

Save the Tasmanian Devil Program Roadkill Project

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1. Executive summary

In 2009 the Save the Tasmanian Devil Program Roadkill Project was implemented, based on a similar pilot project conducted in 2006 and 2007. The official public launch of the project took place in December 2009, although training of volunteers began in November 2009. Prior to 2006, the Save the Tasmanian Devil Program received occasional reports of Tasmanian devil roadkill, primarily from staff members. These reports have subsequently been incorporated into the roadkill database. To date, eight groups of volunteers have been trained to collect information and biological data from roadkill Tasmanian devils; this includes staff from seven Parks and Wildlife Service (PWS) offices and staff from the Cape Grim weather station.

Tasmanian devil roadkill appears to be a State-wide problem; it is assumed that roadkill is an additional threatening process for devil populations already under threat from Devil Facial Tumour Disease (DFTD). Members of the public have been encouraged to report roadkill Tasmanian devils through significant publicity campaigns in the media and in selected locations around the State. A number of options for roadkill reporting have been implemented, including reply-paid forms; email, phone and SMS services; and an online report form. 898 roadkill devils have been reported to the Program since 2001; 342 (38%) of these were reported between December 2009 and July 2010, suggesting that widespread publicity is having an effect on reporting rate. Roadkill reporting shows clear monthly trends, but the factors behind the observed patterns have not yet been clearly identified.

A number of limitations in the types and sources of data currently collected have been identified. These include the unreliability of potentially subjective data coming from untrained individuals, and the potential for geographical bias arising from current data collection methods. This has reduced the amount of data available for analysis at this stage. Measures to improve the robusticity of data collection, including modification of report forms to collect source-appropriate data, and the training of additional volunteers, have been identified and will be

implemented in the next year of the project

II. Introduction

Roadkill has been identified as a threatening process to some Australian fauna populations (Taylor and Goldingay 2010). In 2008 it was suggested that over 3000 Tasmanian devils are killed on the roads each year (Hobday and Minstrell 2008); this could have a significant impact on devil populations already in decline as a result of DFTD.

In 2006, the Save the Tasmanian Devil Program (STDP) implemented a pilot Roadkill Project to determine the extent of Tasmanian devil roadkill on Tasmanian roads. Initially it was intended that PWS staff would be utilised to monitor roads in Park areas; this was not possible, and the project was subsequently changed to involve trained volunteers rather than PWS staff. The pilot project was successful, with 94 and 103 roadkill devils being reported to the project in 2006 and 2007, respectively. At the time, however, the project was not deemed to be an immediate priority for the STDP and was eventually discontinued.

The current Roadkill Project was implemented in August 2009, drawing on experience from the 2006-07 pilot project. Due to changes in department structuring, it was possible for the new project to involve the PWS; funding of the project allowed for training of PWS staff to collect biological data from roadkill devils and provision of equipment for the collection of biological material and Personal Protective Equipment. Trained volunteers were also expected to provide a reliable source of roadkill reports. The project was officially launched in December 2009, with a significant publicity and awareness campaign and a number of ways for members of the public to report roadkill devils. 342 roadkill devils were reported between December 2009 and July 2010.

This report summarises the findings of the first year of the Save the Tasmanian Devil Roadkill Project, with conclusions and suggestions for the future of the project.

3. Aim

As stated in the Business Plan for the Save the Tasmanian Devil Program Roadkill Project (2010) the aims of the project are as follows:

- To use passive management techniques to monitor the impact of roadkill on Tasmanian devil populations across the State and provide additional information to other Save the Tasmanian Devil Program teams;
- To collect data to assist in making informed management decisions in relation to:
 - Additional passive monitoring to long term monitoring sites;
 - Provide additional monitoring to the Orphan Release Project
 - Inform the Disease Suppression Project of additional non-DFTD impacts to the local population
 - Inform of disease progression across the State
 - Inform the STDP of any interesting changes in the age structure of diseased populations
 - Inform the STDP of any potential pockets of disease-free populations within the diseased area of the State
 - Data analysis to inform the STDP of potential hotspots and potential impacts to the Tasmanian devil population;
- To develop key messages to educate the community of the potential impacts of Roadkill to the Tasmanian devil population; and
- To establish reporting systems and procedures.

4. Methods

4.1 Public reporting

The majority of the data collected by the Save the

Tasmanian Devil Roadkill Project comes from members of the general public. Since December 2009 the project has been widely publicised and the number of methods of reporting roadkill has been increased. Information currently requested of members of the public includes:

- Date and location of the roadkill sighting
- The approximate age of the devil (juvenile, sub-adult, adult)
- The general condition of the devil (good, poor)
- The gender of the devil
- Whether the devil appeared to have DFTD

Not all reports include information on all of these details.

Reply-paid forms: Since the launch of the Roadkill Project in December 2009, 9260 reply-paid roadkill forms have been distributed to nearly 80 businesses or agencies, including PWS visitor centres, Service Tasmania outlets, regional visitor information centres, car rental agencies and tourism ventures. These forms collect basic information on roadkill devils, but do not include certain details (for example, whether the observer got out of the car or checked inside the devil's mouth; pouch appearance; signs of injuries or scars).

Online form: The STDP website and the DPIPWE website each provide links to an online roadkill reporting form. The information collected on these forms is the same as that from the reply-paid forms; however, online reporting allows direct attachment of photographs of the devil.

SMS / MMS service: Members of the public can send details and photographs of roadkill devils directly to a mobile phone. The number is provided on Roadkill Project publicity materials as well as on reply-paid forms, allowing observers to send photos of devils for which they send the details on reply-paid forms.

Phone / Email services: Roadkill can be reported on the STDP phone number or via email.

4.2 Trained volunteers

Since November 2009, the Roadkill Project team has trained PWS staff from seven field centres across Tasmania (Stanley, Ulverstone, Strahan, Queenstown, Lake St Clair, Freycinet and Mt William), as well as volunteers from the weather station at Cape Grim in the north-west, in the collection of biological data from roadkill Tasmanian devils. Data collected may include ear biopsies, measurements of tooth wear and growth for accurate ageing, and assessments of pouch condition. In addition, staff members are trained to identify early, middle and late stages of DFTD. Written information is emailed or sent to the project; biological samples are stored at the centre until delivery or collection is possible.

Roadkill Kit: A roadkill kit comprising a microchip scanner, all equipment needed for collection of biological data, personal safety and biosecurity equipment, data sheets and a training manual was provided to each office at the time of training. The majority of the contents of the roadkill kits came from existing STDP supplies; the estimated cost of the remaining equipment is approximately \$350 per kit. Eight kits have been distributed so far. Feedback from PWS staff has indicated that the current size of the kits is a drawback, given lack of space in PWS vehicles. This issue will be investigated and the kits altered accordingly.

4.3 Collation of data

Information on roadkill Tasmanian devils provided to the project is entered into the Roadkill and Public Reporting section of the Natural Values Atlas database along with information regarding sightings of live devils and reported incidents including public trapping events and dog attacks. Devils in which a microchip has been detected are entered under their existing microchip number. Each record is assigned a reporter type code (devil biologist; other biologist or vet; trained volunteer; general public), allowing data to be ranked according to the knowledge and experience of the observer.

5. Results

5.1 Roadkill numbers

Since February 2001, 898 roadkill Tasmanian devils have been reported with the corresponding data entered into the Natural Values Atlas. Of 342 roadkill devils reported to the project between December 2009 and July 2010, 61 (17.8%) were known to have been reported more than once, either by a single individual using multiple reporting methods, or by different observers. Where possible, these replicates have been identified and entered onto the database only once, although it is likely that not all replicates are detected (see Section 6). Figure 1 shows the number of roadkill Tasmanian devils reported to the Program each year since 2001.

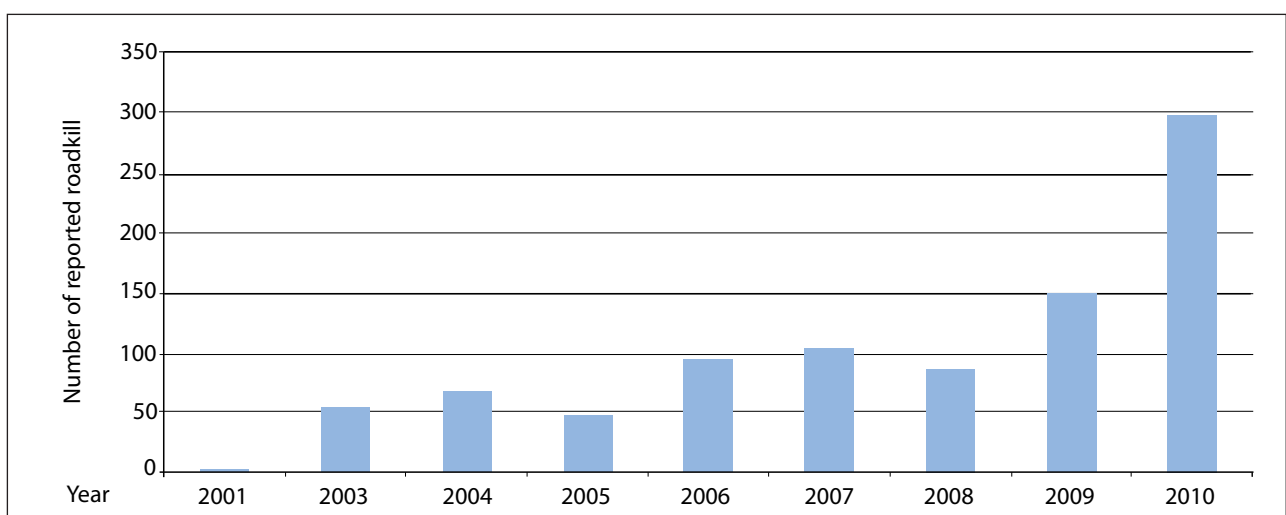


Figure 1. Number of reported roadkill Tasmanian devils by year. 2010 data include January to July only, as only these data were available at the time of writing.

5.2 Reporting methods

Of the 898 reports of roadkill devils received by the STDP between February 2001 and June 2010, 770 (85.7%) were received from members of the public. Tasmanian devil wildlife biologists (including current and past field- and captive-based members of the STDP) contributed 71 (7.9%) reports, while trained volunteers including PWS staff and members of the public trained during the 2006 roadkill project submitted 37 (4.1%) reports. The remaining 20 (2.2%) reports were received from other (non-STDP) biologists and veterinarians.

Table 1 shows the methods available for members of the public to report roadkill Tasmanian devils with

the number of reports received between 1 December 2009 and 30 June 2010. Note the number of reports is not the same as the number of individual devils, as replicates have not been removed from these data.

5.3 Temporal variation

The number of roadkill Tasmanian devils being reported to the STDP exhibits a clear monthly trend when all years (2001-2010) are combined (Figure 2a) and when the incomplete 2010 data are excluded (Figure 2b). This trend can be seen for male and female roadkill taken separately as well as with the sexes combined (Figure 3).

| Report type | Number of reports | Percentage of reports |
|----------------------------|-------------------|-----------------------|
| Online reporting form | 67 | 16.6 |
| Reply-paid forms | 111 | 27.5 |
| After hours calls | 74 | 18.4 |
| SMS | 43 | 10.7 |
| 6233 2006 (STDP telephone) | 58 | 14.4 |
| Email | 23 | 5.7 |
| PWS | 13 | 3.2 |
| Other | 14 | 3.5 |
| Total | 403 | 100 |

Table 1. Breakdown of numbers of Tasmanian devil roadkill reports by available reporting type between 1 December 2009 and 30 June 2010

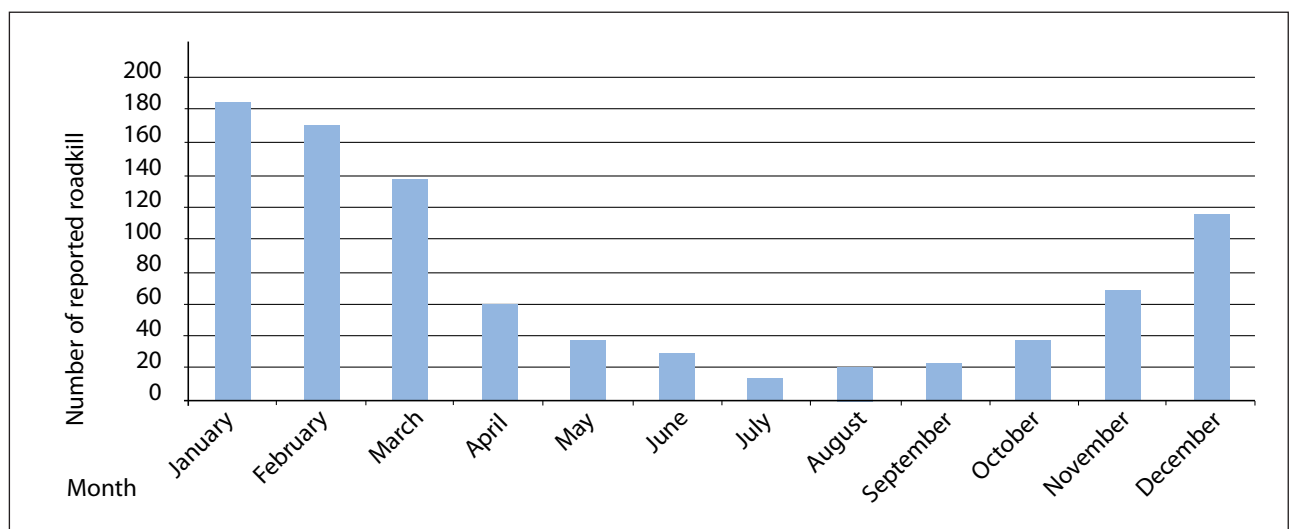


Figure 2a. Number of reported roadkill Tasmanian devils by month: 2001-2010 data (2010 data include Jan-June only).

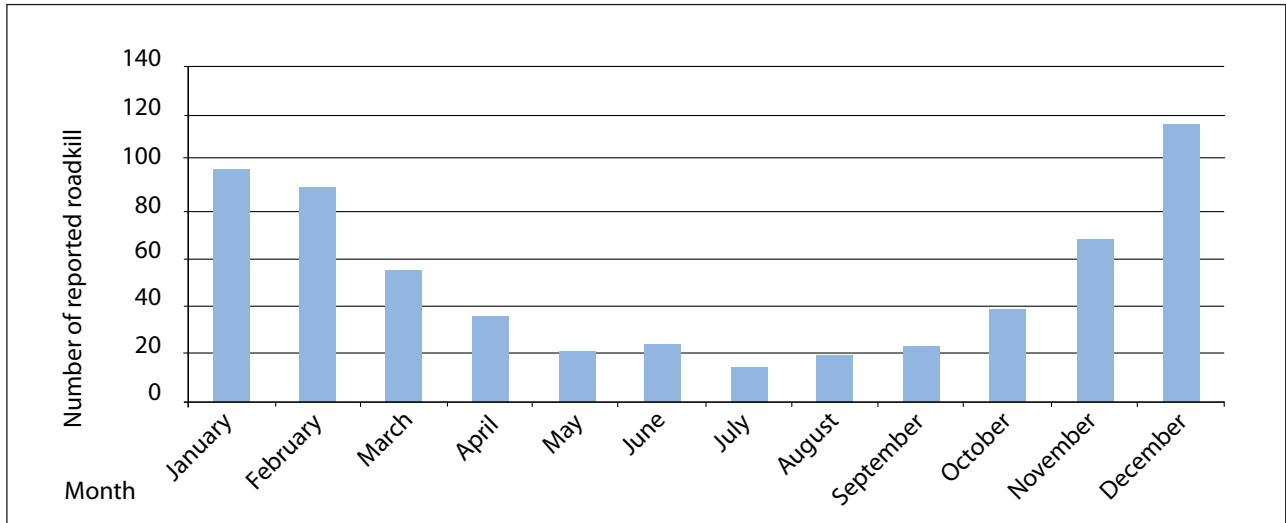


Figure 2b. Number of reported roadkilled Tasmanian devils by month: 2001-2009 data.

5.4 Gender

Gender was recorded for 437 (49%) Tasmanian devil roadkill reports entered into the Natural Values Atlas database. Of these, 266 (60.9%) were male and 171 female. There was no clear monthly variation in the gender ratio (Figure 4). The relatively high proportion

of females in July is likely to be an artefact of the small sample size (six devils of known gender) rather than a true representation of gender ratio; collection of further data, and comparison to known population data, will be necessary to test this.

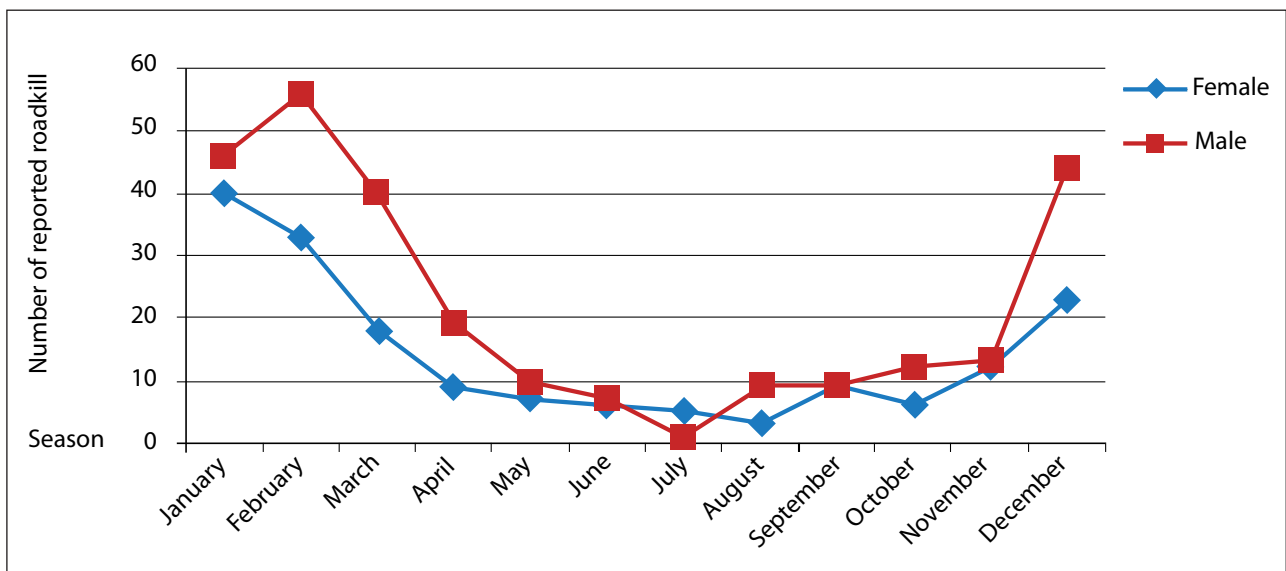


Figure 3. Number of reported roadkilled Tasmanian devils by month, separated by reported gender. Sample sizes here are lower than shown in Figure 2 as not all reports record gender.

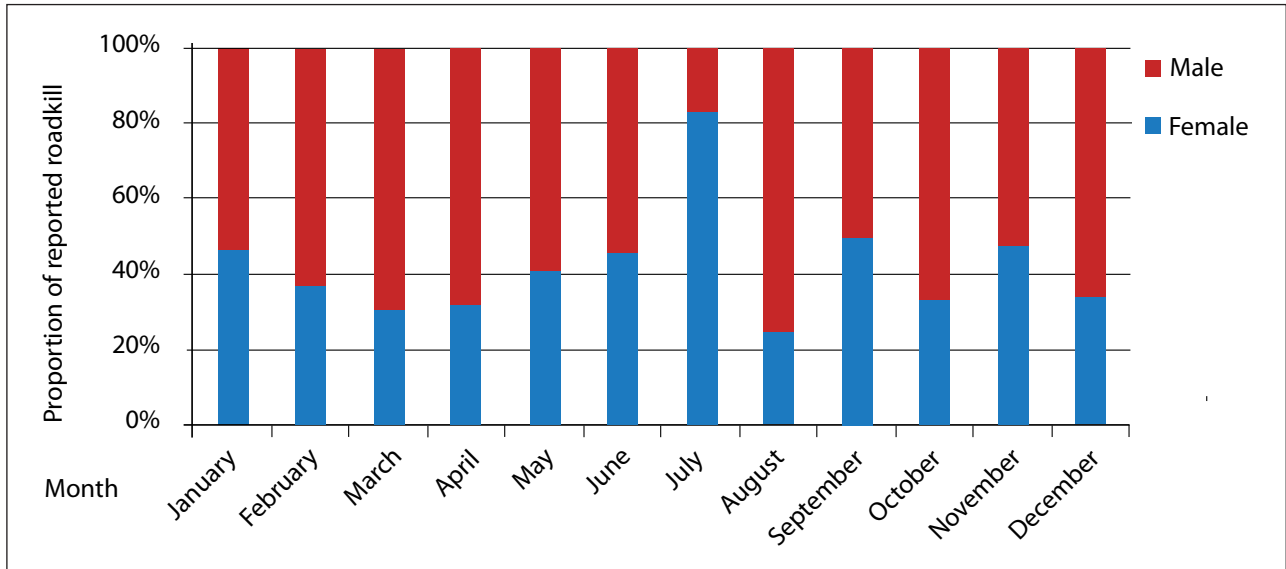


Figure 4. Proportion of reported male and female roadkill Tasmanian devils by month. Reports with no gender recorded were excluded from the data.

5.5 Age

612 of the 898 roadkill reports entered into the Natural Values Atlas were assigned to age classes by the observer. Figure 5a shows the total number of reported roadkill devils in the three defined age classes (juvenile, sub-adult, adult). There is evidence that juveniles are more likely to be killed on the road in summer than

adults or sub-adults (Figure 5b); this corresponds with the peak time of dispersal of juveniles, but may also simply reflect other factors, such as increased road traffic in summer. This may be investigated further using additional and more reliable age data, or by comparing roadkill rates with traffic data.

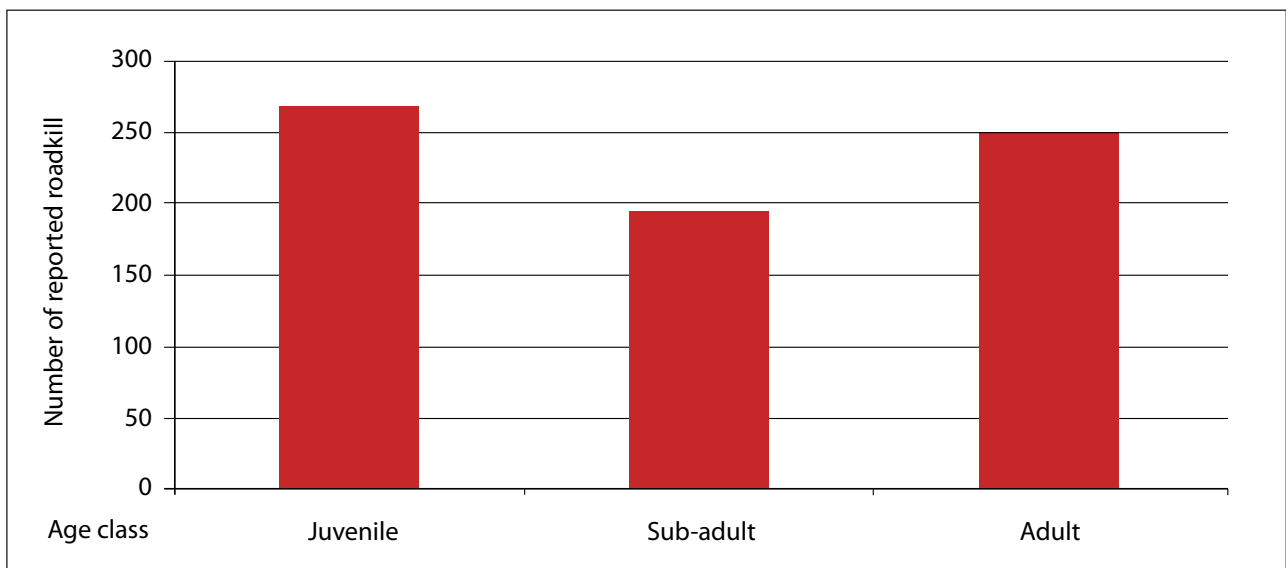


Figure 5a. Number of reported roadkill Tasmanian devils by reported age class: total numbers.

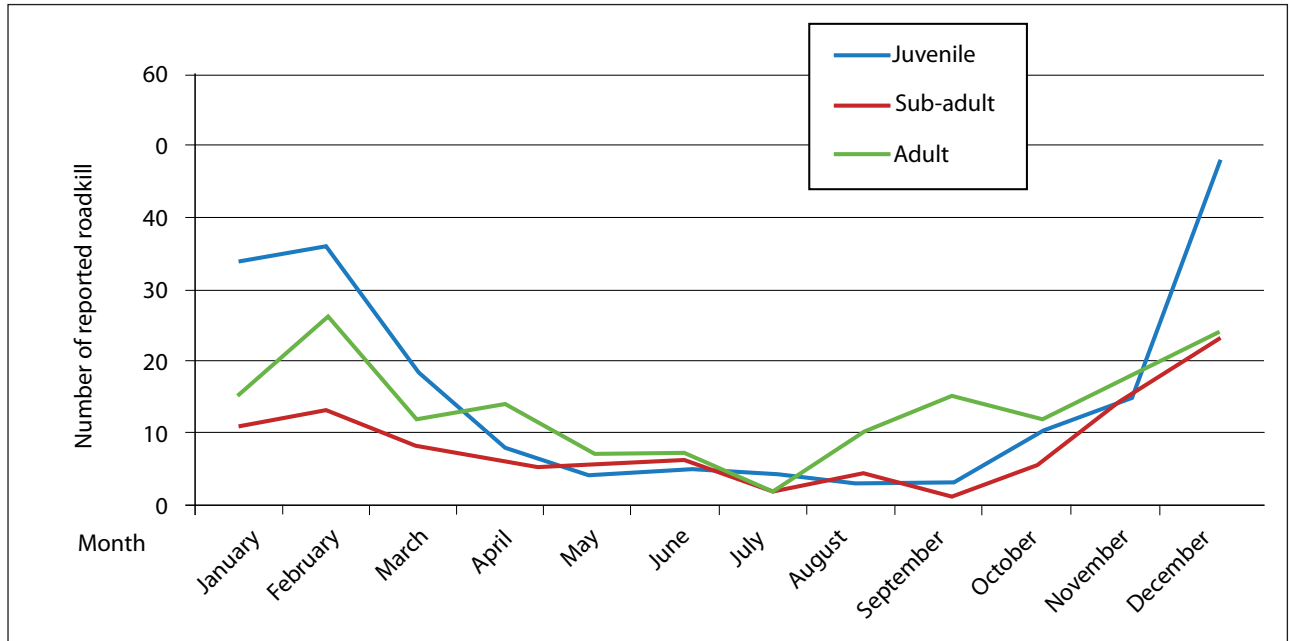


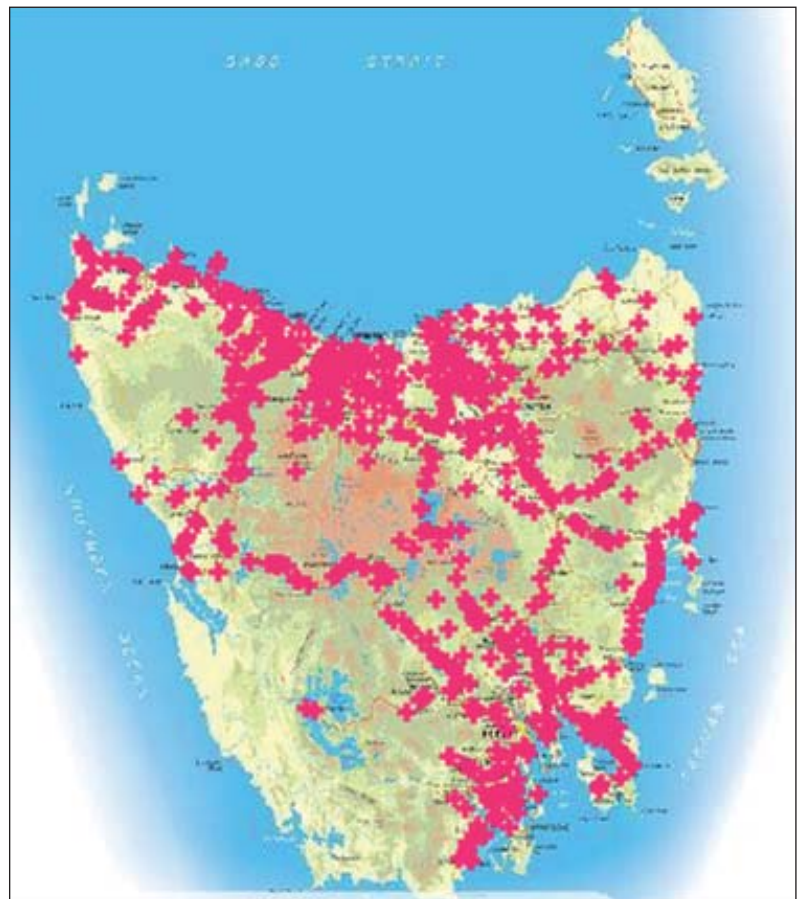
Figure 5b. Number of reported roadkill Tasmanian devils by reported age class: numbers by month.

5.6 Distribution of roadkill

Analysis of Tasmanian devil roadkill hotspots around the State has not yet been undertaken. In its current form, fine-scale analysis would not be possible given the poor location accuracy (up to a 10 km radius in some cases) of many roadkill reports. Visual analysis of Figure 6 suggests high roadkill density along the Murchison Highway in the north-west, and on the Forestier Peninsula in the south-east; these are both areas which are known to be frequented by individuals who are keen roadkill reporters and thus roadkill devils in these areas may be more likely to be reported than in other areas.

Breakdown of roadkill numbers by region is pending and will be reported to relevant Parks and Wildlife Service offices in subsequent reports.

Figure 6. Location of reported roadkill Tasmanian devils between 2001 and 2010.



5.7 Speed limits

Road speed limits were given on 100 roadkill reports. Of these, 91 devils were killed on stretches of road with speed limits of or greater than 80km h⁻¹.

5.8 Known devils

Since 2001, 33 microchipped devils have been reported as roadkill. This figure does not take into account devils that were not scanned but were found in areas that had previously been trapped.

6. Discussion

Since the first reported roadkill devil in 2001—and particularly since the launch of the new Roadkill Project in December 2009—the Save the Tasmanian Devil Program Roadkill Project has collated details of nearly 900 roadkill Tasmanian devils. The Roadkill Project has shown that devil roadkill is widespread across the State, with devils being killed virtually anywhere there are roads.

Public reporting accounts for approximately 86% of devil roadkill reports entered into the Natural Values Atlas database. This is a vital source of roadkill reports, as it allows for state-wide coverage with little resource input; however, there are inherent limitations in using information from untrained and inconsistent sources. These limitations should be addressed before the objectives of the Roadkill Project can be fully met.

6.1 Patterns in roadkill numbers

The number of roadkill Tasmanian devils reported to the project showed a clear temporal trend, with numbers peaking in summer and relatively low in winter. A number of factors may be implicated in the observed monthly patterns of roadkill reporting. These factors include behavioural (population trends, behaviour, dispersal), environmental (rainfall, food availability) as well as anthropogenic (traffic frequency, driver behaviour, likelihood of roadkill detection and reporting). Identification of temporal patterns in roadkill density, along with spatial distribution, is one of the most important aspects of the Roadkill Project at this time. Recommendations for roadkill

mitigation will be reliant on determining which, if any, of the above factors are driving the observed patterns; this will require changes in the way in which data are collected for the project or, preferably, targeted studies into some of the more likely factors as identified through existing roadkill literature or knowledge of Tasmanian devil biology and behaviour. While other information collected by the project (devil age and gender) will be of high importance for analysis of the temporal data in the future, currently the available age and gender data are of insufficient quality to be fully useful.

Of the 100 roadkill reports in which speed limit was provided, 91 involved stretches of road with speed limits greater than 80km h⁻¹. This suggests that higher speeds may be a factor in Tasmanian devil roadkill rates, as seen in other Tasmanian roadkill studies (Jones 2000; Hobday and Minstrell 2008), but does not take into account the relative prevalence or frequency of travel on roads with different speed limits. The mean night-time detection distance for Tasmanian devils, from a car with headlights on high beam, is 60.8m; this corresponds to a maximum speed of 54km h⁻¹ at which a driver could stop safely to prevent collision with a devil (Hobday 2010). This information, in conjunction with increased knowledge of times and locations of high devil roadkill prevalence, may contribute to informed roadkill mitigation measures.

6.2 Specific limitations of the Roadkill Project

Non-reporting: It is highly likely that not all roadkill Tasmanian devils are reported to the Program, for a range of reasons. These include the devil dying out of sight of passing vehicles, major road trauma making the devil unrecognisable, and the possibility that the devil is observed but simply not reported. Parks and Wildlife Service staff members have indicated that they do not stop and check all devils they come across if the devil is in an area where stopping may be dangerous, if time is limited, or if the carcass is old or very misshapen. These are valid concerns, but it is important that basic information (date and location) of all devils that trained volunteers encounter are reported to the project even if other procedures are not undertaken.

Location accuracy: Observers are asked to provide a detailed description of the location of the roadkill devil they are reporting. Many reports are too vague to allow accurate representation of roadkill locations, making fine-scale determination of roadkill hotspots impossible. Consequently, identifying physical factors that influence roadkill density is not yet achievable at this stage.

Bias: The risk of reporting bias is considerably higher in a study using public, anecdotal information than in a controlled or planned study. Our knowledge of a roadkill devil is dependent on the devil being seen by an individual who is both aware of the project and motivated and able to report their sighting. It is clear that there are certain individuals, usually travelling regularly within a limited area, who are particularly conscientious in reporting every roadkill Tasmanian devil they find; it can therefore be assumed that in these areas most roadkills are reported, particularly when more than one such individual works in the area. This assumption cannot be made for other areas, and may potentially lead to the identification of false roadkill hotspots when the data are collated.

Heavy publicity of the project and an increase in the number of reporting methods appears to have significantly increased the number of individuals reporting Tasmanian devil roadkill. This is likely to increase the chance of a roadkill devil being spotted and reported, thus reducing the disparity between reporting effort in different areas of the State; conversely, greater use of trained volunteers in key areas may increase the risk of bias.

Report replication: Since the implementation of public campaigns for roadkill reporting, a number of replicate reports have been detected. An increase in the number of individuals motivated to report a roadkill devil increases the devil being reported by more than one person if it remains visible on the road or roadside verge. Identification of replicates is largely dependent on the consistency in the date and location of the reports. In most cases it has been possible to identify replicate reports either at the time of reporting or when the reports are entered into the Natural Values Atlas database. In other instances, however, it has not been possible to confirm whether two similar reports refer to the same or different devils. This is made particularly

difficult where the locations provided on the forms are vague, or when observations are some days apart.

Non-detection of replicates, or the wrongful identification of replicates, is currently considered a significant limitation in this project. Consequently, improvements are being considered, including inquiring whether the observer removed the devil out of sight; the development of a decomposition scoring system to be added to public and volunteer data sheets; and the development of a protocol for assessing potential replicates based on temporal and geographic parameters. When developed, the latter may be used retrospectively to exclude replicates from existing roadkill data.

Data quality: Assessment of the impacts of roadkill on local devil populations is not possible without large numbers of reliable data on roadkill age and gender structure, as well as knowledge of the local population structure and movements. Collection of information about the age and gender of a roadkill devil is dependent on the reporter having physically checked the devil; early data sheets, which ask whether the observer got out of the car, indicate that often this does not occur. Legal implications restrict the ability of Roadkill Project material to request or recommend that observers check or remove the devil from the road. Consultation with the Department of Infrastructure, Energy and Resources regarding the legality of working on roadsides and the involvement of the public has been planned, and the results of this consultation may affect the type of data collected from members of the public.

Members of the public are given brief descriptions of devils in each age class and condition class. These descriptions are necessarily simplified, and consequently it would be very easy for a person with limited or no experience of devils to assign a roadkill devil to an incorrect age class, particularly if the carcass is in poor condition. Therefore, while in many cases the age is not reported, where it is reported it cannot be assumed that the information is necessarily correct. Such data from the public should be used as general information only. Increasing the number of volunteers trained in accurately ascribing age to devils will be vital for the collection of valid data, if this is considered a necessary part of the Roadkill Project.

6.3 Outcomes relative to objectives

To look for DFTD in non-DFTD areas: Although members of the public are asked whether or not a roadkill devil appears to be diseased, it is unlikely that an untrained individual could accurately identify early-stage tumours, particularly in devils exhibiting the effects of road trauma. In its current form, the Roadkill Project is therefore not a reliable source of information on disease distribution unless a clearly diseased animal is found and reported from an area previously thought to be DFTD-free. Increased use of trained volunteers in key areas such as the disease front may greatly improve the usefulness of the project in this function. This has already begun, with training of staff from the Cape Grim weather station near Woolnorth in the far north-west of the State. Other potential volunteers around the disease-front area have been identified.

To identify hotspots and what impacts that is having on local devil populations: The identification of roadkill hotspots is dependent on reliable, unbiased recording and clear descriptions of roadkill locations. Ideally, all roadkill devils would be reported by a single person, however this is clearly not possible in a study of this nature.

To conduct passive monitoring (an additional tool) of long-term monitoring and orphan release sites: Roadkill devils have been reported in areas of low devil density (e.g. the Mt William area), suggesting that the project may be a useful tool for passive monitoring of devil presence in such areas. So far, 33 microchipped devils have been identified as roadkill. Passive monitoring of previously trapped sites would be more effective with an increase in trained volunteers equipped with microchip scanners. Data sheets for observers equipped with microchip scanners will be modified to include a field asking whether the devil was scanned.

To provide a functional reporting service to interested stakeholders: The project sends regular email updates to stakeholders including Parks and Wildlife Service (PSW) field centres involved in the Roadkill Project. These updates include information on what has been happening within the project. Reports specific to PWS regions, including updates of regional roadkill numbers, are likely to be produced in the future.

7. Conclusions and operational recommendations

In total, 898 Tasmanian devils have been reported as roadkill since 2001, with around 300 of these reported since the official launch of the Project in December 2009. In this time, it has been found that:

- The Roadkill Project has so far been effective in determining the geographical scale of devil roadkill across the State;
- Currently data quality is insufficient for analysis of roadkill hotspots or factors influencing roadkill density.


Potential measures to increase the usefulness and scope of the Roadkill Project have been identified, including:

- Consultation with DIER regarding legality of working on roadsides and what we can ask the public to do;
- Investigation into existing roadkill collection, and ways of incorporating contractors into the project;
- Determination of key stakeholders in the project;
- Re-training of staff in PWS offices following staff movements, and identification and training of further volunteers;
- Development of a protocol for assessing possible replicate reports and corresponding alterations to public and volunteer data sheets;
- Collection of information on other roadkill within the vicinity of roadkill devils.

Feedback from trained PWS volunteers regarding their training and involvement has generally been positive, although some issues have been raised which will be investigated and addressed in the next year of the project. These include:

- The inability of staff to stop and process all devils sighted;
- The size of the kits;
- Some offices did not receive the regular updates put out by the project.

In all cases training and the provision of equipment was deemed to be adequate. Feedback from PWS staff



will be taken into account when further volunteers are trained for the project.

It is recommended that the results from the first year of this project be reported to members of the public before or during the onset of the next roadkill campaign. This will serve to increase the public “ownership” of, and interest in, the campaign through showing the importance of public reporting, the scale of devil roadkill, and our appreciation of public efforts.

While no formal recommendations can be made from the existing data regarding potentially expensive roadkill mitigation measures, the next roadkill campaign should focus on the extent of devil roadkill, and how much of a threat roadkill is to devils, given devil declines through DFTD in some areas. With our current data we are in a good position to do this, and to get a clear message to the public about the need to slow down and minimise devil roadkill.

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