

Annual Statewide Spotlight Surveys Tasmania 2020/2021

Regional Summary: Priority Harvested Species



May 2021

Cite as:

DPIPWE (2021). Annual Statewide Spotlight Surveys, Tasmania 2020/2021. Nature Conservation Report 21/2

ISSN: 1838-7403

Summary

The Department of Primary Industries, Parks, Water and Environment has been carrying out annual nocturnal spotlight surveys in Tasmania since 1975. The surveys were originally designed to monitor the harvested populations of Bennett's wallabies, Tasmanian pademelons and brushtail possums, however all observations of wild native and non-native mammal species are recorded.

Surveys are conducted by vehicle across five management regions on mainland Tasmania and also on King and Flinders Islands. Each survey route follows an existing road and is 10 km long. The results of these surveys provide a long-term time-series of data for detecting population trends.

This report summarises the survey results for the three main target species, the Bennett's wallaby, Tasmanian pademelon and the brushtail possum from the 2020 surveys. Encounter rates are also provided for a range of other species.

Table of Contents

SUMMARY	1
OVERVIEW	3
PRIORITY SPECIES	4
BRUSHTAIL POSSUM	5
BENNETT’S WALLABY	8
TASMANIAN PADEMELON	11
NON-HARVESTED SPECIES	14
APPENDIX 1: Statewide average densities	17
APPENDIX 2: Raw counts of significant other species	19
APPENDIX 3: Management regions and survey routes	21

Overview

The Department of Primary Industries, Parks, Water and Environment have been carrying out annual nocturnal spotlight surveys in Tasmania since 1975. The surveys were established to monitor the harvested populations of Bennett's wallabies, Tasmanian pademelons and brushtail possums, however all observations of wild native and non-native mammal species are recorded (see Appendix 1 for summary).

Surveys are undertaken across five management regions on mainland Tasmania and also on King and Flinders Islands. The results of these surveys provide a long-term time-series of data for detecting population trends. Surveys were originally undertaken along fifty-one survey routes, however following a review by Southwell (1985), the number of survey routes was increased to 132 and the methodology standardised for all surveys. Further survey routes were added between 1985 and 1990, resulting in 150 transects surveyed annually since 1990.

In 2002 a change in methodology was made whereby the distance an animal was sighted from the survey route was noted, allowing the calculation of density indexes for the three most abundant species. Further surveys were also added in 2002. In 2006, the system was further changed to record the age class (immature, juvenile, adult) and exact location of particular species including the eastern quoll and Tasmanian devil.

As of 2009, there have been 190 survey routes spread across Tasmania: 172 on mainland Tasmania, 8 on Flinders Island and 10 on King Island. Appendix 2 gives an overview of the establishment of new survey routes since surveys began.

Each survey route follows an existing road and is 10 km long. Surveys are conducted by vehicle at a steady speed of 20 km/h, with the driver operating a hand-held spotlight. The driver relays their observations to a passenger for recording. The distance of each animal from the roadside is estimated, allowing a detection function to be modelled, and an estimate of species density is produced. Population trends are analysed on a regional basis. Due to the inherent biases of surveying from roads, this estimate is intended as an index of density to monitor population trends. It is used to provide an indication of changes in relative abundance but should not be used for calculating estimates of population size. A more detailed description of survey methodology can be found in the *Tasmanian Spotlight Survey Manual*.

This report summarises the survey results for the three abundant harvested species, the Bennett's wallaby, Tasmanian pademelon and the brushtail possum from the 2020 surveys. Population trends are also shown since distance sampling methodology was first used in 2002.

2020 Surveys

The 2020 surveys were carried out by a number of staff from the Natural and Cultural Heritage Division, DPIPWE, primarily between late November 2020 and early January 2021. Surveys on King and Flinders islands were conducted in March. Data analysis and report writing was undertaken by staff from Wildlife Management, Natural and Cultural Heritage Division.

Climatic conditions leading up to the survey period were variable across the state, particularly during spring. Mean temperatures were warmer than average across Tasmania from September to November with November being 'very much above average' for both minimum and maximum temperatures (BOM 2021). October and December were very wet in the east with average or above average rainfall elsewhere. However, November was the 9th driest on record for the

state, resulting in a drier than average spring for the west and south, and close to average seasonal rainfall for the east. These combined environmental conditions resulted in extensive grass growth, particularly along roadside verges which consequently lowered observation rates and detectability of animals.

Priority Species

In accordance with methods established by Dr Tony Pople, DPIPWE, has reviewed the 2020 spotlight survey data for Tasmania and calculated Density Index estimates in the five mainland management regions and Flinders Island for the three abundant harvested species: the Bennett’s wallaby; Tasmanian pademelon; and the brushtail possum. Statewide (mainland) average density estimates are provided for each of these species in Appendix 1

Counts of other mammal species observed during the surveys are given in Appendix 2.

Regional Surveys

Table 1 gives details of the number of surveys carried out in each region during 2020 and the numbers of animals sighted.

Table 1: Number of survey routes undertaken and mammals sighted 2020

Region	Survey Routes	Brushtail Possum	Bennett’s Wallaby	Tasmanian Pademelon	Other Native	Non- Native
Central	27	261	321	113	89	567
Flinders Island	8	35	682	137	111	3
King Island	10	122	446	30	0	6
North East	59	154	262	704	70	105
North West	30	62	124	489	55	11
South East	44	308	424	430	82	102
South West	12	33	28	189	13	0
Total	190	975	2287	2092	420	794

Brushtail Possums

A summary of 2020 regional density indexes for the brushtail possum is given in Table 2. The density indexes from 2011 to 2020 are given in Table 3 and Figure 1 depicts the density index for the period 2002 to 2020.

The results for density estimates for brushtail possum for 2020 surveys were essentially stable in the Central, South East and South West when compared with recent years. Results were slightly up for the North East and slightly down for Flinders Island but the long-term trend for density estimates have remained stable since 2002 (when estimates were initially calculated). Density estimates declined substantially in the North West region to the lowest level since 2002, however the long-term trend is stable. On King Island the density of brushtail possums has substantially increased since 2018 (when surveys were last conducted) and were recorded at levels (113 animals per km²) nearly twice the previous highest level (59 animals per km²) in 2005. The statewide average density index for brushtail possum in 2020 was 28.1 animals per km² which is less than recorded for 2019 (33.2 animals per km²) but similar to the period 2014-2018. It is speculated that the lower figure for 2020 may be caused by lower detection of animals due to higher grass levels. The long-term average statewide density trend is shown in Appendix I.

Table 2: Regional Density Index Summary 2020: Brushtail Possum (BP)

	Density (n/km ²)	%CV	No. BPs	Length (km)	Enc. Rate (n/km)	Detection Probability
Central	49.9	21.87	261	270	0.97	0.097
Flinders Is.	16.9	44.95	35	80	0.44	0.130
King Island	113.0	21.63	122	100	1.22	0.054
North East	19.40	18.41	154	590	0.26	0.071
North West	11.44	36.17	62	300	0.21	0.090
South East	31.52	17.23	308	440	0.7	0.111
South West	23.62	29.92	33	120	0.275	0.058

Table 3: Regional Density Index results 2010 – 2020: Brushtail Possum

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Central	30.7	69.6	74.0	51.9	37.1	56.3	48.7	29.9	50.4	49.9
Flinders Is.	12.63	24.9	7.48	2.7	9.4	12.4	15.7	10.2	6.4	16.9
King Island	-	38.4	42.18	40.3	49.0	33.2	22.7	36.8	-	113
North East	24.5	23.8	30.1	27.8	27.8	20.7	23.6	29.1	27.2	19.4
North West	23.4	22.2	19.8	16.6	33.3	24.3	21.7	20.0	21.5	11.4
South East	36.8	38.4	34.8	23.1	31.1	13.7	28.8	21.6	24.9	31.5
South West	82.2	13.3	36.5	17.9	12.8	18.7	16.4	30.9	41.8	23.6

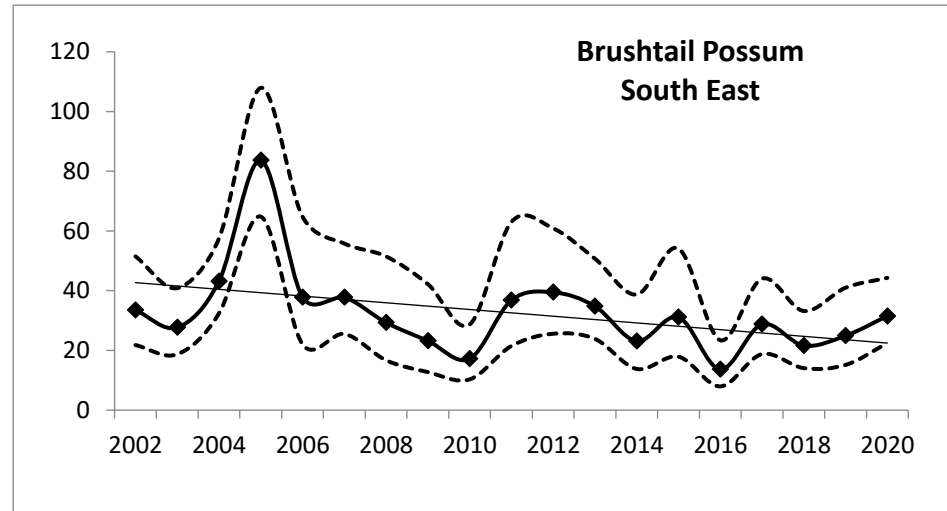
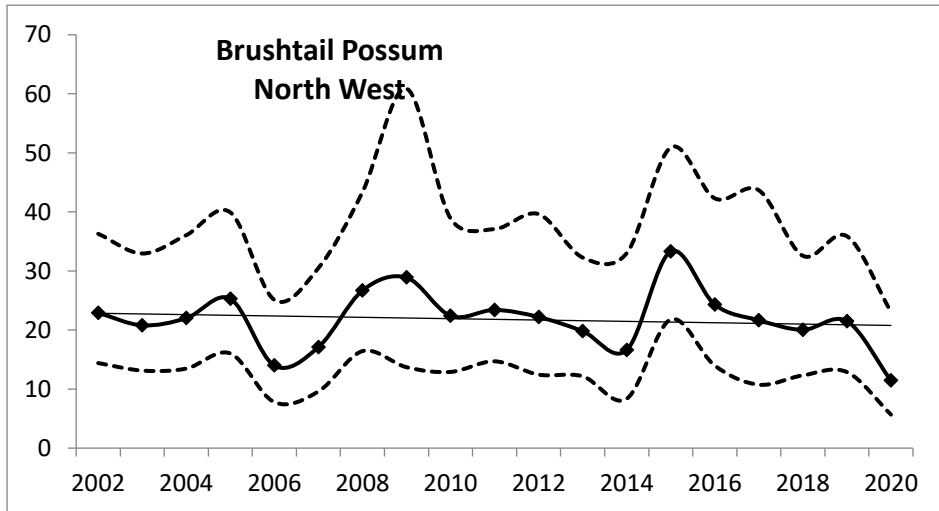
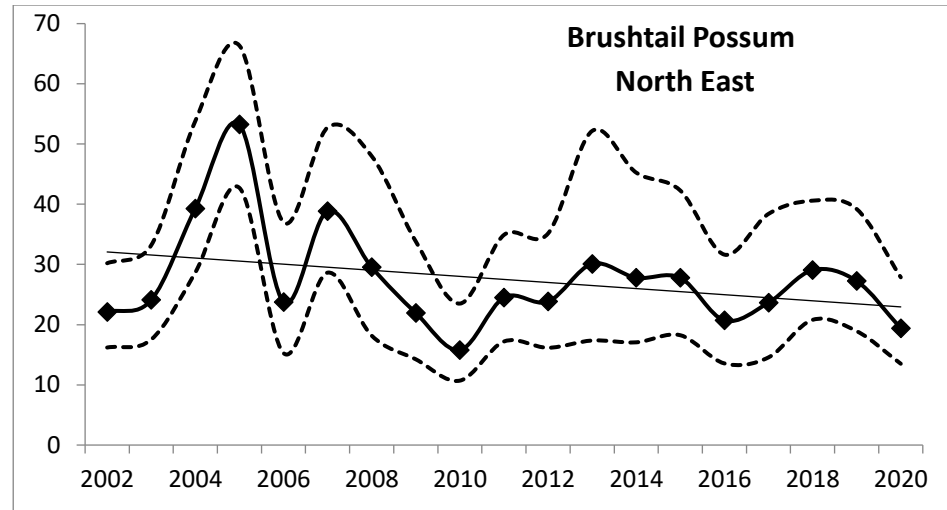
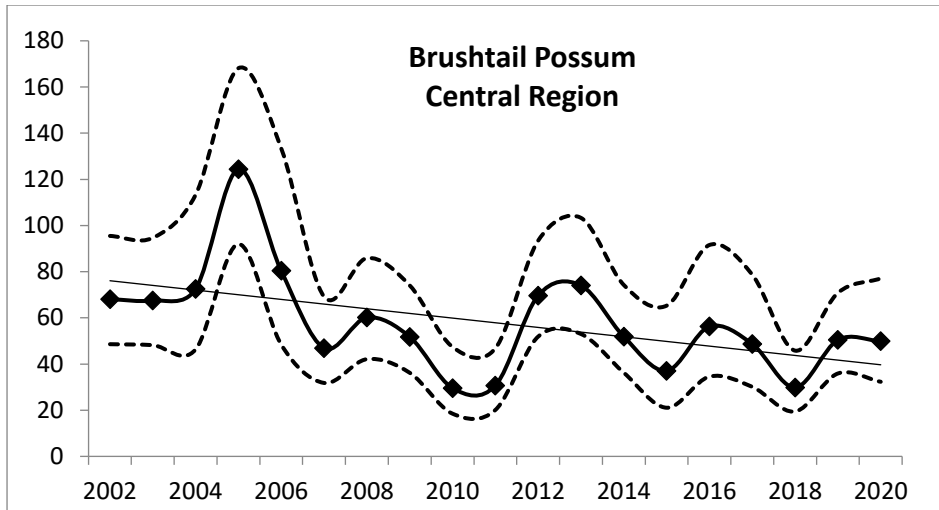


Figure I: Density index trends in each region – brushtail possums 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

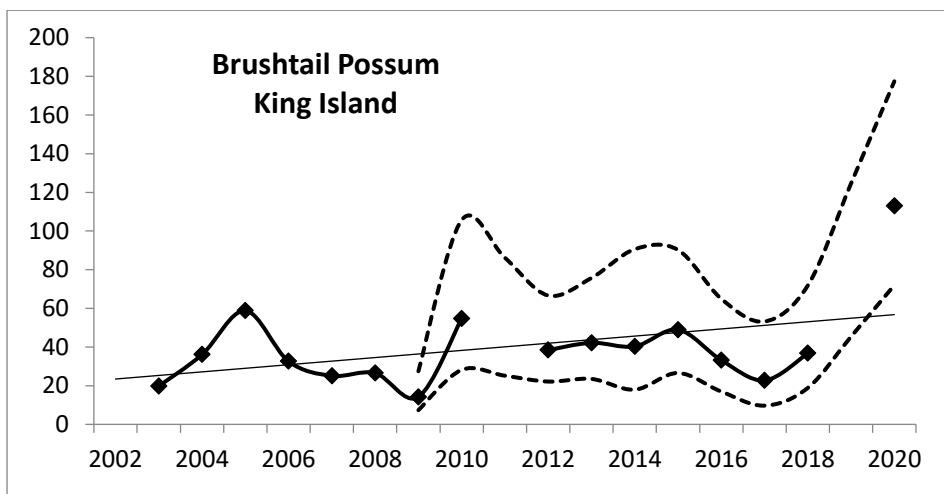
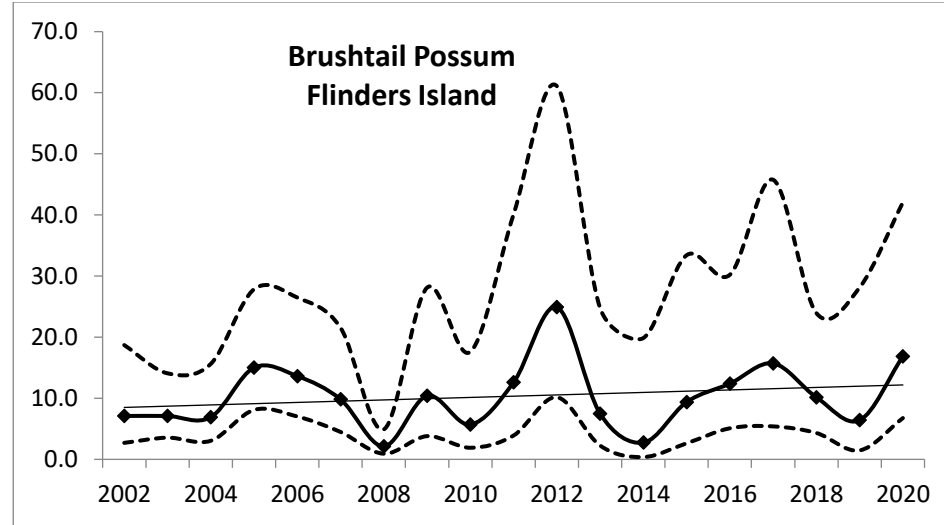
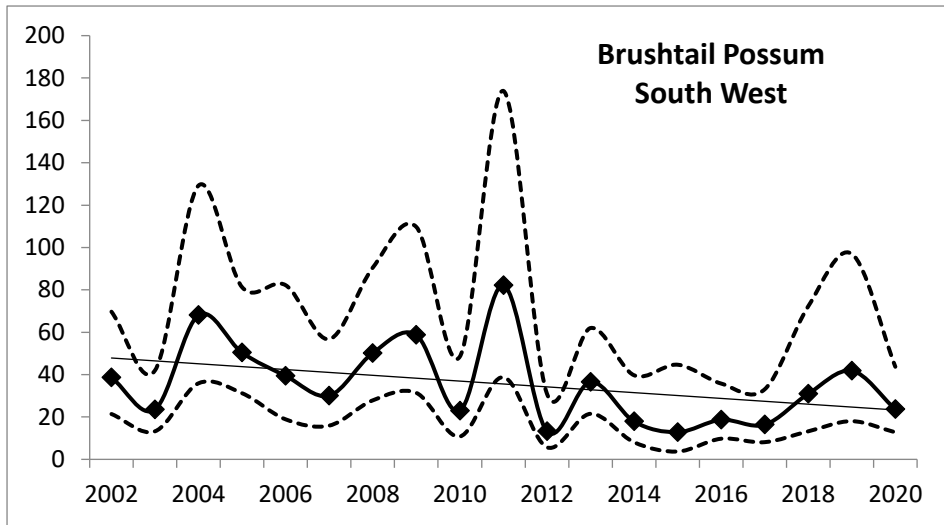


Figure I (continued): Density index trends in each region – brushtail possums 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

Note: Prior to 2009, King Island was managed and reported under a Wildlife Trade Operation plan which included different data analysis and reporting, consequently 95% confidence limits are not available for this period. Also, King Island was not surveyed in 2011 and 2019.

Bennett's Wallaby

A summary of the 2020 regional density indexes for the Bennett's wallaby is given in Table 4. The regional density indexes from 2011 to 2020 are shown in Table 5; Figure 2 depicts trends in the density index for the period 2002 to 2020.

King and Flinders Islands typically have a significantly higher density of Bennett's wallaby than the rest of Tasmania, and this result continues for 2020. All Tasmanian mainland regions except the South West had a lower density than was recorded in 2019. The South West region recorded a density comparable to 2019. This may reflect a lower detection probability rather than a lower density due to increased roadside grass cover and therefore poorer visibility. Both King and Flinders Islands had an increase in estimated density above recent years, with the increase on King Island being substantial. The long-term trend for Bennett's wallaby density for all Tasmanian regions is stable or increasing.

The statewide average density index in 2020 for Bennett's wallaby was 29.7 animals per km² which is lower than that recorded for 2019 (35.7 animals per km²) but similar to figures recorded in 2016 and 2018. (shown in Appendix I). The long-term average statewide density trend is shown in Appendix I.

Table 4: Regional Density Index Summary 2020: Bennett's Wallaby

	Density (n/km ²)	%CV	No. BW's	Length (km)	Enc. Rate (n/km)	Detection Probability
Central	46.0	23.4	321	270	1.19	0.13
Flinders Is.	247.6	38.8	682	80	8.53	0.17
King Island	216.0	28.3	446	100	4.46	.10
North East	23.3	17.3	262	590	0.44	0.10
North West	18.0	34.3	124	300	0.41	0.11
South East	31.3	26.6	424	440	0.96	0.15
South West	20.0	49.0	28	120	0.23	0.06

Table 5: Regional Density Index results 2009 – 2020: Bennett's Wallaby

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Central	34.9	43.6	33.5	78.2	56.5	29.6	51.7	46.9	52.2	46.0
Flinders Is.	114.4	130.4	73.4	40.7	65.8	241.3	220.0	191.3	215.3	247.6
King Island	-	57.5	98.3	167.3	111.7	87.0	68.6	77.0	-	216.0
North East	25.1	37.0	38.8	39.8	42.6	33.1	21.9	32.0	31.4	23.3
North West	29.7	28.6	15.5	25.3	38.8	39.1	46.7	26.9	27.3	18.0
South East	30.8	33.8	28.0	41.0	108.7	19.8	38.2	22.1	48.7	31.3
South West	11.3	32.2	25.1	9.7	15.4	26.5	23.7	8.6	18.8	20.0

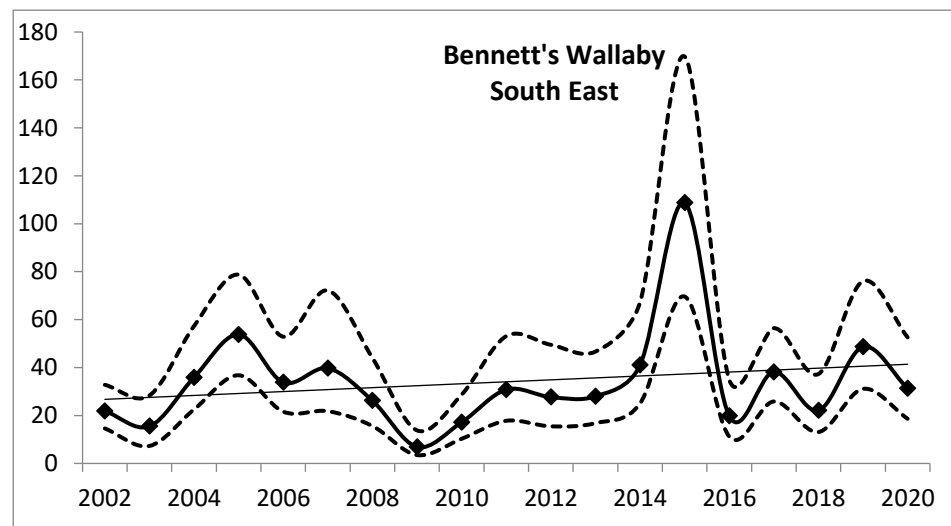
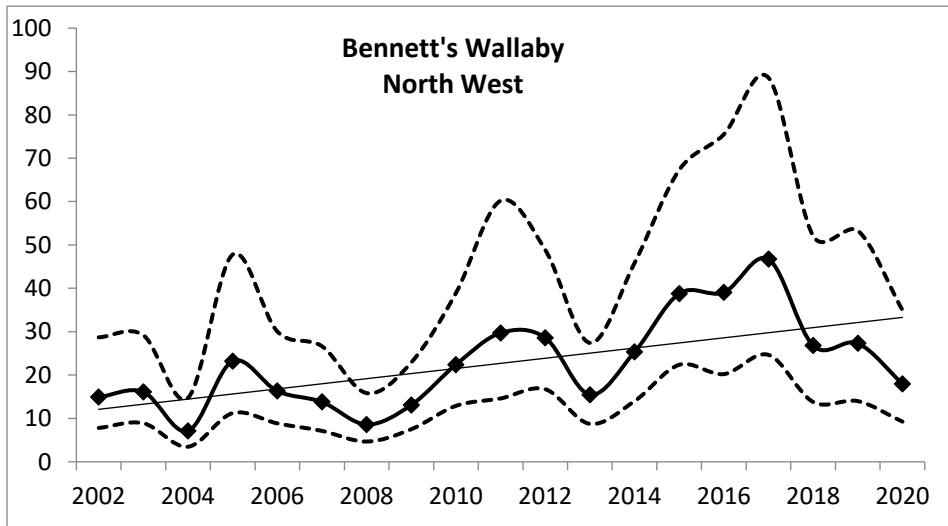
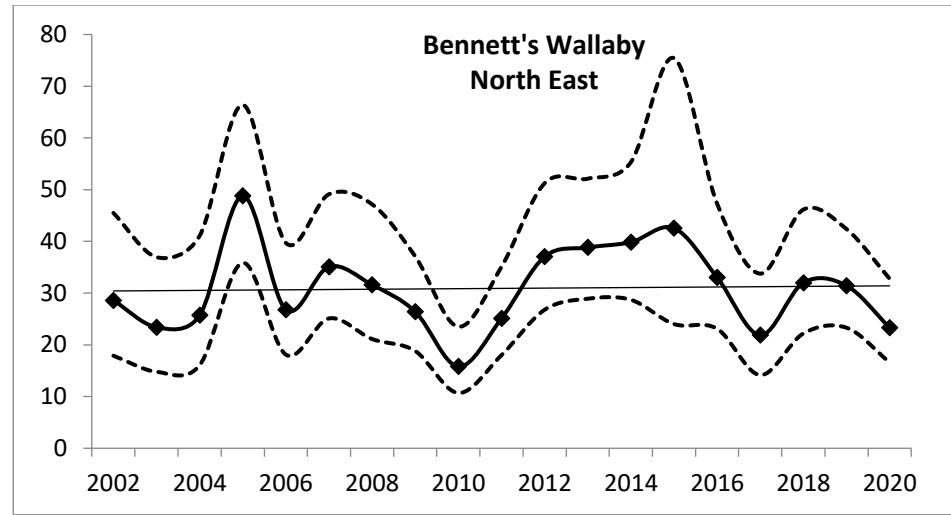
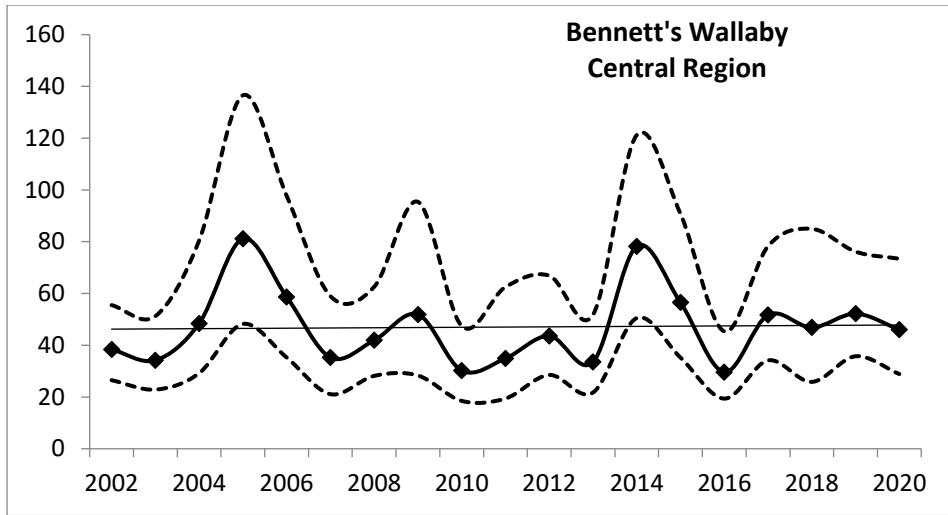


Figure 2: Density index trends in each region – Bennett’s wallaby 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

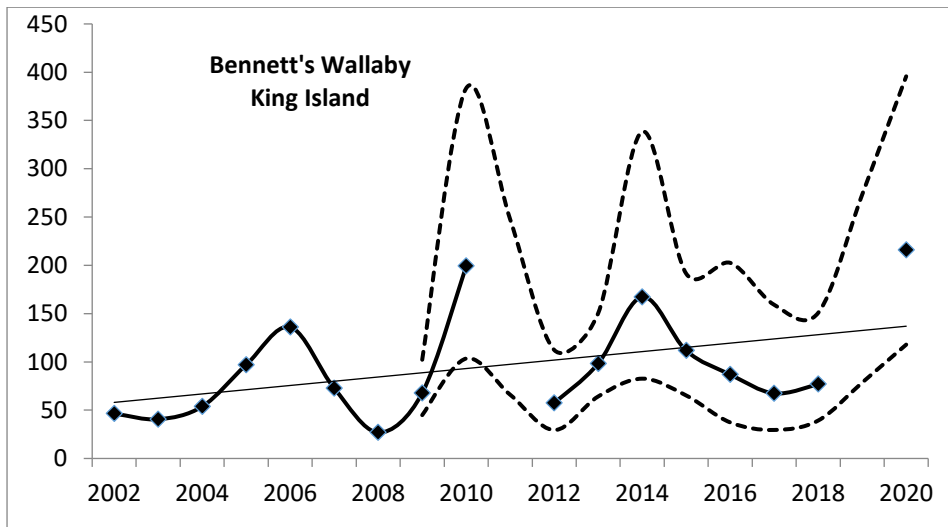
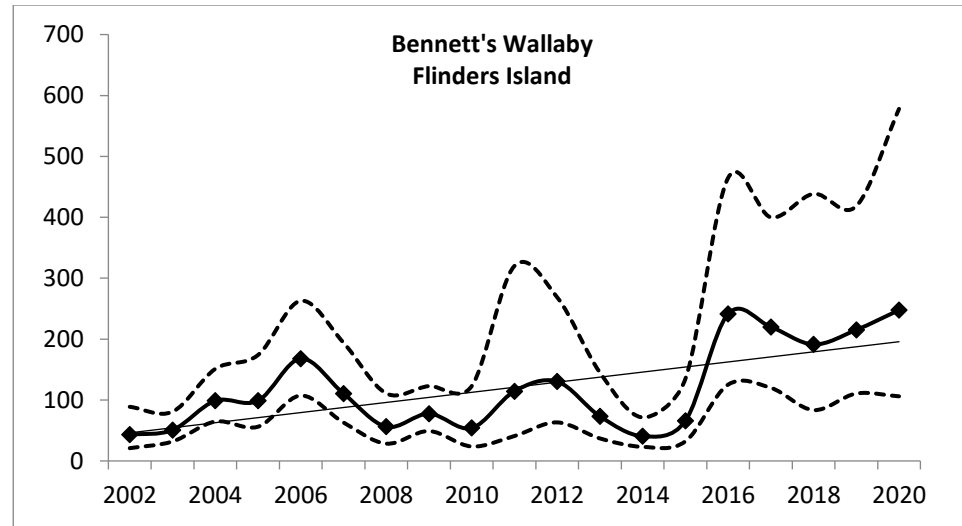
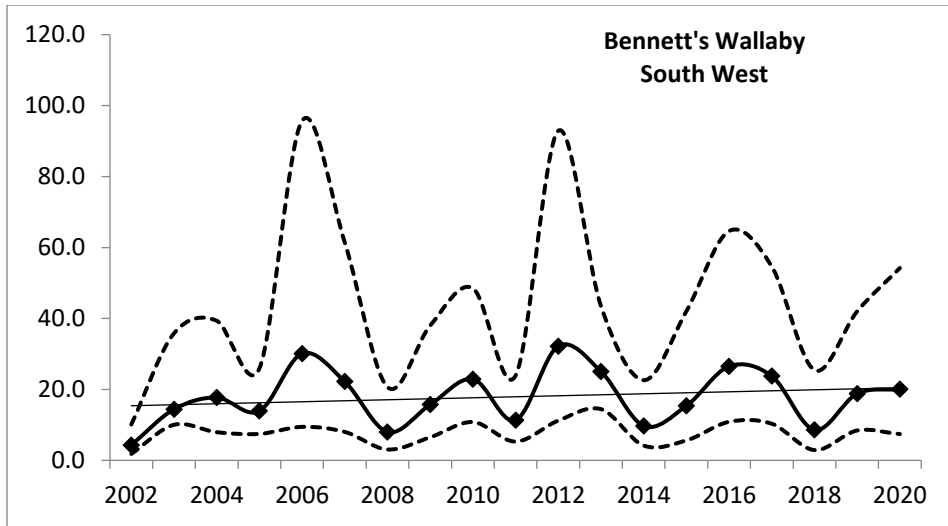


Figure 2 (continued): Density index trends in each region – Bennett’s wallaby 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

Note: King Island was managed and reported under a Wildlife Trade Operation plan which included different data analysis and reporting prior to 2009, consequently 95% confidence limits are not available for this period. Also, King Island was not surveyed in 2011 and 2019.

Tasmanian Pademelon

A summary of the 2020 regional density indexes for Tasmanian pademelon is given in Table 6. The density indexes from 2011 to 2020 are given in Table 7 and Figure 3 depicts the density index for the period 2002 to 2020.

All Tasmanian mainland regions except the South West had a lower density than was recorded in 2019. This may reflect a lower detection probability rather than a lower density due to increased roadside grass cover and therefore poorer visibility. The South West region recorded a density index substantially greater than that of 2019 and may reflect the food availability following forest regeneration since the Gell River bushfires in December 2018. The long-term trends for Tasmanian pademelon are declining for the Central Region and Flinders Island. In all other regions the long-term trends are stable or increasing.

The statewide density index for Tasmanian pademelons in 2020 was 46.4 animals per km². This is lower than the long-term yet stable trend (shown in Appendix I).

Table 6: Regional Density Index Summary 2020: Tasmanian pademelon

	Density (n/km ²)	%CV	No. TP's	Length (km)	Enc. Rate (n/km)	Detection Probability
Central	16.44	29.5	113	270	0.42	0.13
Flinders Is.	29.17	28.04	137	80	1.71	0.29
King Island	9.45	33.7	30	100	0.3	0.16
North East	61.83	19.76	704	590	1.19	0.10
North West	77.76	17.19	489	300	1.63	0.11
South East	32.71	22.93	430	440	0.98	0.15
South West	159.63	12.21	189	120	1.58	0.05

Table 7: Regional Density Index results 2009 – 2020: Tasmanian pademelon

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Central	26.7	43.1	19.6	42.5	45.7	10.54	25.5	20.0	29.0	16.44
Flinders Is.	81.3	83.4	55.9	83.7	45.4	121.5	120.0	64.6	81.9	29.17
King Island	-	7.8	11.6	13.4	18.9	8.2	10.0	12.4	-	9.45
North East	74.6	86.8	96.3	109.3	119.1	78.9	53.7	60.0	121.7	61.83
North West	90.0	119.3	110.0	121.8	157.2	180.0	117.9	80.2	129.7	77.76
South East	41.8	23.4	37.3	37.2	76.7	33.1	48.1	32.5	56.4	32.71
South West	55.4	82.1	138.3	22.2	46.5	103.4	100.0	24.1	93.4	159.63

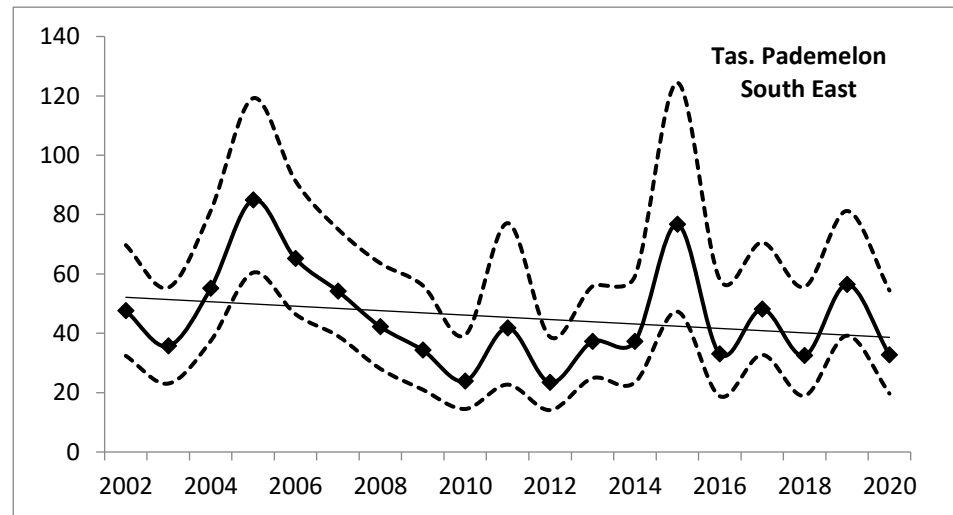
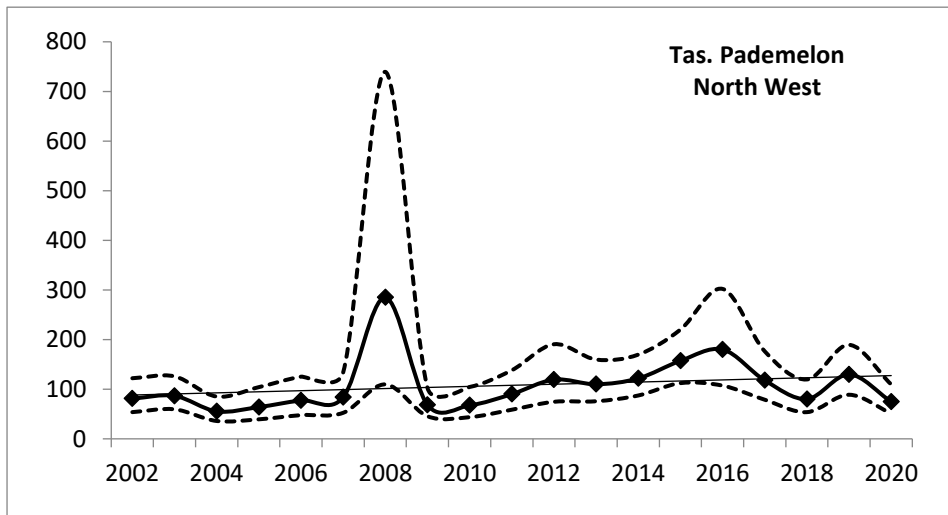
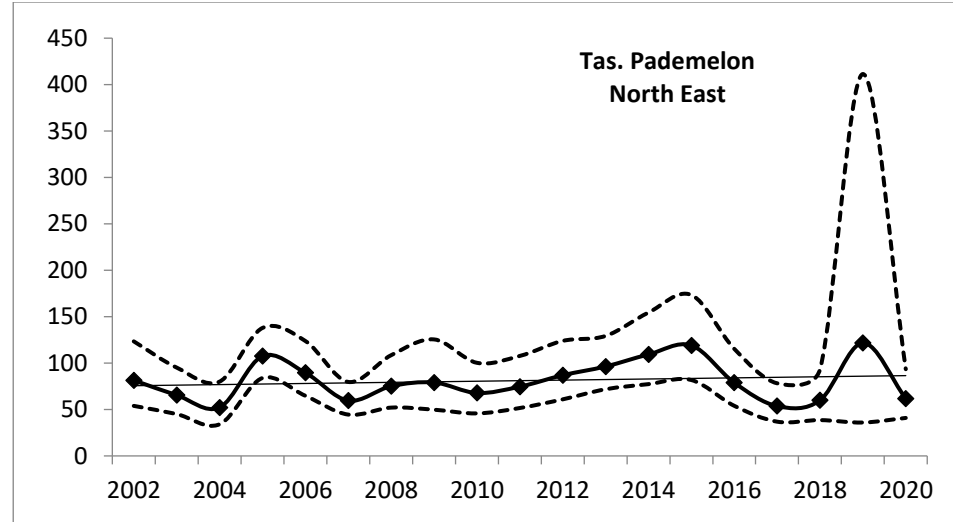
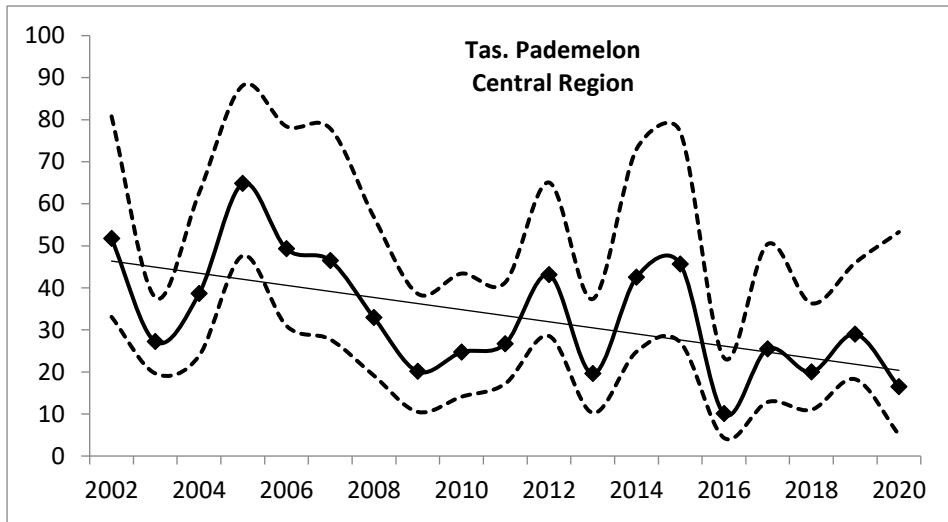


Figure 3: Density index trends in each region – Tasmanian pademelon 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

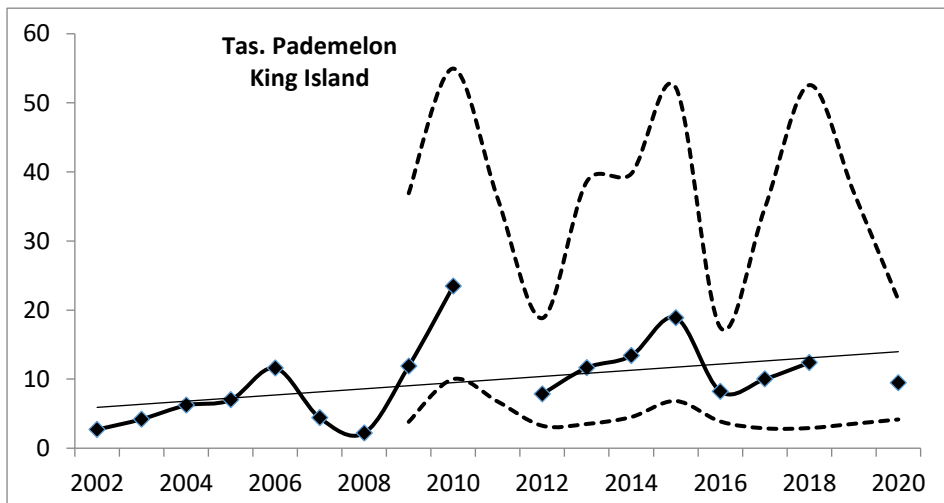
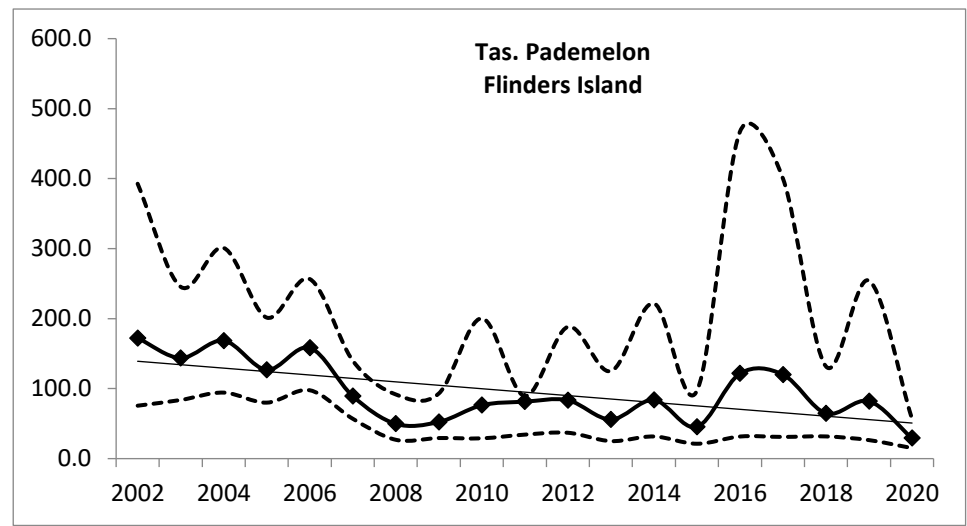
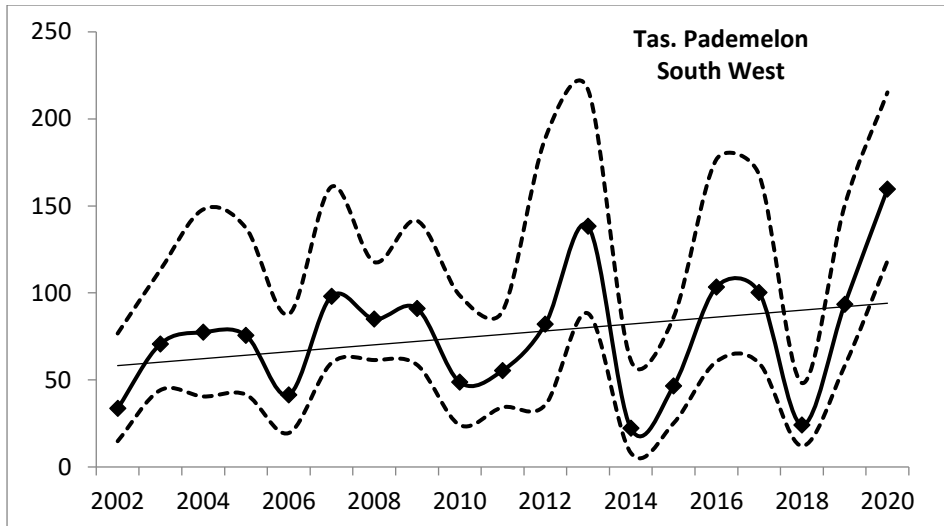


Figure 3 (continued): Density index trends in each region – Tasmanian pademelon 2002-2020.

Dotted lines represent 95% confidence limits. Straight line is the long-term trend. Density is measured in individuals per square kilometre.

Note: King Island was managed and reported under a Wildlife Trade Operation plan which included different data analysis and reporting prior to 2009, consequently 95% confidence limits are not available for this period. Also, King Island was not surveyed in 2011 and 2019.

Non-harvested Species

While the statewide spotlight surveys are designed specifically to monitor the three harvested species, the surveys also enable the collection of data for other species. As a consequence of the lower abundance and/or lower observability of these species, insufficient data is collected to allow density analysis to be undertaken. However, the raw counts and encounter rates (number of a given species observed per 10 kilometre transect) provide information which can be a useful indicator of population trends. Raw counts of a range of species are provided in Appendix I, and trends in encounter rates are provided in Figures 4 and 5.

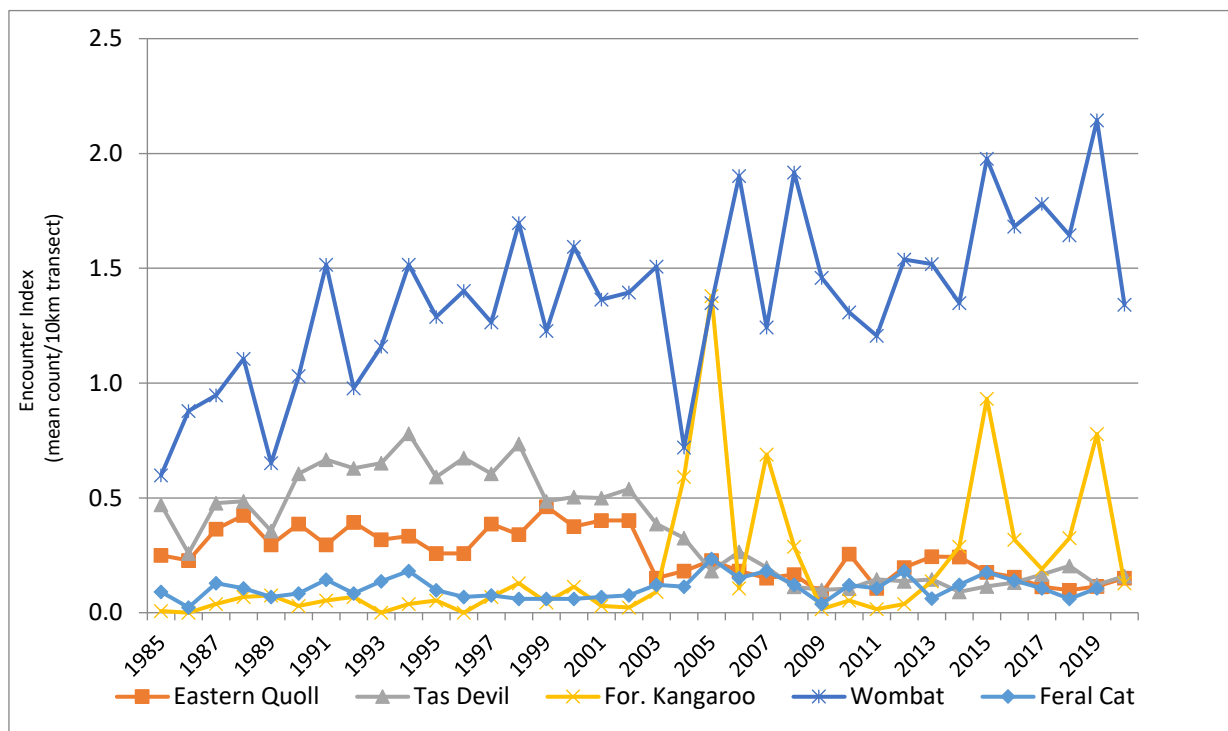


Figure 4: Encounter rates for selected species on mainland Tasmania* (Part I)

*Based on only the 132 transects conducted continuously since 1985

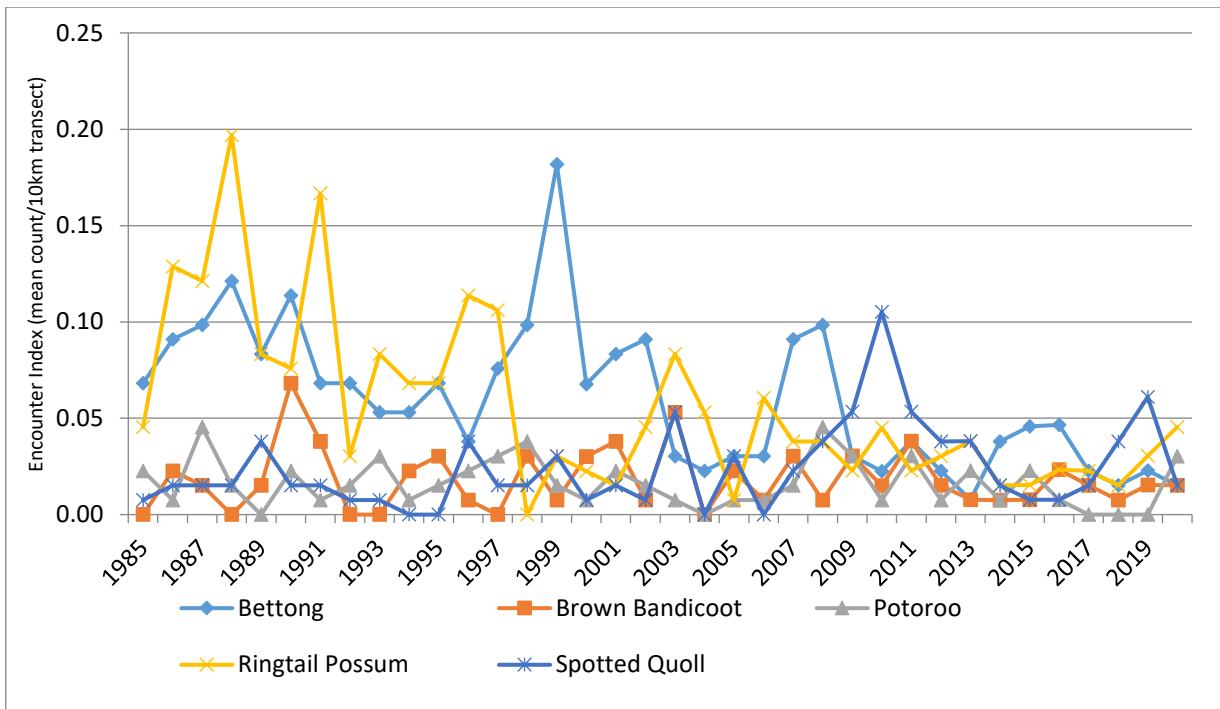


Figure 5: Encounter rates for selected species on mainland Tasmania* (Part 2)

*Based on only the 132 transects conducted continuously since 1985

As a consequence of the progressive addition of survey routes since the original survey was established in 1975, it is possible to provide a range of presentations based on the data set used and the timeframes represented. The later data sets (post 1985) are statistically more rigorous due to their larger sample size; however, the earlier 1975 series (i.e. those 42 transects that have been run continuously since 1975) provide a longer, but statistically less robust, perspective of population trends.

This is particularly of interest given the declining trends, based on the 1985 data series, evident in several species (Tasmanian devil, eastern quoll, Tasmanian bettong). Based on the 1975 data series the trend for these three species is still negative but less pronounced. Trends in encounter rates based on the 1975 data series are provided in Figure 6.

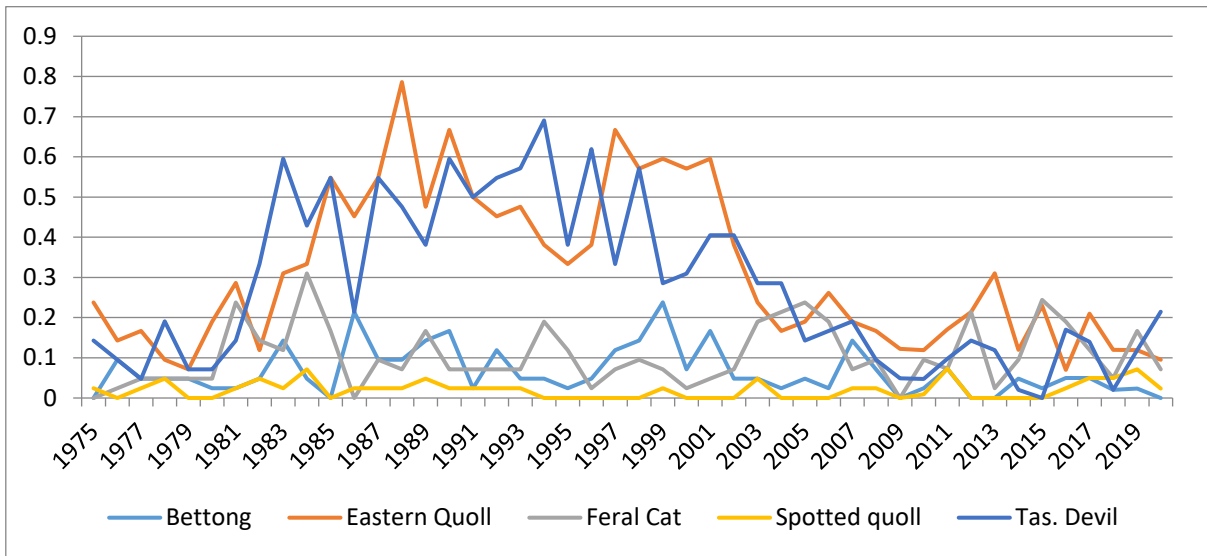


Figure 6: Encounter rates for selected species on mainland Tasmania -1975 data series*

*Based on the original 42 transects conducted continuously since 1975

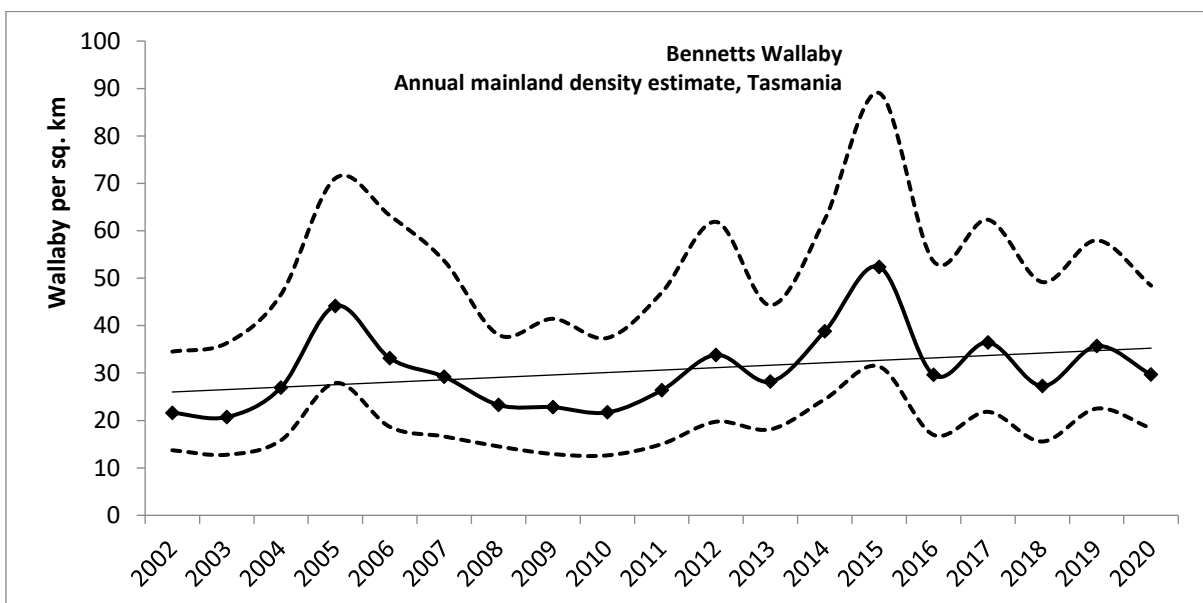
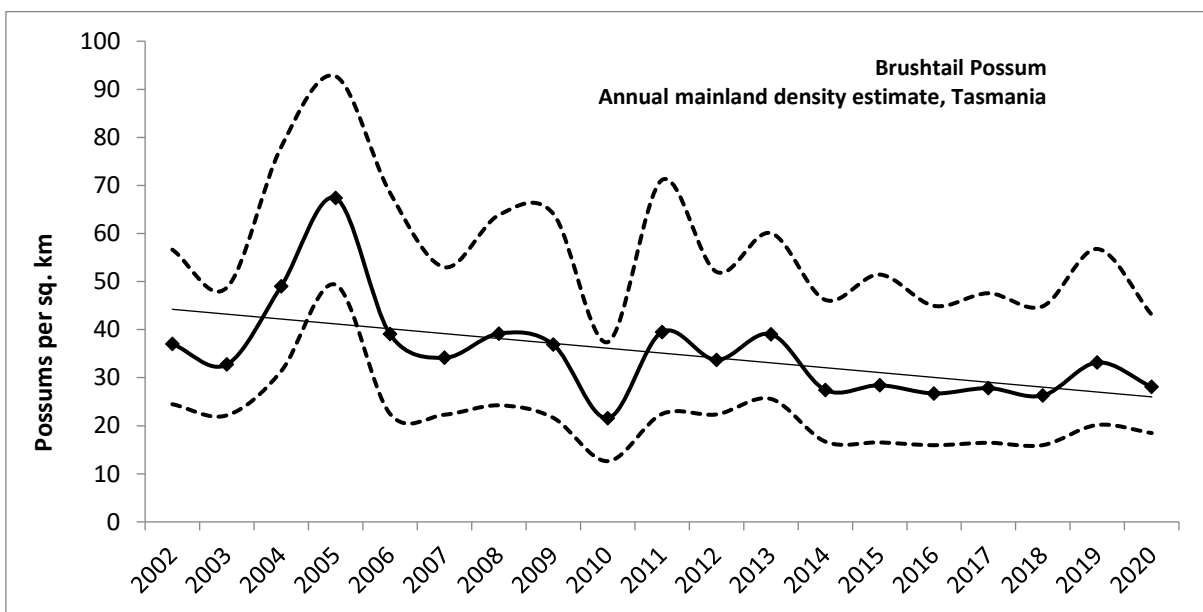
Due to the very low encounter rates it must be stressed that these data (1975 series) should be interpreted with caution. Trends of particular interest include the return of eastern quoll and Tasmanian devil encounter rates to levels similar to those observed in the 1970s, and the absence of a major change in feral cat encounter rates over the period 1975-2020, despite the considerable changes in the Tasmanian devil and eastern quoll encounter rates over the same period.

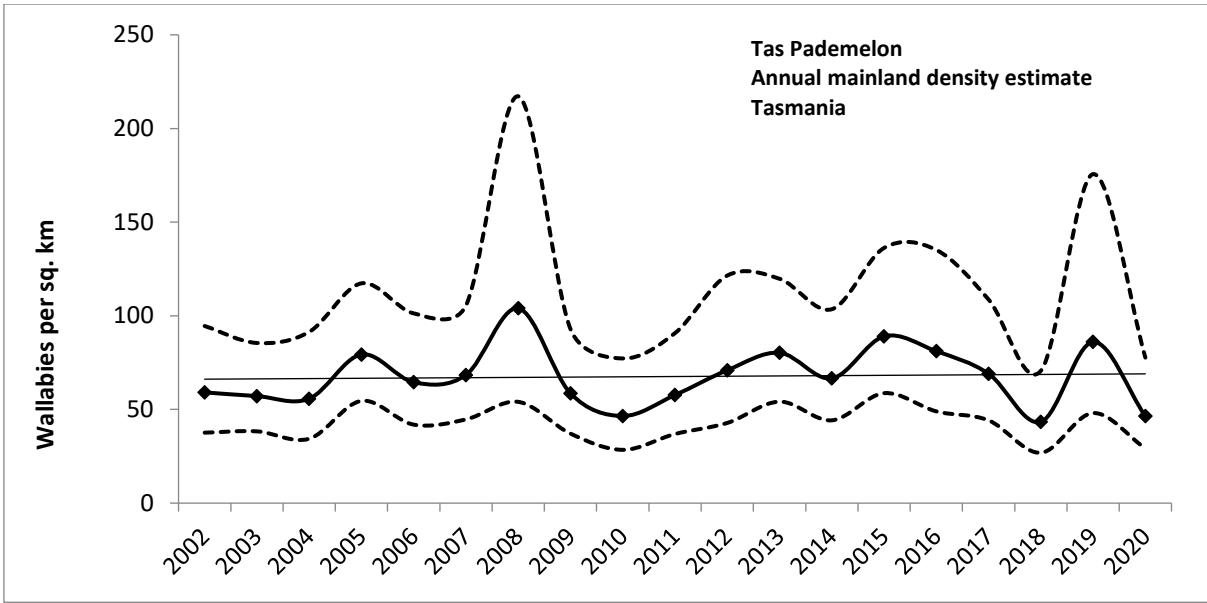
References

- Bureau of Meteorology (2020). Tasmanian in 2020: Drier in the west and south, wetter in the east and warmer nights everywhere. <http://www.bom.gov.au/climate/current/annual/tas/summary.shtml>. Accessed 23 April 2021.
- Southwell, C and M. Fletcher (1985). Investigations into methods of improving the precision of spotlight surveys used for monitoring wallaby populations in Tasmania. National Kangaroo Monitoring Unit, Australian national Parks and Wildlife Service. Report to the Tasmanian National Parks and Wildlife Service.

Appendix I. State average densities for the three priority species

Note: the average densities shown below are calculated as a simple mean of the regional density estimates, rather than using the statewide density estimate as calculated by the Distance program. The reason for this is the Distance program uses a ‘weighted’ mean based on the number of transects in a region, this could bias the results by minimising the input from the South West region because there are only 12 transects in that region compared with, for example, the North East, which has 59 transects. Conversely, the small sample size in the South West region means that there is greater potential for survey specific bias (weather, timing of survey) to affect the result. Consequently, the State average shown here (with the long-term trend line) should be viewed with caution; regional densities provide a significantly more robust indication of density and trends, and are used to guide management.





Appendix 2

Table 1: Raw counts of other mammal species observed during the Annual Statewide Spotlight Surveys, mainland Tasmania 2002-2020.

MAINLAND TASMANIA		COUNT												
		Native Species										Non-native Species		
Year	# Surveys Routes	Tasmanian Devils	Spotted- tailed quoll	Eastern quoll	Forester kangaroo	Tasmanian bettong	Eastern barred bandicoot	Southern brown bandicoot	Common wombat	Ringtail possum	Long- nosed potoroo	Fallow deer	Feral cat	Rabbit
2002	172	87	1	69	3	23	4	1	257	9	3	149	19	155
2003	173	64	8	30	12	7	3	7	242	21	2	160	20	168
2004	173	51	0	57	86	11	1	0	128	14	0	256	21	129
2005	172	36	5	55	183	7	1	3	227	3	1	619	33	311
2006	173	46	1	42	15	12	4	4	313	11	1	449	25	249
2007	172	32	3	43	91	18	0	5	215	6	2	231	28	197
2008	170	19	5	41	40	25	2	1	294	7	6	165	20	289
2009	172	18	7	20	45	19	6	5	262	5	5	80	9	187
2010	172	19	13	45	5	6	4	2	193	9	2	113	21	191
2011	171	20	10	25	2	13	2	7	200	4	4	154	14	194
2012	172	21	5	36	6	9	2	2	242	4	1	392	27	144
2013	171	21	5	44	18	6	3	2	251	5	7	258	13	125
2014	172	12	3	44	38	11	7	2	214	3	1	434	22	113
2015	171	15	1	30	122	15	1	2	313	2	3	808	33	147
2016	168	17	2	27	41	9	8	3	273	3	3	223	24	106
2017	172	24	2	23	25	4	3	2	283	4	2	613	15	97
2018	172	28	6	23	43	7	2	1	259	2	0	793	11	75
2019	172	20	10	26	102	6	11	2	325	4	0	576	18	97
2020	172	32	3	30	17	3	5	3	316	7	4	693	12	71

Table 2: Raw counts of additional mammal species observed during the Annual Statewide Spotlight Surveys, Flinders Island 2002-2020.

FLINDERS ISLAND		Count			
Year	# Surveys	Common wombat	Ringtail possum	Long-nosed potoroo	Feral cat
2002	16	30	0	0	1
2003	16	45	3	1	10
2004	16	73	0	0	4
2005	16	110	0	0	3
2006	16	112	1	0	5
2007	16	68	0	0	8
2008	16	41	0	0	0
2009	16	51	0	0	2
2010	16	55	0	0	1
2011	8	18	0	0	0
2012	8	62	0	0	2
2013	8	68	0	0	4
2014	8	41	0	0	2
2015	8	49	0	0	1
2016	8	54	0	0	1
2017	8	132	0	0	1
2018	8	105	0	0	5
2019	8	83	0	0	3
2020	8	98	0	0	0

Table 3: Raw counts of additional mammal species observed during the Annual Statewide Spotlight Surveys, KING ISLAND 2002-2020

KING ISLAND		Count	
Year	# Surveys	Feral cat	Fallow deer
2002	10	0	Not Present
2003	20	0	Not Present
2004	20	5	Not Present
2005	20	5	Not Present
2006	20	2	Not Present
2007	10	0	Not Present
2008	10	2	0
2009	10	4	0
2010	10	0	0
2011	No survey	No survey	No survey
2012	10	2	0
2013	10	2	0
2014	10	1	0
2015	10	3	0
2016	10	0	3
2017	10	5	0
2018	10	1	0
2019	No survey	No survey	No survey
2020	10	5	1

Appendix 3: Management regions and survey routes

The management regions reflect the areas covered by the existing population-monitoring program and correlate closely with IBRA bioregions. These regions are presented in Figure 7.

South West Region (20,490 km²)

The south west region is the largest of the regions, extending from Sandy Cape on the west coast to New River Lagoon on the south coast. The area consists predominantly of the World Heritage Area and other conservation reserves, with very little agricultural activity taking place in most of the region.

South East Region (12,610 km²)

The South east region extends from New River Lagoon on the south coast to Long Point on the east coast. It adjoins the southwest, central and northeast regions. This region includes the D'Entrecasteaux Channel area, the Tasman Peninsula, and much of the Derwent River Valley and the east coast. This region is highly developed for agriculture, including high-value crops, and therefore there is a large demand for crop protection permits.

Central Region (9,041 km²)

The Central region is bounded by all other regions and encompasses much of the Central Plateau and the Midlands. The Midlands area has been highly modified since European settlement and is dominated by agricultural land use. In particular, the loss of natural habitat through native vegetation clearance and the growing of crops have seen the encroachment of browsing wildlife onto farming properties and they have particularly flourished in this region.

North East Region (11,300 km²)

The North east region extends from Long Point on the east coast to the mouth of the Rubicon River on the north coast. It encompasses the hinterland south of Launceston to Longford and westward to Westbury, as well as the Tamar Valley and the Fingal Valley in the south. This region has several important agricultural areas, particularly in the vicinities of Longford and Scottsdale as well as the northeast coast.

Northwest Region (9,949 km²)

The Northwest region extends from Liffey at the boundary of the Central region through Westbury to the north coast and to Sandy Cape on the west coast. It includes the far northwest as well as the Smithton, Somerset, Burnie, Devonport and Deloraine areas. Impacts to farming activities on high value agricultural lands are felt in the region although to a lesser extent than the central region due to the larger area of natural habitat available to browsing wildlife.

Flinders Island (1,333 km²)

Eight spotlight survey routes were established on Flinders Island in 1991 and were surveyed twice each fiscal year until 2010. Since then they have been surveyed only once per year.

King Island (1,098 km²)

Ten spotlight survey routes were established on King Island in 2001 and until 2006 they were surveyed twice each fiscal year. Since then they have been surveyed only once per year, although no surveys were undertaken in 2011.

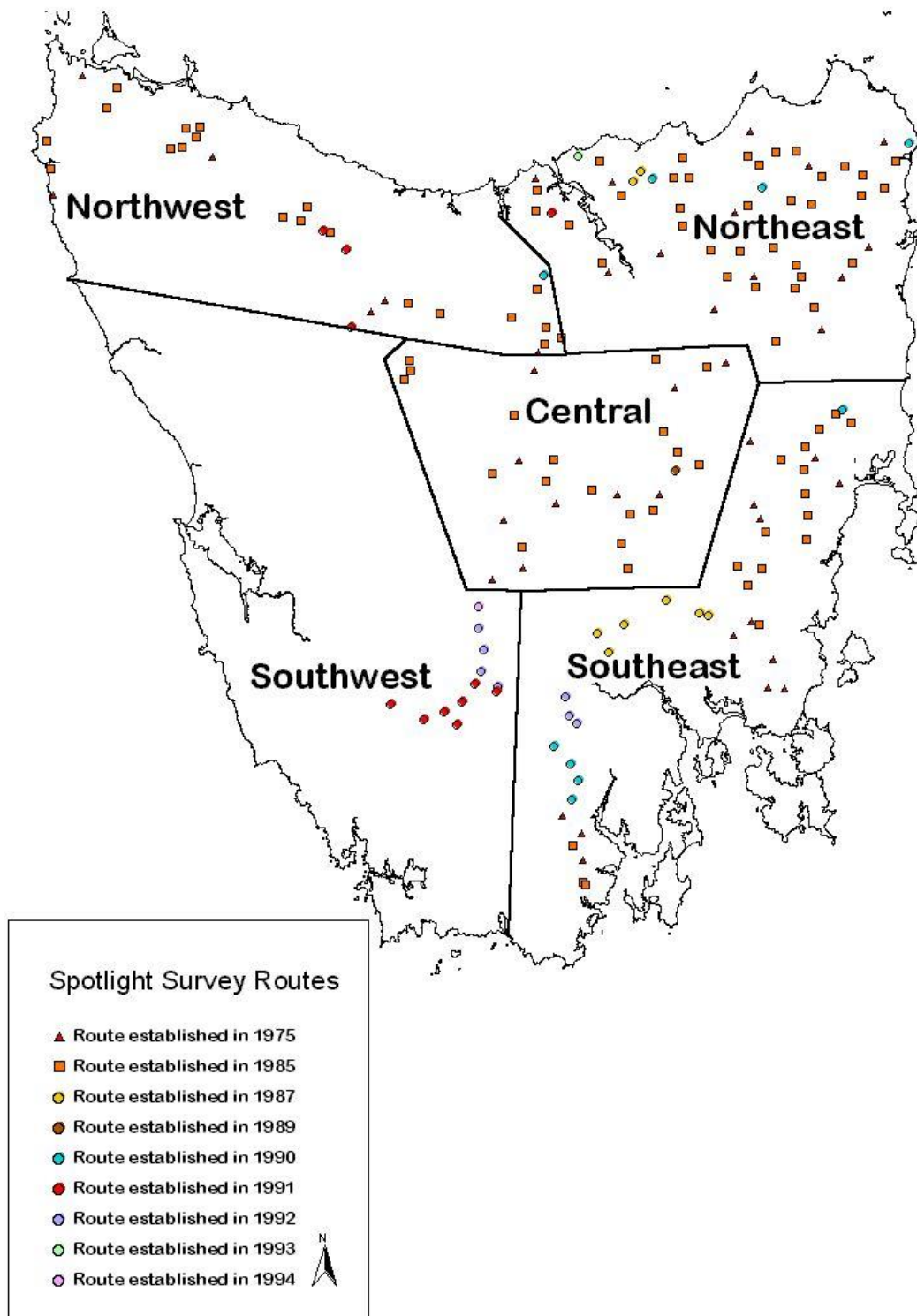


Figure 7: Management regions and survey routes for wildlife population monitoring, mainland Tasmania.