

Appendix 7

Spotlight Survey Protocol

1. Background

A system of standardised, vehicle-based spotlight surveys have been used since 1975 to monitor state wide, as well as regional trends in the relative abundance of a number of the more common species of nocturnal, medium-sized Tasmanian mammals. These include more abundant species such as the Tasmanian pademelon, Bennett's wallaby and brushtail possum for which the survey results are used in setting harvest quotas, as well as less frequently recorded species including the wombat, Tasmanian devil and eastern quoll.

It has been shown (Driessen and Hocking 1992) that the current spotlight survey program involving 132 standard routes, each of 10 km length, is sufficiently sensitive or precise to permit changes in abundance of approximately 20% to be detected in Tasmanian pademelon, Bennett's wallaby and brushtail possum populations. In areas of more uniform habitat, 20 routes of 10 km each will allow changes of approximately 30% to be detected. Less frequently observed species require more sampling effort.

Strict standardisation of the spotlight survey procedure is the key to maintaining the precision, and hence sensitivity, of the method in detecting changes in relative abundance. Surveys should be standardised with respect to such variables as: the length and location of routes, time of year, time of night, speed of observer, spotlight type, weather/environmental conditions, skill level of the observer and the distance over which animals can be observed.

The precision and sensitivity of the method can be improved by surveying each route on 2 or more occasions, thereby reducing the effect of between night variation in counts. This procedure is followed for monitoring wallabies on King and Flinders Islands.

Line Transect Surveys

Commencing in 2002, the system of standardised spotlight surveys has been modified by incorporating line transect sampling, a form of distance sampling, in order to provide an estimate of population density around the existing transect lines that would be an improvement on the pre-existing method. Importantly, line transect counts are expected to improve precision and assist in reducing the effect of observer variation and seasonal differences in the observability of the animals.

Line transect sampling involves an observer moving along a transect line; in this case the survey route, recording perpendicular distances to detected objects. Objects away from the line will often go undetected, but those on or near the line are assumed to be seen with certainty. The sample of detection distances allows a detection function to be modelled and the proportion of objects detected in a strip transect (=detection probability) to be estimated. An estimate of density can then be calculated.

The line transect is the sample unit, which can analysed as for simple random sampling and sampling can be stratified. In practice, at least 60 sightings are usually required to adequately model the detection function. Exact perpendicular distances to detected objects may be recorded or, as in the present survey, sightings may be placed in distance classes away from the observer- 0-5m, 5-10m, 10-20m, 20-40m, 40-60m, 60+ metres.

The technique still doesn't overcome the potential problem of bias from road-based surveys. It is important to note that data are still collected in a way that is compatible with historical data so long-term trends can be monitored.

2. The Survey Method

Spotlight surveys are done at night from a vehicle travelling at approximately 20 km/h along a series of standard road routes. Each route is divided into 2, 5 km sections. Sightings of all non-domestic animals observed both on the road and off the road are recorded along with an estimate of the distance class (0-5m, 5-10m, 10-20m, 20-40m, 40-60m, 60+ metres) of the animal from the road.

Type of Vehicle

Some vehicles are better suited to spotlighting than others. Only vehicles in which a seated observer's head is approximately 1.6 m above ground level should be used.

Type of Spotlight

It is important that the same type of spotlight is used by all observers as differences in the strength of the beam can result in different numbers of animals being counted. A *Watco*, 100W, 12V sealed beam spotlight is the standard spotlight used on the current surveys.

Recording Sheets

An example of a spotlight survey data sheet is attached. One sheet is completed for each route surveyed.

Observers

Only one person should spotlight and count animals and that person must be the driver. Assistants may be used to record information but should not assist in counting animals as this will lead to inflated counts.

All new observers should be trained by experienced observers. This training should consist of several nights in which the trainee accompanies the experienced observer followed by several nights in which the trainee conducts the surveys under supervision. The trainee must be confident of identifying all potentially recordable species. Training should include identification of species using eye-shine and movement characteristics.

Observers will vary in their ability to count animals on spotlight surveys. In order to reduce the effect of this variability, routes should be surveyed by the same observer where possible.

Use of Spotlight

Spotlighting is always undertaken by the driver. The spotlight is held in the right hand and the beam is continuously swung in a 180° arc in front of the driver. Spotlighting should mainly be directed at ground level. Do not spotlight on houses.

Speed of Surveying

Vehicle speed has a marked effect on the number of animals observed. A speed of 20 km/h has been found to be optimum in terms of safety and number of animals seen. In areas where animals are numerous it may be necessary to stop and count.

Time of night

Animals vary their activity during the course of a night. For example many Tasmanian mammals come out to feed for a short period after dusk, then retreat to their nests and then come out again later. It is therefore important that the starting time for a particular route be standardised. In order to achieve this, spotlight surveys must start approximately 40 minutes after sunset and routes done on the same night must be done in the same order. On cloudy nights it may be possible to start up to ten minutes earlier.

Time of year

It is of vital importance that spotlight surveys be conducted over as short a time as possible to avoid natural changes in composition of animal populations due to recruitment and mortality. For this reason, replicate surveys of individual routes should be completed within a 2-month period.

Unfavourable Weather Conditions

Certain weather conditions, such as high winds, heavy rains and fog, are known to bias survey counts. It is therefore necessary to avoid these conditions. This may involve a temporary halt to the survey until conditions improve or even abandoning surveys for the night. It is strongly recommended that a reliable weather forecast be obtained before setting out.

Recording Weather and Moon Phase

The moon phase and predominant weather conditions experienced during the course of a survey must be recorded at the completion of each route.

Wind

Wind speed should be estimated based on the scale below. Surveys should not be conducted during moderate (3), strong winds (4) or gales (5).

Wind Index	Description
0	No Wind (smoke rises vertically)
1	Breeze (wind just detectable on hand or face)
2	Light Wind (small branches moving)
3*	Moderate Wind (major branches moving)
4*	Strong Wind (small trees swaying)
5*	Gale (large trees swaying)

* surveys should not be conducted during these conditions

Rain

Rain should be recorded based on the scale given below. Surveys should only be conducted under conditions of no rain or at most very light rain. Occasional periods of light rain are acceptable.

Rain Index	Description
0	No Rain
1	Very Light Rain (intermittent windscreen wipers required)
2*	Light Rain (slow speed windscreen wipers required)
3*	Moderate Rain (slow speed windscreen wipers required)
4*	Heavy Rain (fast speed windscreen wipers required)
5*	Torrential Downpour

* surveys should not be conducted during these conditions

Temperature

Temperature (°C) should be recorded using a thermometer.

Moon Phase

The phase of the moon should be recorded based on the scale given below. If the moon phase is known, but obscured by cloud, it should still be recorded.

Moon Phase	Description
0	new moon
1	quarter moon
2	half moon
3	three quarter moon
4	full moon
5	moon phase not known or moon not risen

Cloud Cover

Percentage cloud cover is estimated to the nearest 10%.

Fog and Misty Rain

Surveys should not be conducted when routes are covered by fog or misty rain.

Traffic Volume

Volume of traffic on a route can influence the activity of animals on the roadside Provision has now been made on the spotlight survey sheets to record the number of vehicles passed during the course of a survey. In addition a high traffic volume may require that a route be discontinued for safety reasons.