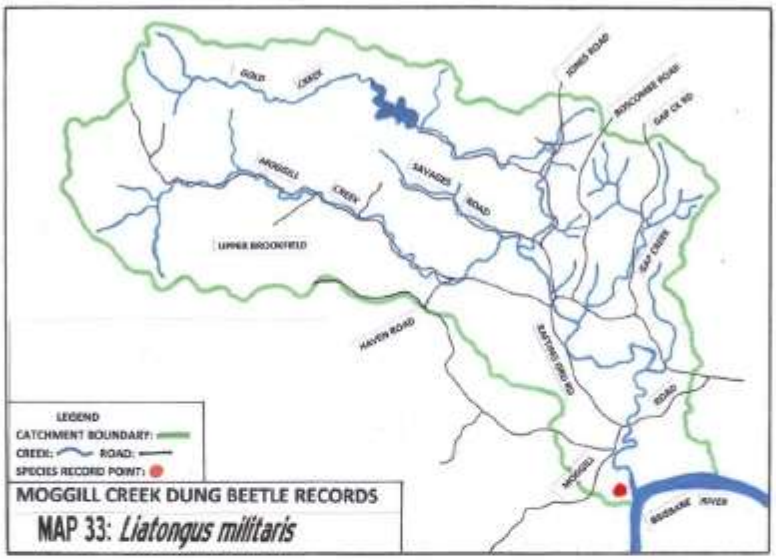
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 32: *Euoniticellus intermedius*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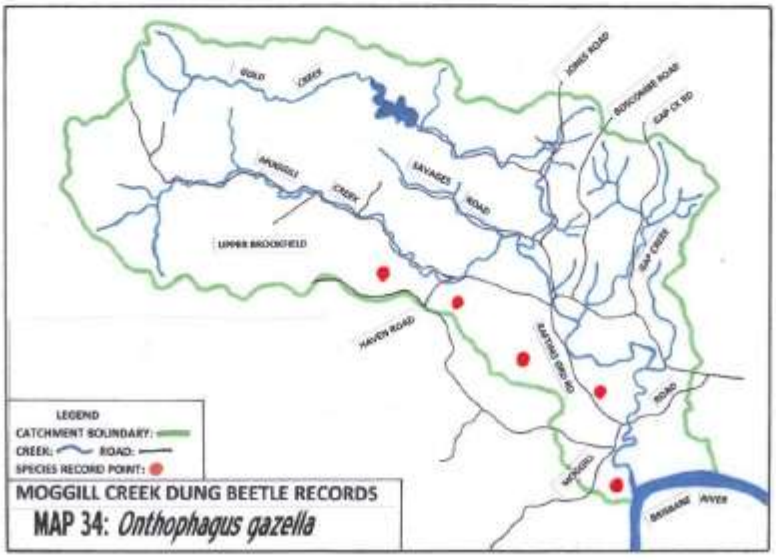
CREEK
SAVAGES
ROAD
LOWER BROOKFIELD
HAVEN ROAD
SAP CREEK
LEGEND
CATCHMENT BOUNDARY:
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 33: Liatongus militaris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MOGGILL
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SAVAGES
ROAD
LOWER BROOKFIELD
HAVEN ROAD
SAP CREEK
LEGEND
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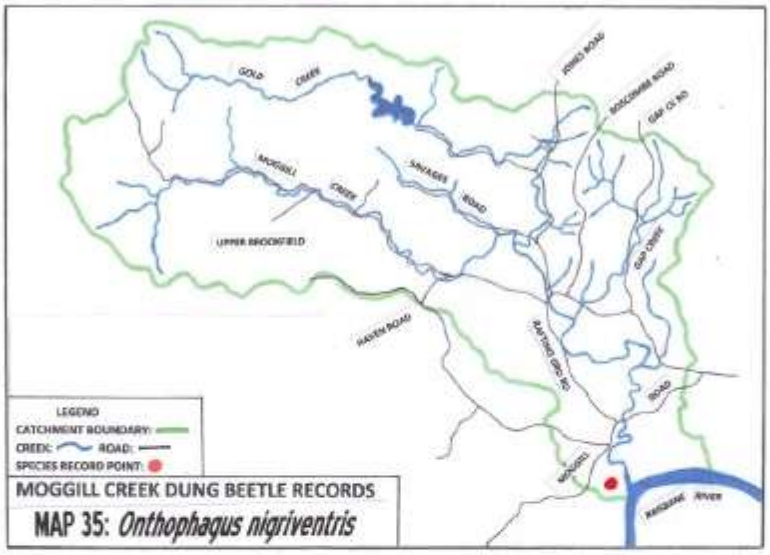
CREEK:
ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 34: Onthophagus gazella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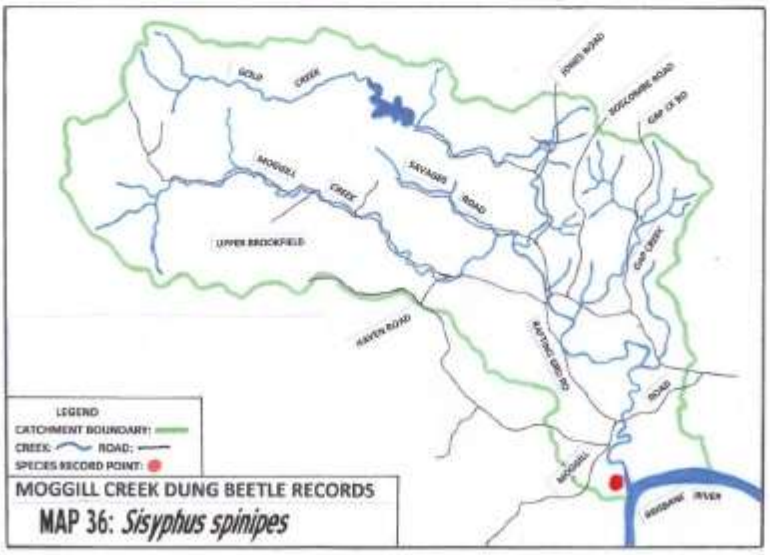
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
RAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 35: Onthophagus nigriventris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JONES ROAD
MOGGILL CREEK
SAVAGES ROAD
UPPER BROOKFIELD
GAP CREEK
RAVEN ROAD
LEGEND
CATCHMENT BOUNDARY:
CREEK: ROAD:
SPECIES RECORD POINT:
MOGGILL CREEK DUNG BEETLE RECORDS
MAP 36: Sisyphus spinipes

APPENDIX 12: CHECKLIST AUSTRALIAN DUNG BEETLES

This is a working checklist of all known species of Australian native and introduced dung beetles. The list includes the 340 named native species, 99 undescribed native species indicated by provisional code names, and 23 introduced African and European species.

The 36 recorded Moggill Creek catchment species are highlighted in green as follows:
..... MOGGILLCREEK CATCHMENT.

AUSTRALIAN NATIVE SPECIES

CANTHONINI

AMPHISTOMUS

Amphistomus accidatus Matthews, 1974
Amphistomus calcaratus (Macleay, 1871)
Amphistomus complanatus Matthews, 1974
Amphistomus cunninghamensis Matthews, 1974
Amphistomus inermis Matthews, 1974
Amphistomus macphersonensis Matthews, 1974
Amphistomus montanus Matthews, 1974
Amphistomus opacus Matthews, 1974
Amphistomus palpebratus Matthews, 1974
Amphistomus pectoralis Matthews, 1974
Amphistomus primonactus Matthews, 1974
Amphistomus pygmaeus Matthews, 1974
Amphistomus speculifer Matthews, 1974
Amphistomus squalidus (Macleay, 1887)
Amphistomus storeyi Matthews, 1974 MOGGILL CREEK CATCHMENT
Amphistomus trispiculatus Matthews, 1974
Amphistomus tuberculatus (Lansberge, 1885)
Amphistomus tuberosus Matthews, 1974
Amphistomus CQ1
Amphistomus NQ1
Amphistomus NQ2
Amphistomus NQ3
Amphistomus NQ4
Amphistomus NQ5
Amphistomus NSW1
Amphistomus WA1

APTENOCANTHON

Aptenocanthon hopsoni (Carter, 1936)
Aptenocanthon kabura Storey & Monteith, 2000
Aptenocanthon jimara Storey & Monteith, 2000
Aptenocanthon monteithi Storey, 1984
Aptenocanthon rossi Matthews, 1974
Aptenocanthon speewah Storey & Monteith, 2000
Aptenocanthon winyar Storey & Monteith, 2000
Aptenocanthon wollumbin Storey & Monteith, 2000

AULACOPRIS

Aulacopris matthewsi Storey, 1986
Aulacopris maximus Matthews, 1974
Aulacopris reichei White, 1859

BOLETOSCAPTER

Boletoscapter cornutus (Macleay, 1887)
Boletoscapter furcatus Matthews, 1974 MOGGILL CREEK CATCHMENT

CANTHONOSOMA

Canthonosoma castelnaui (Harold, 1868)
Canthonosoma macleayi (Harold, 1868)

Canthonosoma mastersii Macleay, 1871
Canthonosoma CQ1

CEPHALODESMIUS
Cephalodesmius armiger Westwood, 1841
Cephalodesmius laticollis Pascoe, 1863
Cephalodesmius quadridens Macleay, 1871 MOGGILL CREEK CATCHMENT
Cephalodesmius CQ1
COPROECUS
Coproecus hemisphaericus (Guerin-Meneville, 1830)
Coproecus WA1
DIORYGOPYX
Diorygopyx asciculifer (Lea, 1923)
Diorygopyx cuspidatus Matthews, 1974
Diorygopyx duplodentatus Matthews, 1974
Diorygopyx incomptus Matthews, 1974
Diorygopyx incrassatus Matthews, 1974
Diorygopyx niger Matthews, 1974
Diorygopyx simpliciclunis Matthews, 1974
Diorygopyx tibialis (Macleay, 1871) MOGGILL CREEK CATCHMENT
LABROMA
Labroma horrens Sharp, 1873
Labroma tuberculata (Waterhouse, 1874)
Labroma umbratilis Matthews, 1974
LEPANUS
Lepanus arator Matthews, 1974
Lepanus australis Matthews, 1974 MOGGILL CREEK CATCHMENT
Lepanus bidentatus (Wilson, 1922)
Lepanus dichrous (Gillet, 1925)
Lepanus furcifer Matthews, 1974
Lepanus gelasinus Matthews, 1974
Lepanus glaber Matthews, 1974
Lepanus globulus (Macleay, 1887)
Lepanus illawarrensis Matthews, 1974
Lepanus latheticus Matthews, 1974
Lepanus loftyensis Matthews & Weir, 2002
Lepanus monteithi Matthews, 1974
Lepanus niger (Lansberge, 1874) (nomen inquirendum)
Lepanus nitidus Matthews, 1974
Lepanus nitidus/dichrous complex
Lepanus occidentalis Matthews, 1974
Lepanus palumensis Matthews, 1974
Lepanus parapisoniae Matthews, 1974
Lepanus penelopae Matthews & Weir, 2002
Lepanus pisoniae (Lea, 1923)
Lepanus politus (Carter, 1936) MOGGILL CREEK CATCHMENT
Lepanus politus/parapisoniae complex
Lepanus pygmaeus (Macleay, 1888)
Lepanus ustulatus (Lansberge, 1874) MOGGILL CREEK CATCHMENT
Lepanus vestitus Matthews, 1974
Lepanus villosus Matthews, 1974
Lepanus CQ2
Lepanus CQ3
Lepanus CYP1
Lepanus CYP2
Lepanus CYP3
Lepanus CYP4
Lepanus NQ1
Lepanus NQ2
Lepanus NQ3

Lepanus NQ4
Lepanus NQ5
Lepanus NQ6
Lepanus NQ7
Lepanus NQ8
Lepanus NSW1
Lepanus NSW2
Lepanus NSW3
Lepanus NSW4
Lepanus NT1
Lepanus NT2
Lepanus NT3
Lepanus WA1
Lepanus WA2
Lepanus WA3

MENTOPHILUS

Mentophilus hollandiae Castelnau, 1840
Mentophilus subsulcatus Sharp, 1873

MONOPLISTES

Monoplistes curvipes Lea, 1923
Monoplistes haroldi Lansberge, 1874
Monoplistes leai Paulian, 1934 MOGGILL CREEK CATCHMENT
Monoplistes occidentalis (Macleay, 1888)
Monoplistes phanophilus Lea, 1923
Monoplistes tropicus Lea, 1923
Monoplistes NQ1
Monoplistes NT1

PSEUDIGNAMBIA

Pseudignambia mimerops (Matthews, 1974)
Pseudignambia squamata (Matthews, 1974)
Pseudignambia NQ1
Pseudignambia NQ2
Pseudignambia NQ3
Pseudignambia NQ4
Pseudignambia NQ5
Pseudignambia NQ6
Pseudignambia NQ7
Pseudignambia NQ8
Pseudignambia NQ9
Pseudignambia NQ10
Pseudignambia NQ11
Pseudignambia NQ12
Pseudignambia NQ13
Pseudignambia NQ14
Pseudignambia NQ15
Pseudignambia NQ16
Pseudignambia NQ17
Pseudignambia NQ18

SAUVAGESINELLA

Sauvagesinella becki (Paulian, 1934)
Sauvagesinella monstrosa Paulian, 1934
Sauvagesinella palustris Matthews, 1974

TEMNOPLECTRON

Temnoplectron aeneopiceum Matthews, 1974
Temnoplectron bornemisszai Matthews, 1974
Temnoplectron boucomonti Paulian, 1934
Temnoplectron cooki Reid & Storey, 2000
Temnoplectron disruptum Matthews, 1974
Temnoplectron diversicolle Blackburn, 1894
Temnoplectron finnigani Reid & Storey, 2000

Temnoplectron involucre Matthews, 1974
Temnoplectron laeve (Castelnau, 1840)
Temnoplectron lewisense Reid & Storey, 2000
Temnoplectron major Paulian, 1985
Temnoplectron monteithi Reid & Storey, 2000
Temnoplectron politulum Macleay, 1887
Temnoplectron reyi Paulian, 1934
Temnoplectron rotundum Westwood, 1842
Temnoplectron subvolitans Matthews, 1974

TESSERODON
Tesserodon angulatum Westwood, 1842
Tesserodon erratum Storey, 1991
Tesserodon feehani Storey, 1991
Tesserodon gestroi Lansberge, 1885
Tesserodon granulatum Matthews, 1974
Tesserodon henryi Storey, 1991
Tesserodon hilleri Storey, 1991
Tesserodon intricatum Lea, 1923
Tesserodon novaehollandiae (Fabricius, 1775)
Tesserodon pilicrepus Matthews, 1974
Tesserodon simplicipunctatum Storey, 1991
Tesserodon tenebrioides Matthews, 1974
Tesserodon variolosum Macleay, 1888

DICHOTOMIINI
COPTODACTYLA
Coptodactyla brooksi Matthews, 1976
Coptodactyla depressa Paulian, 1933
Coptodactyla ducalis Blackburn, 1903
Coptodactyla glabricollis (Hope, 1842)
Coptodactyla lesnei Paulian, 1933
Coptodactyla matthewsi Reid, 2000
Coptodactyla meridionalis Matthews, 1976
Coptodactyla monstrosa Felsche, 1909
Coptodactyla nitida Paulian, 1933
Coptodactyla onitoides Gillet, 1925
Coptodactyla stereocera Gillet, 1911
Coptodactyla storeyi Reid, 2000
Coptodactyla subaenea Harold, 1877
Coptodactyla torresica Matthews, 1976
DEMARZIELLA
Demarziella alternata (Lea, 1923)
Demarziella eungella (Matthews, 1976)
Demarziella geminata (Macleay, 1871)
Demarziella imitatrix Balthasar, 1967
Demarziella interrupta (Carter, 1936) MOGGILL CREEK CATCHMENT
Demarziella metallica (Carter, 1936) MOGGILL CREEK CATCHMENT
Demarziella mirifica Balthasar, 1961
Demarziella planitarsis Petrovitz, 1971
Demarziella pratensis (Matthews, 1976)
Demarziella scarpensis (Matthews, 1976)
Demarziella storeyi (Matthews, 1976)
Demarziella sylvestris (Matthews, 1976)
Demarziella tropicalis (Matthews, 1976)
Demarziella yorkensis Matthews & Stebnicka, 1986
Demarziella WA1
THYREGIS
Thyregis kershawi Blackburn, 1904
Thyregis monteithi Matthews, 1976

Thyregis relictus Matthews, 1976
Thyregis tarsatus (Paulian, 1933)
Thyregis VIC1

ONTHOPHAGINI

ONTHOPHAGUS
I. *GLABRATUS-group*
Onthophagus carmodensis Blackburn, 1907
Onthophagus chepara Matthews, 1972
Onthophagus glabratus Hope, 1842
Onthophagus kakadu Storey & Weir, 1990
Onthophagus murchisoni Blackburn, 1892
Onthophagus muticus Macleay, 1864
Onthophagus neboissi Frey, 1970
Onthophagus parvus Blanchard, 1846
Onthophagus peramelinus (Lea, 1923)
Onthophagus prehensilis (Arrow, 1920)
Onthophagus variolicollis Lea, 1923
II. *ATROX-group*
Onthophagus atrox Harold, 1867
Onthophagus capitosus Harold, 1867
Onthophagus demarzi Frey, 1959
Onthophagus ferox Harold, 1867
Onthophagus laminatus Macleay, 1864
Onthophagus leai Blackburn, 1903
Onthophagus mjobergi Gillet, 1925
Onthophagus mniszechi Harold, 1869
Onthophagus pentacanthus Harold, 1867
Onthophagus pugnacior Blackburn, 1903
Onthophagus quinquetuberculatus Macleay, 1871
Onthophagus sloanei Blackburn, 1903
Onthophagus solidus Gillet, 1927
Onthophagus NSW1 (atrox gp.)
Onthophagus NT4 (atrox gp.)
III. *CONSPICUUS-group*
Onthophagus bicavicollis Lea, 1923
Onthophagus conspicuus Macleay, 1864
Onthophagus fissiceps Macleay, 1888
Onthophagus jalamari Matthews, 1972
Onthophagus mongana Storey & Weir, 1990
Onthophagus rugosicollis Gillet, 1925
Onthophagus salebrosus Macleay, 1888
Onthophagus tenebrosus Harold, 1871 MOGGILL CREEK CATCHMENT
*Onthophagus tricavicollis*Lea, 1923
Onthophagus worooa Storey & Weir, 1990
IV. *PRONUS-group*
Onthophagus bornemisszanus Matthews, 1972
Onthophagus leanus Goidanich, 1926
Onthophagus pronus Erichson, 1842
Onthophagus NQ8 (pronus gp.)
Onthophagus SEQ2 (pronus gp.)
V. *DECLIVIS-group*
Onthophagus apterus Matthews, 1972
Onthophagus alquirta Matthews, 1972
Onthophagus declivis Harold, 1869
Onthophagus desectus Macleay, 1871
Onthophagus devexus Macleay, 1888
VI. *CAPELLA-group*
Onthophagus capella Kirby, 1818 MOGGILL CREEK CATCHMENT

Onthophagus capelliformis Gillet, 1925
Onthophagus comperei Blackburn, 1903
Onthophagus cooloola Storey & Weir, 1990
Onthophagus darlingtoni Matthews, 1972
Onthophagus dicranocerus Gillet, 1925
Onthophagus ferrari Matthews, 1972
Onthophagus macrocephalus Kirby, 1818
Onthophagus mamillatus Lea, 1923
Onthophagus mundill Matthews, 1972
Onthophagus neostenocerus Goidanich, 1926 MOGGILL CREEK CATCHMENT
Onthophagus nodulifer Harold, 1867
Onthophagus ouratita Matthews, 1972
Onthophagus pugnax Harold, 1868
Onthophagus queenslandicus Blackburn, 1903
Onthophagus tabellifer Gillet, 1927
Onthophagus williamsi Storey & Weir, 1990
Onthophagus NT3 (capella gp.)

VII. *ERICHSONI-group*
Onthophagus bicornis Macleay, 1888
Onthophagus capellinus Frey, 1963
Onthophagus erichsoni Hope, 1842
Onthophagus picipennis Hope, 1842
Onthophagus tabellicornis Macleay, 1864
Onthophagus wigmungan Matthews, 1972
Onthophagus WA3 (erichsoni gp.)
VIII. *DUNNINGI-group*
Onthophagus anchommatus Lea, 1923
Onthophagus brooksi Matthews, 1972
Onthophagus dunningi Harold, 1869 MOGGILL CREEK CATCHMENT
Onthophagus kumbaingeri Matthews, 1972
Onthophagus pinaroo Storey & Weir, 1990
IX. *AUSTRALIS-group*
Onthophagus anisocerus Erichson, 1842
Onthophagus australis Guerin-Meneville, 1838 MOGGILL CREEK CATCHMENT
Onthophagus fuliginosus Erichson, 1842
Onthophagus hoplocerus Lea, 1923
Onthophagus nurubuan Matthews, 1972
Onthophagus paluma Matthews, 1972
Onthophagus parallelicornis Macleay, 1887
Onthophagus thoreyi Harold, 1868 MOGGILL CREEK CATCHMENT
Onthophagus tweedensis Blackburn, 1903 MOGGILL CREEK CATCHMENT
Onthophagus weringerong Storey & Weir, 1990
Onthophagus yourula Storey & Weir, 1990
*Onthophagus CQ*1 (MS *O. tomweiri*)
Onthophagus CQ2 (australis gp.) MOGGILL CREEK CATCHMENT
X. *AURITUS-group*
Onthophagus auritus Erichson, 1842 MOGGILL CREEK CATCHMENT
Onthophagus beelarong Storey & Weir, 1990
Onthophagus cuniculus Macleay, 1864
Onthophagus dandalu Matthews, 1972 MOGGILL CREEK CATCHMENT
Onthophagus discolor Hope, 1842
Onthophagus furcaticeps Masters, 1886
Onthophagus gurburra Storey & Weir, 1990
Onthophagus purpureicollis Macleay, 1864
Onthophagus rufosignatus Macleay, 1864
Onthophagus walteri Macleay, 1887 MOGGILL CREEK CATCHMENT
Onthophagus NQ15 (auritus gp.)
XI. *LATRO-group*
Onthophagus bambra Matthews, 1972

Onthophagus endota Matthews, 1972
Onthophagus latro Harold, 1877
Onthophagus margaretensis Blackburn, 1903
Onthophagus signaticollis Frey, 1970
Onthophagus varianus Lea, 1923
XII. *VILIS-group*
Onthophagus geelongensis Blackburn, 1892
Onthophagus vilis Harold, 1877
Onthophagus yiryoront Matthews, 1972
XIII. *ADELAIDAE-group*
Onthophagus adelaidae Hope, 1847
Onthophagus dinjerra Storey & Weir, 1990
Onthophagus duboulayi Waterhouse, 1894
Onthophagus godarra Storey & Weir, 1990
Onthophagus haagi Harold, 1867
Onthophagus jubatus Harold, 1869
Onthophagus phoenicocerus Lea, 1923
Onthophagus rupicapra Waterhouse, 1894
Onthophagus vermiculatus Frey, 1970
Onthophagus WA2 (adelaidae gp.)

XIV. *PERPILOSUS-group*
Onthophagus arkoola Storey & Weir, 1990
Onthophagus fletcheri Blackburn, 1903
Onthophagus gangulu Matthews, 1972
Onthophagus incanus Macleay, 1888
Onthophagus perpilosus Macleay, 1871
Onthophagus tamworthi Blackburn, 1903
Onthophagus villosus Macleay, 1888
Onthophagus wakelbura Matthews, 1972
Onthophagus NQ11 (MS *O. penedwardsi*)
XV. *PEXATUS-group*
Onthophagus longipes Paulian, 1937
Onthophagus nammuldi Matthews, 1972
Onthophagus pexatus Harold, 1869
Onthophagus squalidus Lea, 1923
Onthophagus CQ9 (pexatus gp.)
Onthophagus NSW4 (pexatus gp.)
Onthophagus WA5 (pexatus gp.)
XVI. *QUADRIPUSTULATUS-group*
Onthophagus blackburni Shipp, 1895
Onthophagus cruciger Macleay, 1888
Onthophagus evanidus Harold, 1869
Onthophagus fabricii Waterhouse, 1894
Onthophagus kokereka Matthews, 1972
Onthophagus minusculus Macleay, 1888 (still in synonymy with *quadripustulatus*)
*Onthophagus quadripustulat*us (Fabricius, 1775) MOGGILL CREEK CATCHMENT
Onthophagus subocelliger Blackburn, 1903
Onthophagus CQ8 (MS name*O. brisbanica*) MOGGILL CREEK CATCHMENT
Onthophagus CQ10 (MS name *O. krucki*)
Onthophagus NQ3 (quadripustulatus gp)
Onthophagus NT1 (quadripustulatus gp)
Onthophagus SEQ1 (quadripustulatus gp)
Onthophagus SEQ3 (quadripustulatus gp)
Onthophagus TAS1 (quadripustulatus gp)
Onthophagus WA6
XVII. *PROPINQUUS-group*
Onthophagus monteithi Matthews, 1972
Onthophagus propinquus Macleay, 1888
Onthophagus semimetallicus Lea, 1923 MOGGILL CREEK CATCHMENT

Onthophagus wagamen Matthews, 1972
XVIII. *MUTATUS-group*
Onthophagus compositus Lea, 1923
Onthophagus frenchi Blackburn, 1903
Onthophagus jangga Matthews, 1972
Onthophagus mutatus Harold, 1859
Onthophagus sydneyensis Blackburn, 1903
Onthophagus togeman Matthews, 1972
Onthophagus yaran Storey & Weir, 1990
Onthophagus yungaburra Matthews, 1972
Onthophagus CQ4 (MS *O. brigalow* - mutatus gp)
Onthophagus NQ1 (mutatus gp)
Onthophagus NQ6 (mutatus gp.)
Onthophagus NQ10 (MS *O. undara)*
Onthphagus NQ16 (mutatus gp.)
Onthophagus NSW2 (mutatus gp.)
Onthophagus SEQ4 (mutatus gp.)
XIX. *POSTICUS-group*
Onthophagus arrilla Matthews, 1972 MOGGILL CREEK CATCHMENT
Onthophagus incornutus Macleay, 1871 MOGGILL CREEK CATCHMENT
Onthophagus millamilla Matthews, 1972
Onthophagus mulgravei Paulian, 1937
Onthophagus posticus Erichson, 1842
Onthophagus turrbal Matthews, 1972
Onthophagus yackatoon Storey & Weir, 1990
Onthophagus CQ3 (MS *O. wonga* - posticus gp)
Onthophagus CQ6 (MS *O. toopi* - posticus gp)
Onthophagus CQ7 (MS *O. murgon* - posticus gp.)
Onthophagus CQ11 (MS *O.dryander*- posticus gp.)
Onthophagus NQ2 (posticus gp) ? Emmet Ck
Onthophagus NQ12 (MS *O. hughendenensis* -posticus gp.)
Onthophagus NSW3 (posticus gp.)
XX. *RUBESCENS-group*
Onthophagus bindaree Storey & Weir, 1990
Onthophagus bundara Storey & Weir, 1990
Onthophagus kiambram Storey, 1977
Onthophagus koebelei Blackburn, 1903
Onthophagus kora Storey, 1977
Onthophagus manya Matthews, 1972 MOGGILL CREEK CATCHMENT
Onthophagus parrumbal Matthews, 1972
Onthophagus punthari Storey, 1977
Onthophagus rubescens Macleay, 1888
Onthophagus symbioticus (Arrow, 1920)
Onthophagus terrara Storey, 1977
Onthophagus trawalla Storey & Weir, 1990
Onthophagus tuckonie Matthews, 1972 MOGGILL CREEK CATCHMENT
Onthophagus waminda Matthews, 1972
Onthophagus wanappe Storey, 1977
Onthophagus wilgi Matthews, 1972
Onthophagus yarrumba Storey, 1977
Onthophagus NQ9 (rubescens gp.)
Onthophagus NQ13 (MS *O. waiben*- rubescens gp)
*Onthophagus NSW5 (*rubescens *gp)*
Onthophagus WA4 (rubescens gp)
XXI. *ASPER-group*
Onthophagus asper Macleay, 1864
Onthophagus ocelliger Harold, 1877
Onthophagus rubicundulus Macleay, 1871 MOGGILL CREEK CATCHMENT
XXII. *BICARINATICEPS-group*
Onthophagus bicarinaticeps Lea, 1923

Onthophagus dummal Matthews, 1972
Onthophagus gidju Matthews, 1972
Onthophagus lamgalio Matthews, 1972
Onthophagus mije Storey & Weir, 1990
Onthophagus yeyeko Matthews, 1972
XXIII. *PLANICOLLIS-group*
Onthophagus clypealis Lea, 1923
Onthophagus macleayi Blackburn, 1903
Onthophagus planicollis Harold, 1880
Onthophagus yunkara Matthews, 1972
Onthophagus NT2 (planicollis gp.)
XXIV. *UNGROUPED-group*
Onthophagus binyana Storey & Weir, 1990
Onthophagus blackwoodensis Blackburn, 1892
Onthophagus bornemisszai Matthews, 1972 MOGGILL CREEK CATCHMENT
Onthophagus bunamin Matthews, 1972
Onthophagus consentaneus Harold, 1867
Onthophagus flavoapicalis Lea, 1923
Onthophagus gandju Matthews, 1972
Onthophagus granulatus Boheman, 1858 MOGGILL CREEK CATCHMENT
Onthophagus gulmarri Matthews, 1972
Onthophagus pillara Matthews, 1972
Onthophagus rubrimaculatus Macleay, 1864
Onthophagus victoriensis Blackburn, 1903
Onthophagus wombalano Matthews, 1972
Onthophagus NQ14 (ungrouped gp.)

NOMINA INQUIRENDA

Onthophagus crotchi Harold, 1871
Onthophagus granum Lansberge, 1885

NON-NATIVE SPECIES

COPRINI

COPRIS
Copris elphenor Klug, 1855
Copris hispanus Linnaeus, 1764

ONITICELLINI

EUONITICELLUS
Euoniticellus africanus (Harold, 1873)
Euoniticellus fulvus (Goeze, 1777)
Euoniticellus intermedius (Reiche, 1849) MOGGILL CREEK CATCHMENT
Euoniticellus pallipes (Fabricius, 1781)

LIATONGUS
Liatongus militaris (Castelnau, 1840) MOGGILL CREEK CATCHMENT

ONITINI

BUBAS
Bubas bison (Linnaeus, 1767)

ONITIS

Onitis alexis Klug, 1835 MOGGILL CREEK CATCHMENT
Onitis aygulus (Fabricius, 1781)
Onitis caffer Boheman, 1857
Onitis pecuarius Lansberge, 1875
Onitis vanderkelleni Lansberge, 1886
Onitis viridulus Boheman, 1857

ONTHOPHAGINI

ONTHOPHAGUS
Onthophagus binodis Thunberg, 1818
Onthophagus depressus Harold, 1871 (accidental introduction)
Onthophagus gazella (Fabricius, 1787) MOGGILL CREEK CATCHMENT
Onthophagus nigriventris d'Orbigny, 1902
Onthophagus obliquus (Olivier, 1789)
Onthophagus sagittarius (Fabricius, 1781)
Onthophagus taurus (Schreber, 1759)

SISYPHINI

SISYPHUS
Sisyphus rubrus Paschalidis, 1974
Sisyphus spinipes (Thunberg, 1818) MOGGILL CREEK CATCHMENT