Queensland Macropod Management Program

Annual Report 2022

Artwork by Adrian Combarngo, proud Mandandanji and Kamilaroi man.

The Department of Environment and Science acknowledges the Country and people of Queensland's First Nations. We pay our respect to Elders past and present. We acknowledge and thank First Nations people for the enduring relationship connecting people, Country and ancestors—an unbreakable bond that safely stewarded and protected the land, waters and sky for thousands of generations

Queensland Government

Prepared by: Queensland Parks and Wildlife Service, Department of Environment and Science

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March 2023

Preface

This annual report summarises the activities of the Macropod Management Program in Queensland for the period 1 January 2022 to 31 December 2022. In accordance with the Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2018–2022, the report addresses:

- actual harvest by zone and species compared to quota
- harvest sex ratio, average carcass weights and skin take
- any special quota used
- non-commercial harvest mortality
- compliance statistics
- climate
- research and experiments
- program improvements.

For the 2022 harvest period, there were 1,065 macropod harvesting licences current. There were 103 dealer licences for dead macropods, which included 10 dealer licences for dead macropods (meat processing) and two dealer licence for dead macropods (tanning) current. Data from dealer returns, entered up to 10 February 2023, indicates that there were 612,233 macropods commercially harvested and sold, representing 34.3% of the overall quota. The harvest was entirely for carcasses used for both human consumption and pet food.

No quota was exceeded for any species in any harvest zone in 2022. The highest percentage use of quota was for common wallaroos in the central zone at 56.7%. In all harvest zones, the percentage of the population used for each species was less than 6%.

The commercial harvest is typically biased towards males due to their generally larger size and weight when compared to females. For 2022 the harvest for each species was biased towards males by 71.5% or greater.

During the 2022 harvest period, the department issued 33 infringement notices and 346 warning notices for offences relating to the commercial macropod harvest.

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1. Background

The Department of Environment and Science (the department) administers the harvest in accordance with the following overarching goal: 'to provide for the sustainable use of macropod species covered by the plan, in accordance with the principles of ecologically sustainable development' (Anon 2017).

There are three main aspects to the program:

- monitoring populations
- setting quotas
- managing the harvest.

Three species can be commercially harvested in Queensland:

- red kangaroo *(Osphranter rufus)*
- eastern grey kangaroo *(Macropus giganteus)*
- common wallaroo *(Osphranter robustus).*

These harvested species are abundant over a broad area of Queensland and Australia. None of these species are listed as threatened under state or Australian Government legislation; all are listed as 'least concern' wildlife under the *Nature Conservation (Animals) Regulation 2020*.

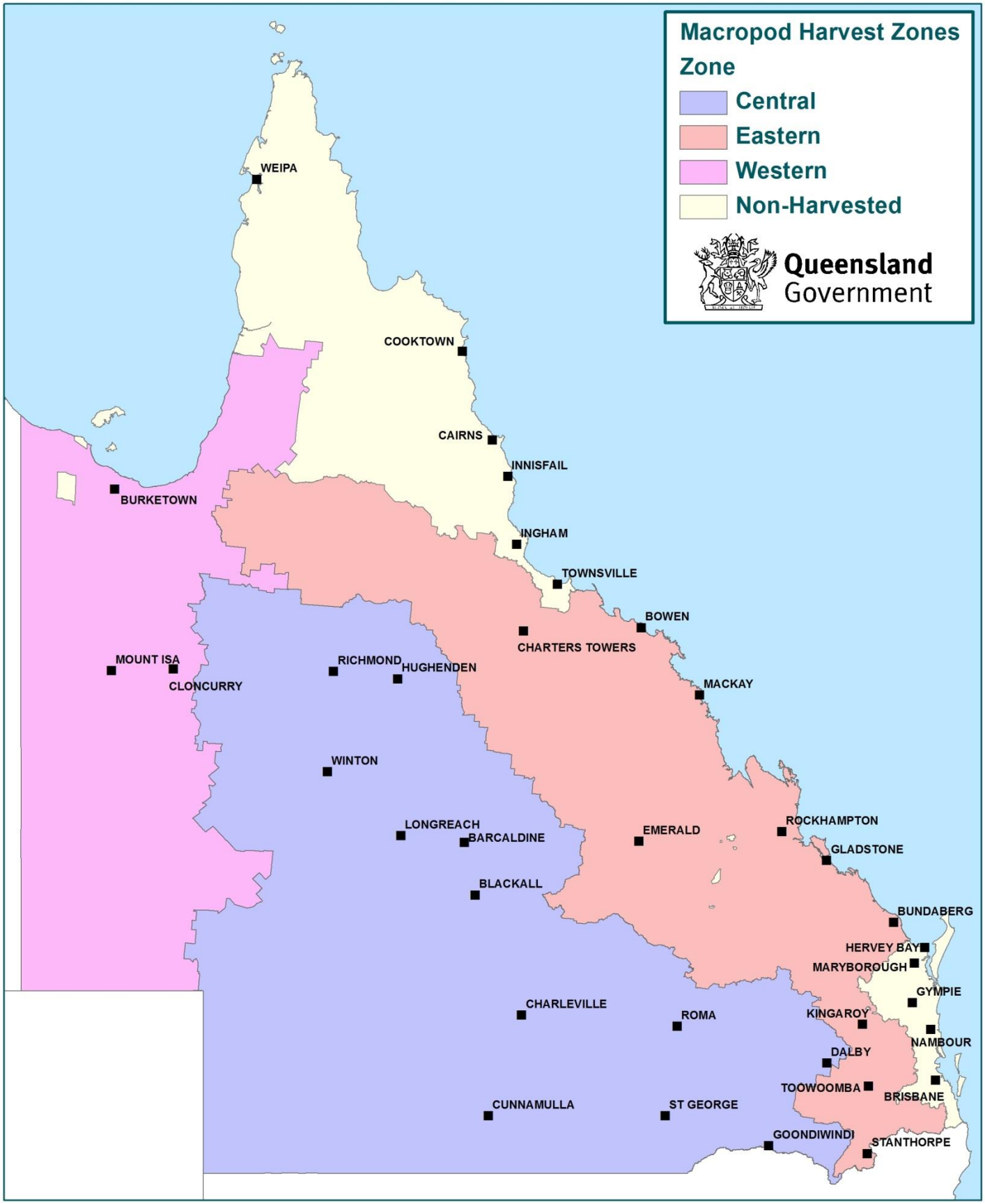
The harvesting of these macropods is regulated through or with consideration to the:

- *Nature Conservation Act 1992*
  - *Nature Conservation (Animals) Regulation 2020*
  - *Nature Conservation (Macropod) Conservation Plan 2017*
- *Environment Protection and Biodiversity Conservation Act 1999*
- Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods—2018–2022
- *Animal Care and Protection Act 2001*
- *Food Production (Safety) Act 2000.*

Management of the harvest is facilitated via quotas that set the number of animals that can be taken. Quotas are based on population estimates derived from annual aerial surveys of the commercially harvested species. Quotas are set for each species for four harvest zones (Figure 1):

- non-harvest zone (quota zero)
- eastern harvest zone
- central harvest zone
- western harvest zone.

Figure 1 – Queensland harvest zones in 2022



Quotas are calculated using a fixed proportion of the estimated macropod populations within the harvest areas. Proportions are adjusted for each species across the harvest zones in relation to the margins of error present in population estimates derived from the aerial surveys. The maximum proportions used for each species are 15% of the populations for eastern grey kangaroos and common wallaroos and 20% of the population for red kangaroos for the central zone. For the eastern and western zones, where survey effort is less extensive when compared to the central zone, the more conservative maximum proportion of 10% is applied for all three species.

These sustainable-use harvest proportions are based on research and modelling undertaken by Caughley et al. (1987) and Hacker et al. (2002) and are currently accepted by the scientific community, state and Australian governments, for determining state quota limits.

This annual report summarises the activities of the Macropod Management Program for the period 1 January 2022 to 31 December 2022. In accordance with the Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods—2018–2022, the report will address:

- harvest by zone and species compared to quota
- harvest sex ratio, average carcass weights and skin take
- any special quota used
- non-commercial harvest mortality
- compliance statistics
- climate
- research and experiments
- program improvements.

All macropod species are ‘protected animals’ in Queensland under the *Nature Conservation (Animals) Regulation 2020* which provides for the licensing of a range of activities in relation to the commercial harvesting of macropods in Queensland.

Harvested macropods must be taken in accordance with the *Nature Conservation (Macropod) Conservation Plan 2017* under a licence issued by the department.

The harvest is controlled by the use of single use, tamper evident numbered tags with a unique colour code for each species and year. The following applies to the use of tags:

- Tags are issued to a specific harvester.
- Tags must be securely attached to the skin of every macropod harvested.
- A tag can only be removed from the macropod skin during the skin tanning process at a licensed tannery.
- The tags are self-locking and tamper-evident.
- The tags are individually numbered and of a different colour for each consecutive year and species.
- A fee (fixed by regulation) is charged for the sale of tags.

Record and return of operations are submitted to the department by harvesters and dealers at regular periods. Harvest statistics from returns are used to monitor and manage the harvest.

2. Harvest management

For the 2022 harvest period, 1065 macropod harvesting licences were issued. There were 103 dealer licences for dead macropods, which included ten dealer licences for dead macropods (meat processing) and two dealer licence for dead macropods (tanning) issued.

All licences were issued in accordance with legislative requirements and within regulatory timeframes.

Tags were limited to the quota amount for each species in each zone to ensure no over-harvest occurred. The highest number of tags sold as a proportion of quota was 95.4% for red kangaroos, in the eastern zone. The actual harvest for this species in this zone was 56.1% of available quota. Statistics on the harvest and tag sales are updated monthly and made available to the public via the Queensland Government website. This assists the industry to monitor the harvest and tag availability.

Table 1—Tag sales and harvest for 2022

Tag categories by zone	2022 quotas	Tags sold		Reported harvest	
		Number of tags	% of quota	Number of macropods	% of quota
Central zone					
Eastern grey kangaroo	441,900	202,100	45.7%	173,574	39.3%
Red kangaroo	755,300	284,850	37.7%	236,041	31.3%
Common wallaroo	114,350	103,750	90.7%	64,842	56.7%
Eastern zone					
Eastern grey kangaroo	292,850	116,300	39.7%	89,471	30.6%
Red kangaroo	22,800	21,750	95.4%	12,797	56.1%
Common wallaroo	71,450	16,400	23.0%	7,389	10.3%
Western zone					
Red kangaroo	59,050	39,450	66.8%	26,794	10.3
Common wallaroo	26,150	3,250	12.4%	1,325	5.1
Total	1,783,850	787,850	44.2%	612,233	34.3%

To ensure harvesters have fair and equitable access to the finite number of tags available, the program regulates the distribution of tags. This is done by establishing a tag allowance for each harvester and ensuring the tags are being used before further tags are ordered.

3. Harvest

The data from dealer returns, entered up to 10 February 2023, indicates that there were 612,233 macropods commercially harvested and sold, representing 34.3% of the overall quota. The harvest of macropods does not occur evenly across the harvest zones. The majority of harvesting occurs in the central harvest zone. Figure 2 shows the distribution of the harvest across the state. Of the 612,233 animals harvested, there were 275,632 red kangaroos, 263,045 eastern grey kangaroos and 73,556 common wallaroos harvested (Figure 3).

Figure 2—Macropod harvest in local government areas during the 2022 harvest period

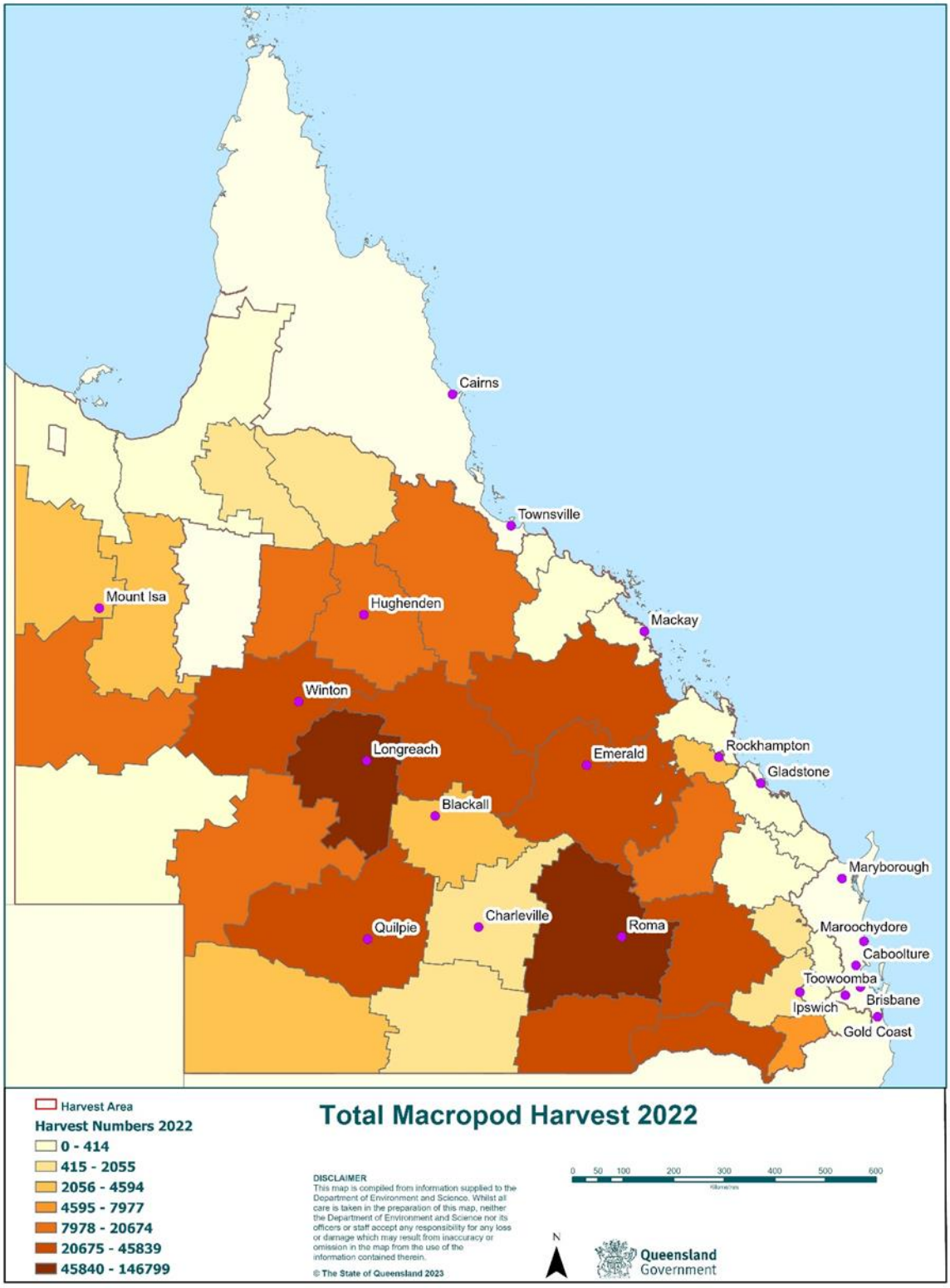
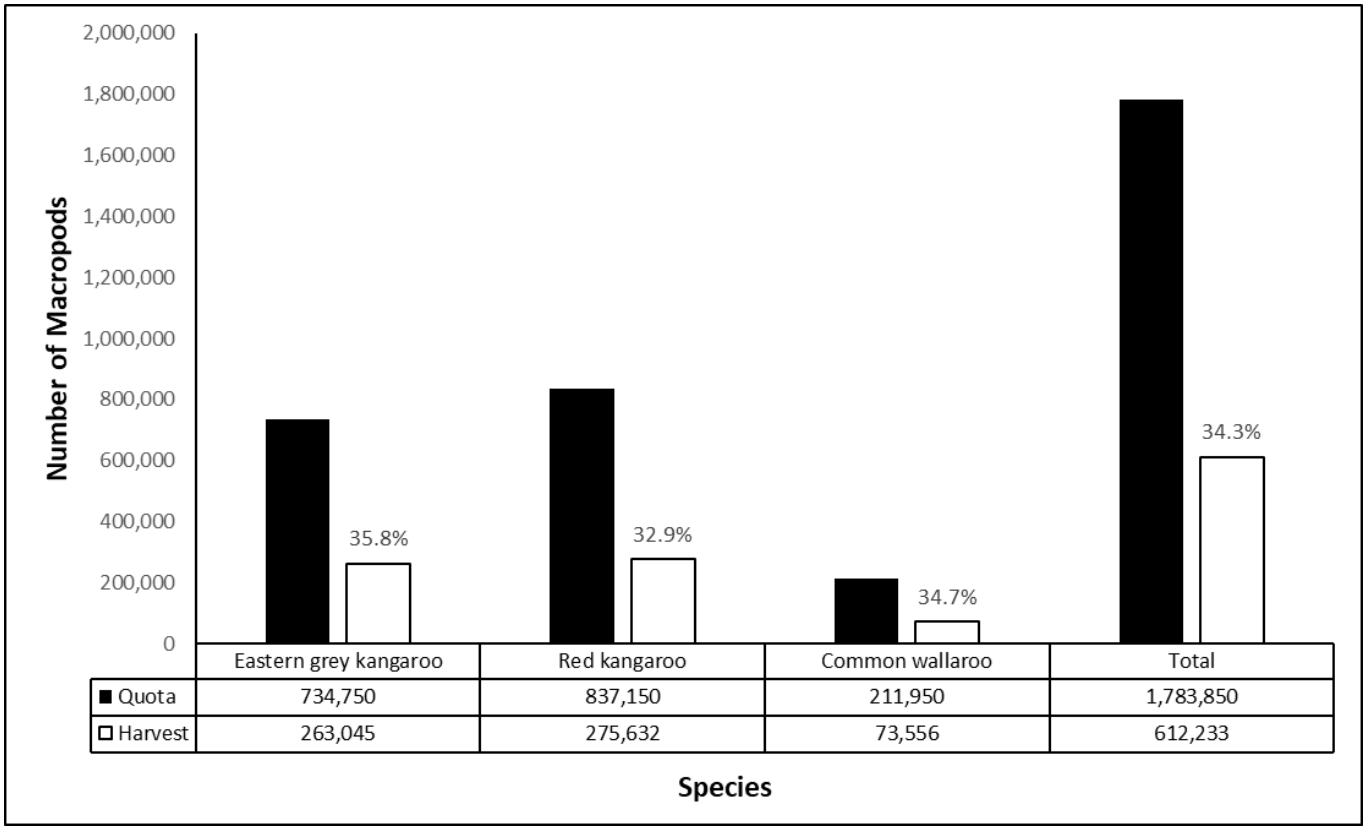


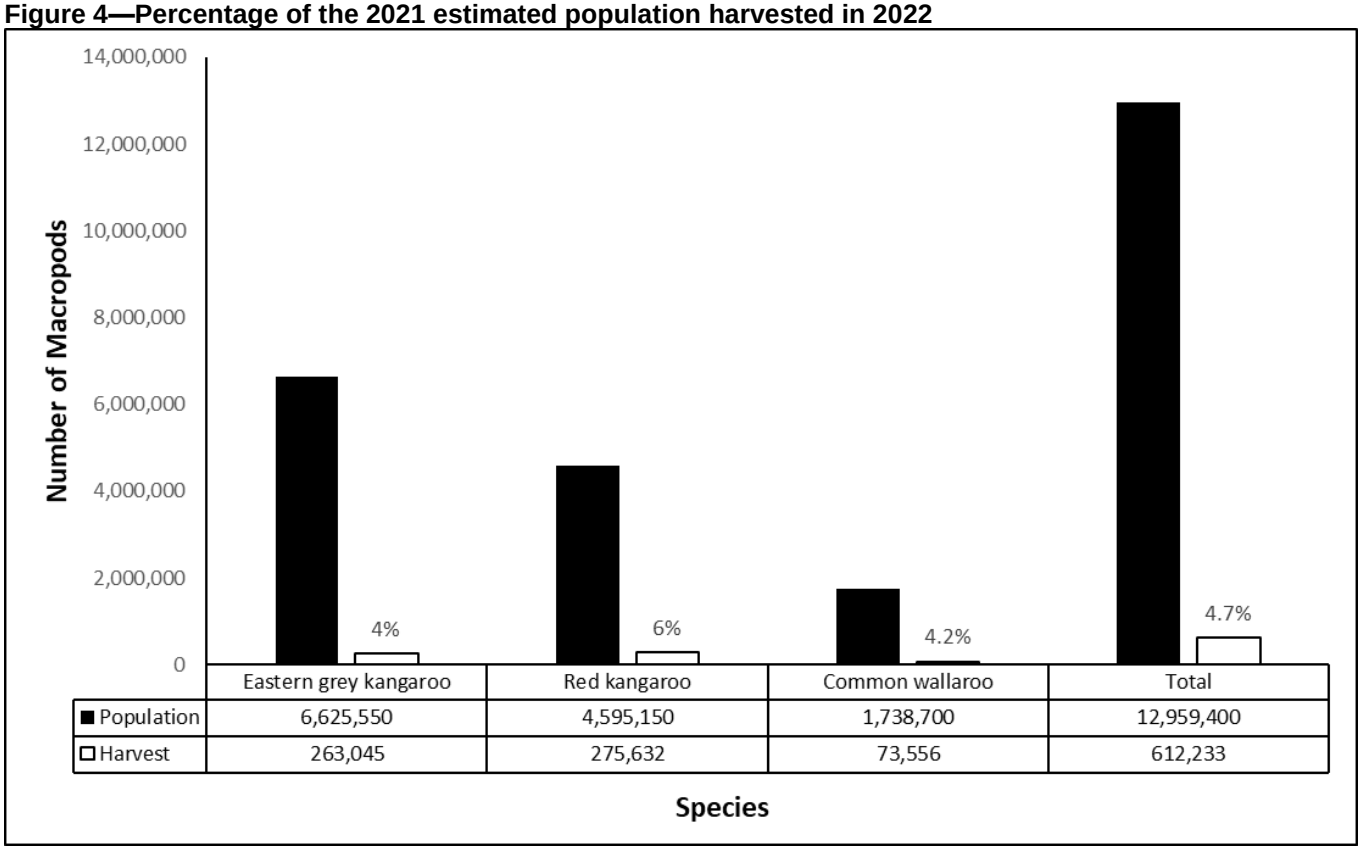
Figure 3—Total number of macropods harvested in 2022 compared to harvest quotas



	Eastern grey kangaroo	Red kangaroo	Common wallaroo	Total
■ Quota	734,750	837,150	211,950	1,783,850
□ Harvest	263,045	275,632	73,556	612,233

For all three harvested species the percentage of the population harvested in 2022 was only 4.7% of the 2021 estimated population (Figure 4). For red kangaroos, 6% of the estimated population in the harvest area was harvested, while 4% of the estimated population of eastern grey kangaroos and 4.2% for common wallaroos was harvested.

Figure 4—Percentage of the 2021 estimated population harvested in 2022



	Eastern grey kangaroo	Red kangaroo	Common wallaroo	Total
■ Population	6,625,550	4,595,150	1,738,700	12,959,400
□ Harvest	263,045	275,632	73,556	612,233

Tables 2–5 contain detailed summaries of the harvest in 2022. Quotas for each species in each zone were not exceeded in 2022. The highest percentage of quota used was for common wallaroos in the central zone at 56.7%. In all harvest zones the percentage of the population harvested for each species was below 9%.

Table 2—Total harvest in 2022

Species	Population estimate 2021	Quota 2022	Harvest take 2022	% quota used 2022	% population harvested 2022
Eastern grey kangaroo	6,625,550	734,750	263,045	35.8%	4.0%
Red kangaroo	4,595,150	837,150	275,632	32.9%	6.0%
Common wallaroo	1,738,700	211,950	73,556	34.7%	4.2%
Total	12,959,400	1,783,850	612,233	34.3%	4.7%

Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quotas. Harvest figures are based on data available 10 February 2023.

Table 3—Harvest of red kangaroos in 2022

Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	3,776,750	755,300	236,041	31.3%	6.2%
Eastern	228,050	22,800	12,797	56.1%	5.6%
Western	590,350	59,050	26,794	45.4%	4.5%
Total	4,595,150	837,150	275,632	32.9%	6.0%

Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quotas. Harvest figures are based on data available 10 February 2023.

Table 4—Harvest of eastern grey kangaroos in 2022

Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	3,697,250	441,900	173,574	39.3%	4.7%
Eastern	2,928,300	292,850	89,471	30.6%	3.1%
Western	NA	NA	NA	NA	NA
Total	6,625,550	734,750	263,045	35.8%	4.0%

Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quotas. Harvest figures are based on data available 10 February 2023.

Table 5—Harvest of common wallaroos in 2022

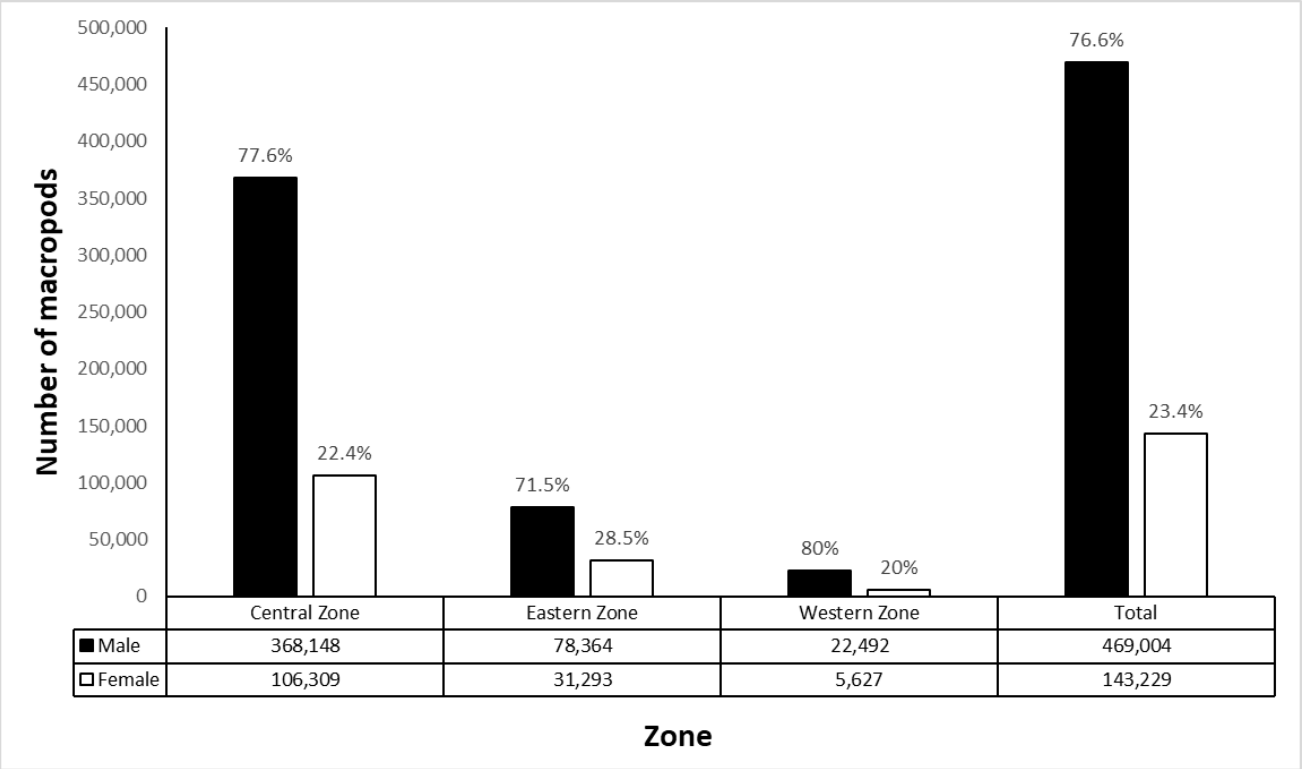
Zone	Population estimate 2021	Quota 2022	Harvest take 2022	% quota utilised 2022	% population harvested 2022
Central	762,550	114,350	64,842	56.7%	8.5%
Eastern	714,700	71,450	7,389	10.3%	1.0%
Western	261,450	26,150	1,325	5.1%	0.5%
Total	1,738,700	211,950	73,556	34.7%	4.2%

Note: population estimates are based on aerial surveys conducted in 2021, which were used to set the 2022 quotas. Harvest figures are based on data available 10 February 2023.

3.1 Harvest sex ratio

The harvest is typically biased towards males due to their generally larger size and weight when compared to females. For 2022, the harvest for each species was biased towards males by 71.5% or greater (Figure 5). Females composed less than 24% of the overall harvest.

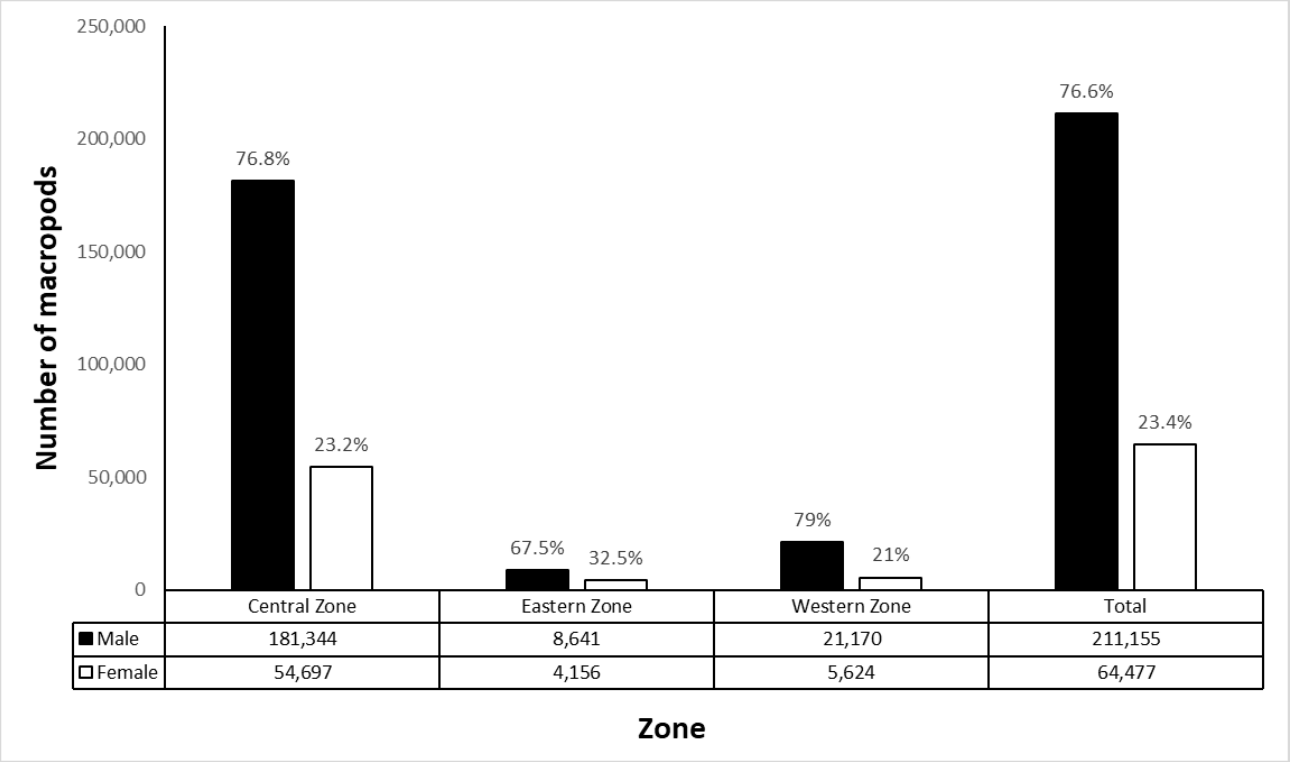
Figure 5—Sex ratio of harvested macropods in 2022 for all harvest zones combined



	Central Zone	Eastern Zone	Western Zone	Total
Male	368,148	78,364	22,492	469,004
Female	106,309	31,293	5,627	143,229

For red kangaroos, the highest percentage of females harvested was in the eastern zone at 32.5%. The overall take of females for this species was 23.4% of the harvest (Figure 6).

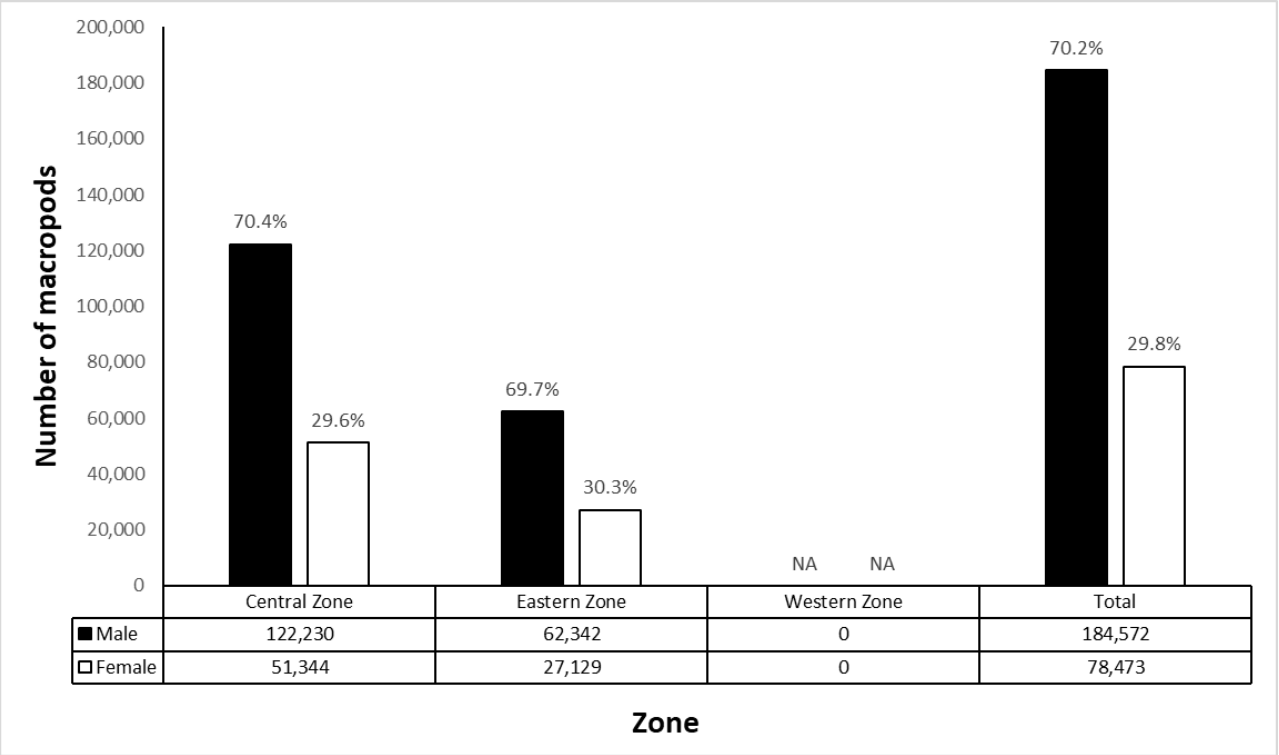
Figure 6—Sex ratio of harvested red kangaroos in 2022



	Central Zone	Eastern Zone	Western Zone	Total
Male	181,344	8,641	21,170	211,155
Female	54,697	4,156	5,624	64,477

For eastern grey kangaroos the greatest percentage take of females was 30.3% in the eastern zone. The overall take of females for this species was 29.8% of the harvest (Figure 7).

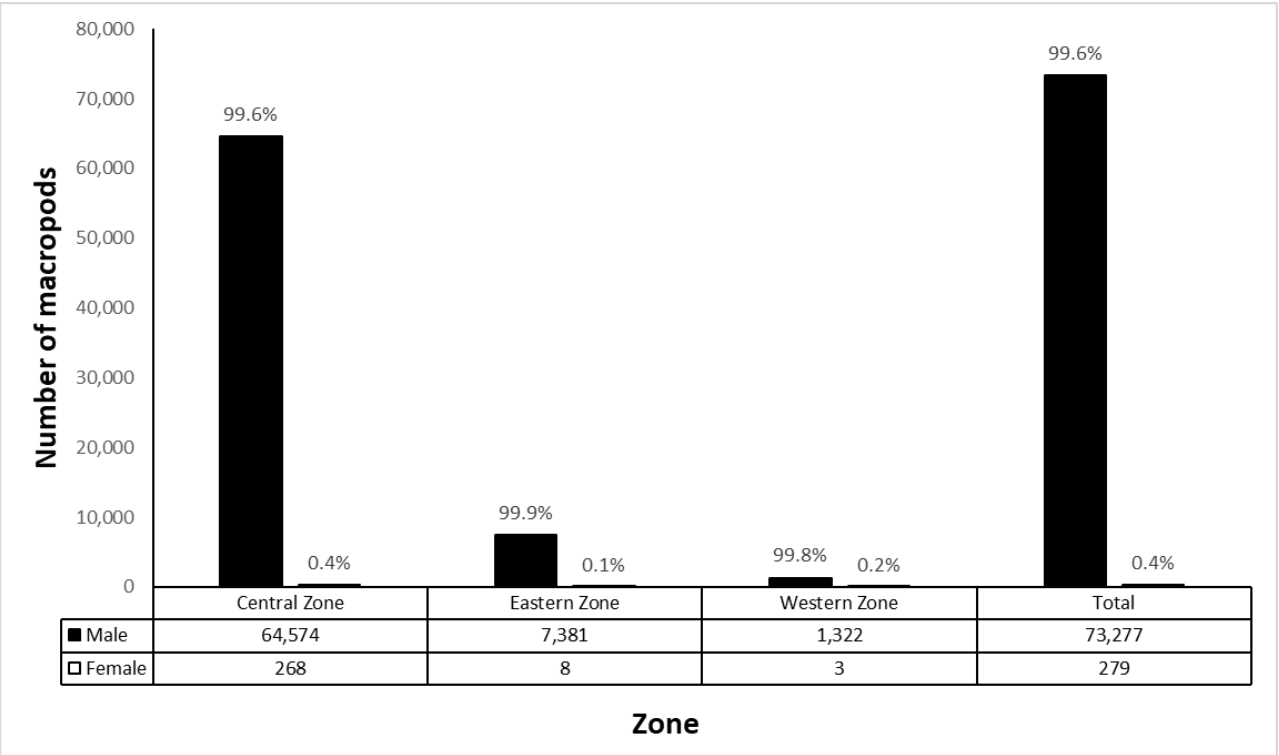
Figure 7—Sex ratio of harvested eastern grey kangaroos in 2022



	Central Zone	Eastern Zone	Western Zone	Total
Male	122,230	62,342	0	184,572
Female	51,344	27,129	0	78,473

For common wallaroos the percentage of the harvest containing females was the lowest amongst the three commercially harvested species at an overall total of only 279 animals. The greatest percentage take of females for this species was 0.4% in the central zone (Figure 8).

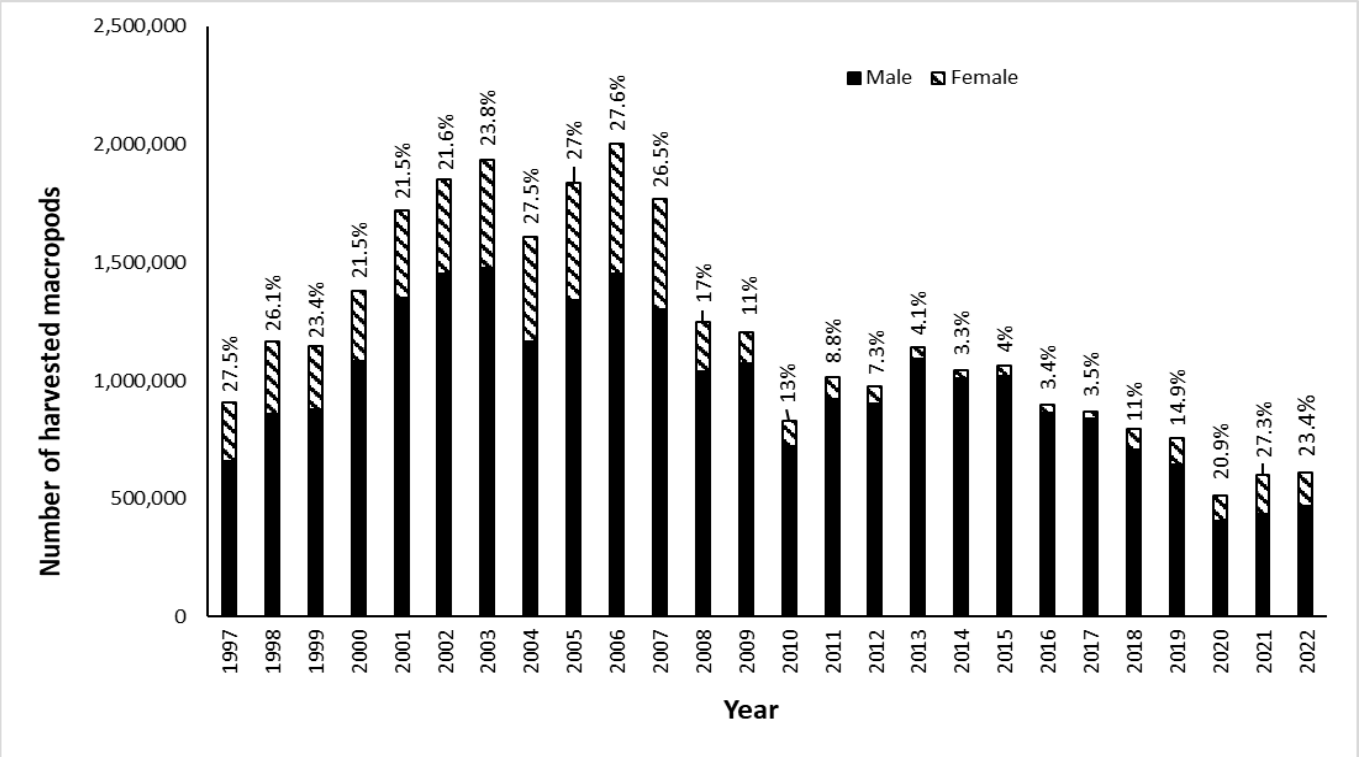
Figure 8—Sex ratio of harvested common wallaroos in 2022



	Central Zone	Eastern Zone	Western Zone	Total
Male	64,574	7,381	1,322	73,277
Female	268	8	3	279

The proportion of the harvest comprising females in 2022 was less than 24%. The percentage of females harvested in 2022 decreased from the previous year and is consistent with long term trends.

Figure 9—Queensland macropod harvest sex ratio trend 1997 to 2022 (percentage of female harvest shown)



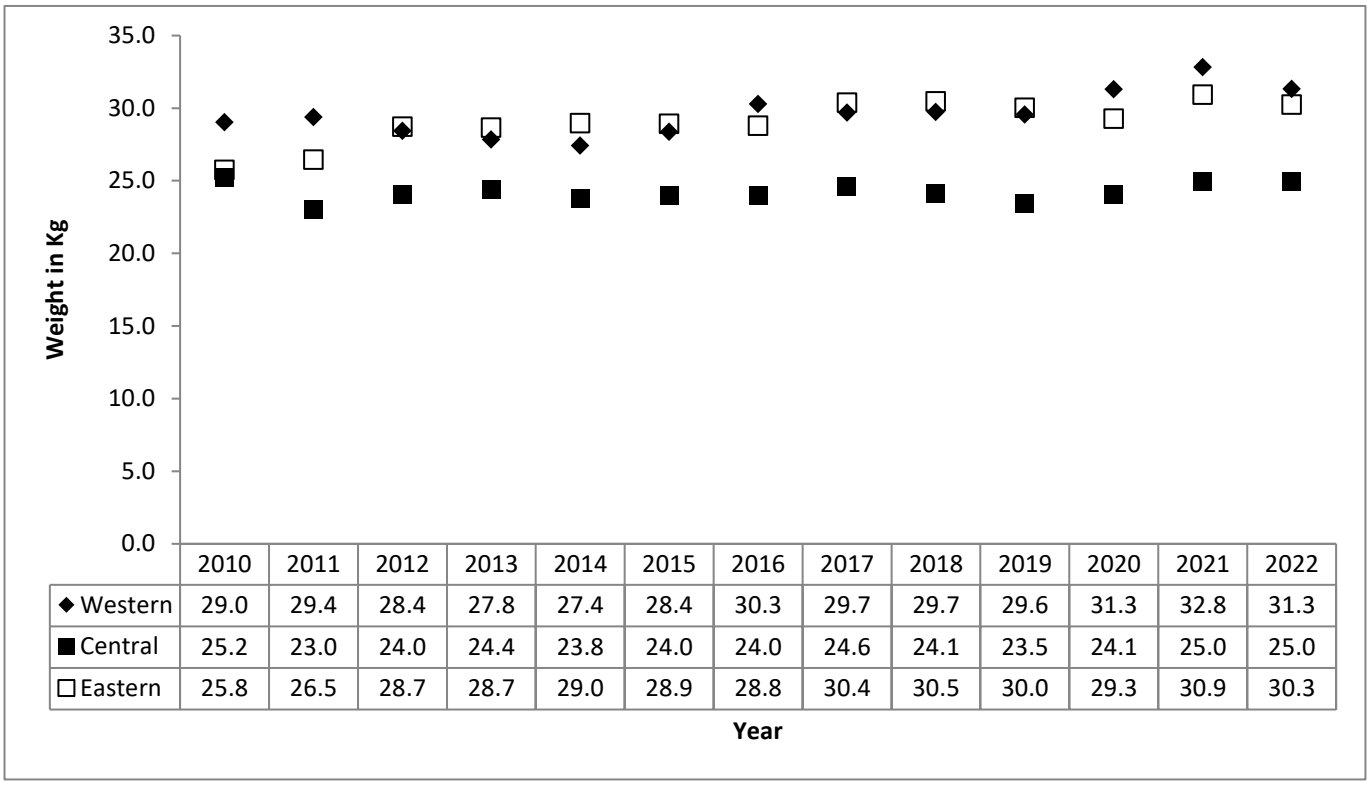
3.2 Carcass and skin harvest

The harvest of macropods in Queensland is predominantly for meat products used for human consumption and pet food. The majority of macropod skins utilised for leather and fur products are sourced from meat processors. No macropods were commercially harvested for their skins only in 2022.

3.3 Average weight

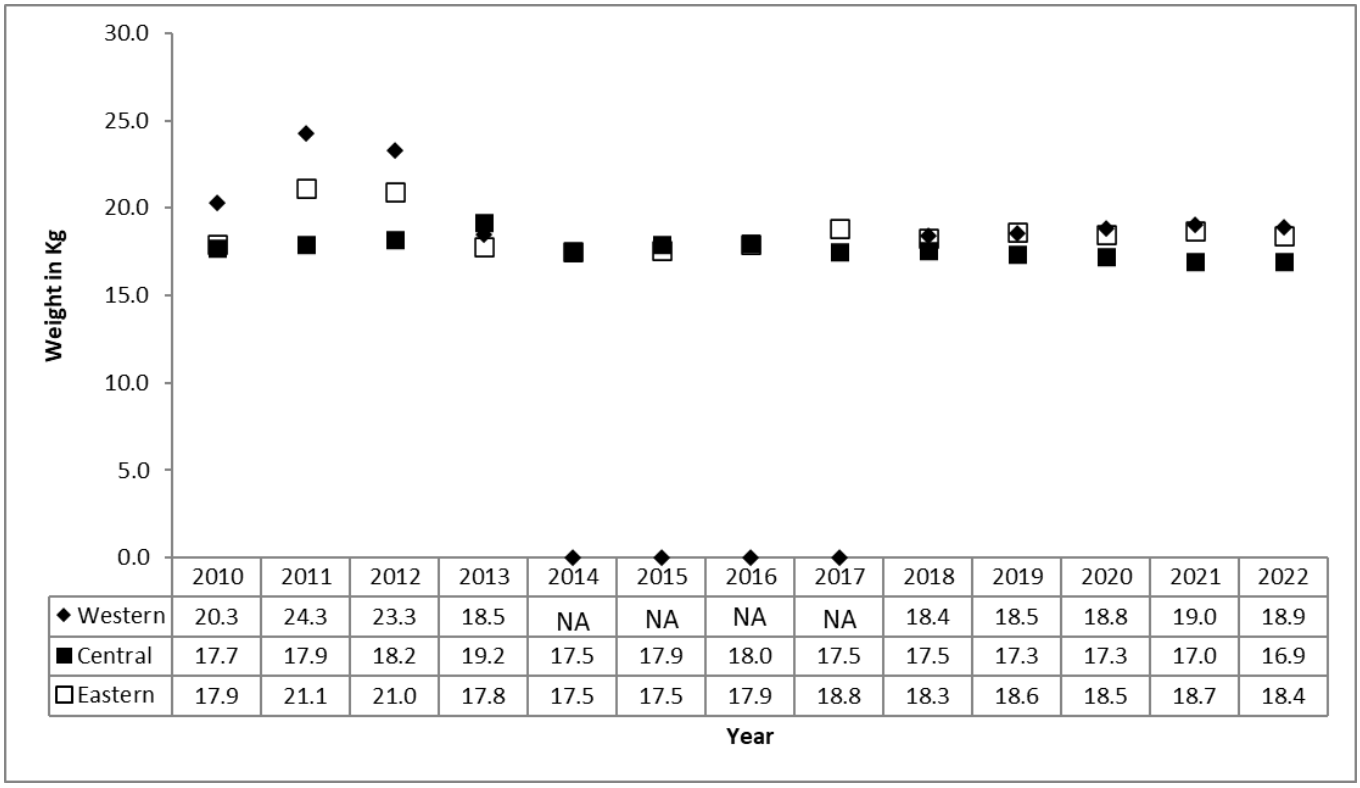
The average dressed carcass weights per harvest zone and species are shown in figures 10 to 13. Carcass weights have fluctuated slightly in the past 12 years in each harvest zone with no significant increases or decreases having occurred in that time. A number of dealer sites have established a minimum preferred dressed weight requirement between 16kg and 18kg. This is driven by economic reasons with efficiencies gained in processing heavier carcasses.

Figure 10—Average dressed carcass weight of Queensland male macropod carcasses 2010–2022



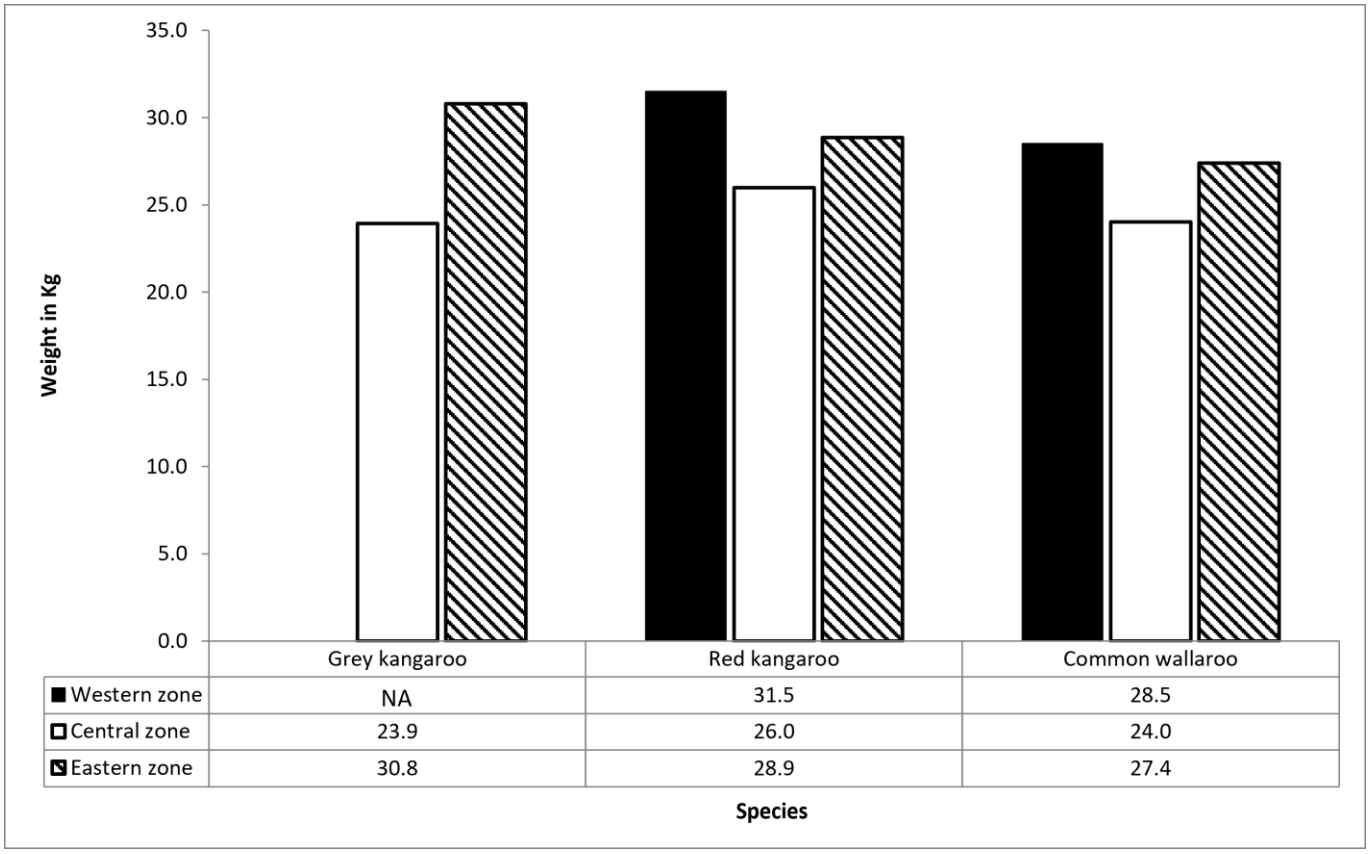
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
◆ Western	29.0	29.4	28.4	27.8	27.4	28.4	30.3	29.7	29.7	29.6	31.3	32.8	31.3
■ Central	25.2	23.0	24.0	24.4	23.8	24.0	24.0	24.6	24.1	23.5	24.1	25.0	25.0
□ Eastern	25.8	26.5	28.7	28.7	29.0	28.9	28.8	30.4	30.5	30.0	29.3	30.9	30.3

Figure 11—Average dressed carcass weight of Queensland female macropod carcasses 2010–2022



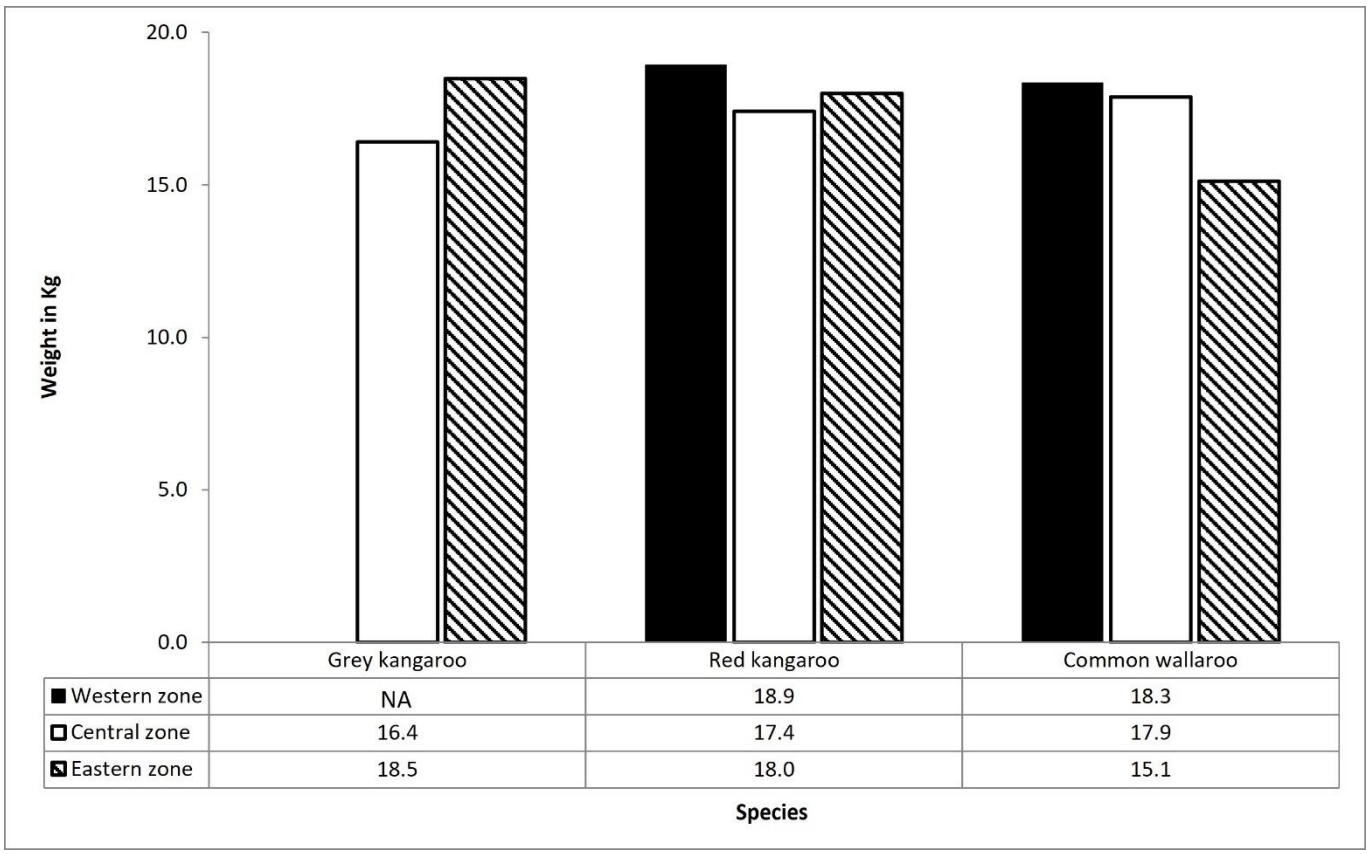
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
◆ Western	20.3	24.3	23.3	18.5	NA	NA	NA	NA	18.4	18.5	18.8	19.0	18.9
■ Central	17.7	17.9	18.2	19.2	17.5	17.9	18.0	17.5	17.5	17.3	17.3	17.0	16.9
□ Eastern	17.9	21.1	21.0	17.8	17.5	17.5	17.9	18.8	18.3	18.6	18.5	18.7	18.4

Figure 12—Average dressed carcass weight for male macropod species harvested in 2022. Note there is no quota for eastern grey kangaroos in the western zone.



	Grey kangaroo	Red kangaroo	Common wallaroo
Western zone	NA	31.5	28.5
Central zone	23.9	26.0	24.0
Eastern zone	30.8	28.9	27.4

Figure 13—Average dressed carcass weight for female macropod species harvested in 2022. Note there is no quota for eastern greys in the western zone.



	Grey kangaroo	Red kangaroo	Common wallaroo
Western zone	NA	18.9	18.3
Central zone	16.4	17.4	17.9
Eastern zone	18.5	18.0	15.1

4. Special quotas

No special quotas were allowed for in 2021. A special quota can only be considered once the harvest quota for a particular species has been reached in a harvest zone. Situations where a special quota may be considered include where there is a high macropod population density in a particular area or where adverse weather conditions such as prolonged drought are having a detrimental effect on macropod health.

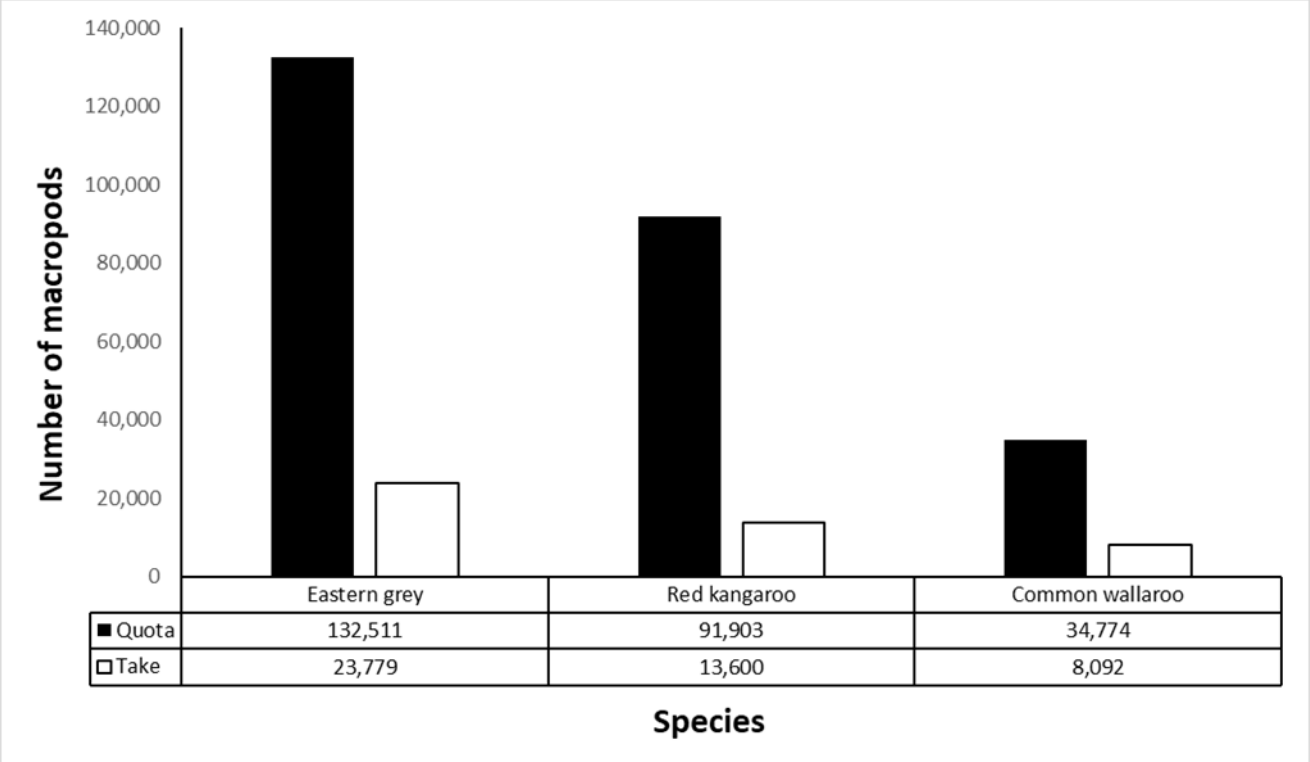
5. The extent of non-commercial harvest mortality

There are many forms of macropod mortality outside of the commercial harvest. It is possible for the department to collect and report data on two forms of non-commercial harvest mortality which can be considered when determining commercial quotas. These are damage mitigation permits (DMPs), and disease outbreak mortality.

6. Damage Mitigation Permits

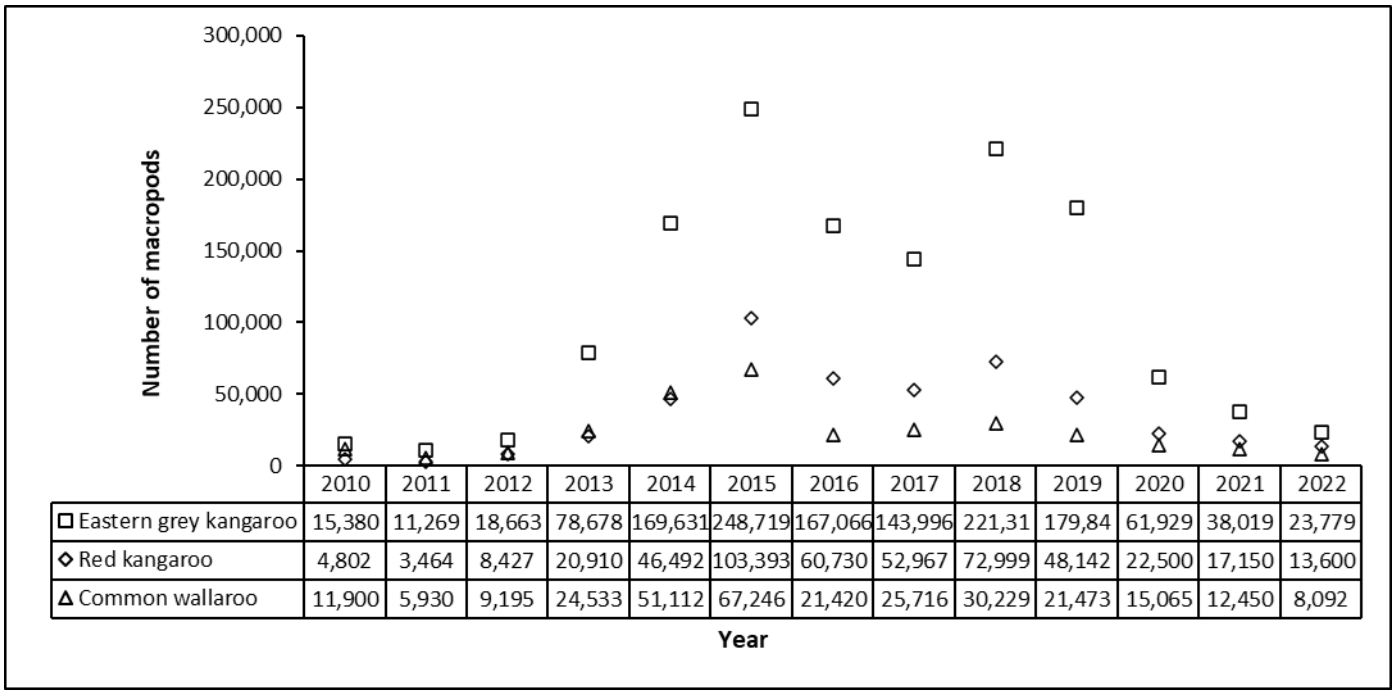
Damage mitigation permits (DMPs) are issued by the department where macropods may cause damage or loss of property or present a threat to human health or wellbeing. The issuing of these permits is limited to a maximum of 2% of the estimated population for each species. The total take under this permit system remains below the allowable quota (Figure 14). For comparative purposes, a summary of the macropods taken under DMPs for each species for 2010–2022 is outlined in Figure 15.

Figure 14—Macropod quota and allowable take for damage mitigation permits in 2022



	Eastern grey	Red kangaroo	Common wallaroo
■ Quota	132,511	91,903	34,774
□ Take	23,779	13,600	8,092

Figure 15—Macropods taken under damage mitigation permits 2010–2022



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
□ Eastern grey kangaroo	15,380	11,269	18,663	78,678	169,631	248,719	167,066	143,996	221,31	179,84	61,929	38,019	23,779
◇ Red kangaroo	4,802	3,464	8,427	20,910	46,492	103,393	60,730	52,967	72,999	48,142	22,500	17,150	13,600
△ Common wallaroo	11,900	5,930	9,195	24,533	51,112	67,246	21,420	25,716	30,229	21,473	15,065	12,450	8,092

7. Disease outbreak mortality

No reports of disease outbreaks in macropods across Queensland were reported during 2022.

8. Long-term population, quota and harvest trends

Since 1991, the Queensland Government has conducted an annual program of aerial surveys by helicopter to directly monitor populations of the three macropod species covered by the Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2018–2022. These surveys occur over 22 representative monitor blocks across the state and are utilised to obtain population estimates that inform the quota.

In 2011 a correction factor of 1.85 was applied to population estimates for common wallaroos in Queensland. Prior to 2011 a conservative correction factor of 1.2 was used for common wallaroos. Current harvesting rates (quotas ranging from 10 to 20% of population estimates) are considered sustainable (Caughley et. al. 1987, Hacker et. al. 2002). None of the three commercially harvested species has shown a consistent decline in abundance since 1992 (Figure 16) which would necessitate a reassessment of the harvest take and species conservation status. Whilst no consistent declines have been observed, the macropod populations in Queensland have fluctuated over time. Of these species, the eastern grey kangaroo is consistently most abundant across the harvest zones, followed by the red kangaroo. Common wallaroos are the lowest. All three species occur in numbers of over 1,000,000 across the harvest zones.

Figures 16–19 below outline data on the three commercially harvested macropod species pertaining to population, commercial harvest quota and macropods commercially harvested and sold for the years 1992–2022. It should be noted that harvest quotas are calculated from population estimates based on aerial surveys conducted in the previous year to the harvest. Combined population estimates, quota and harvest data have been used for the period post-regionalisation to enable comparison with data collated prior to this period. As quotas are set as a constant proportion of the populations, they fluctuate as populations fluctuate, however, numerous factors influence harvest rates for commercial macropods. These include population levels, market forces, environmental conditions and access by harvesters. As a consequence, there is no clear pattern or trend in the proportion of the quota harvested since 1992.

Figure 16—Estimated macropod populations in the Queensland macropod harvest zones 1992–2022

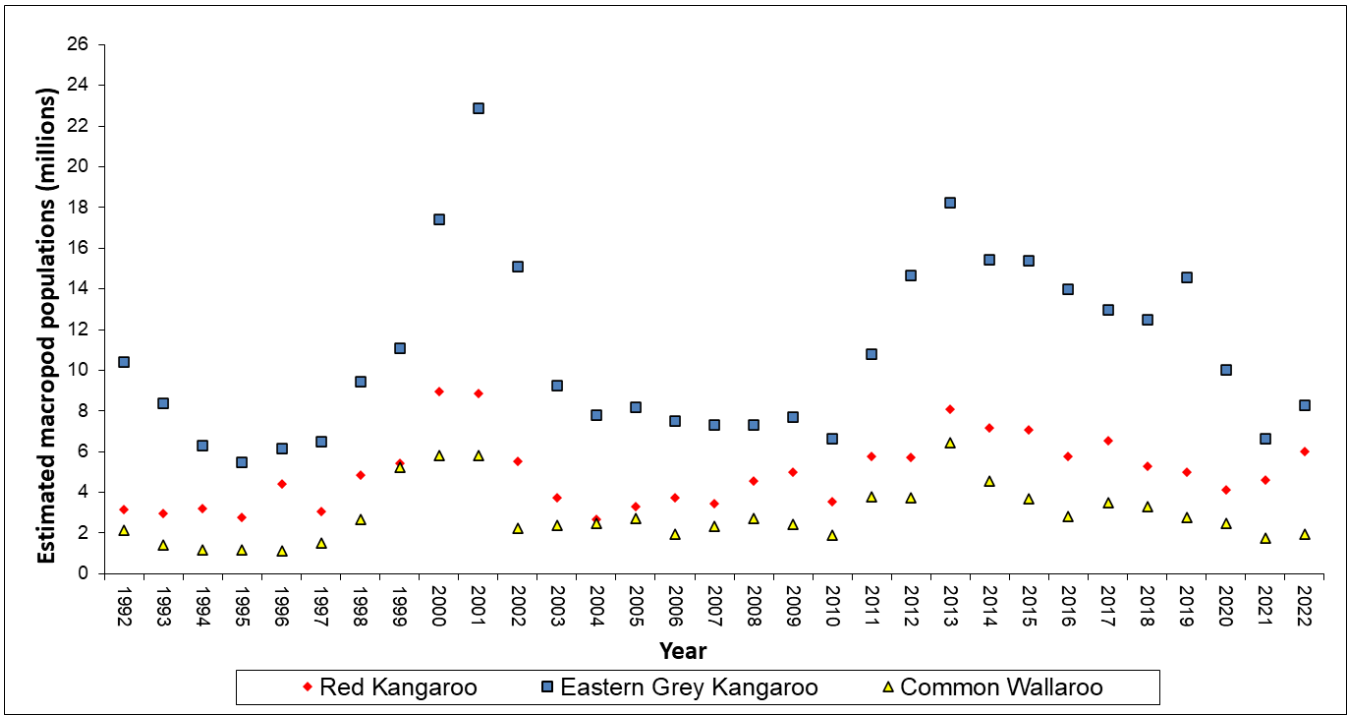


Figure 17—Long-term estimated populations (± SE), harvest quotas and actual harvest of red kangaroos. Note: Harvest quotas are based on survey estimates from the previous year

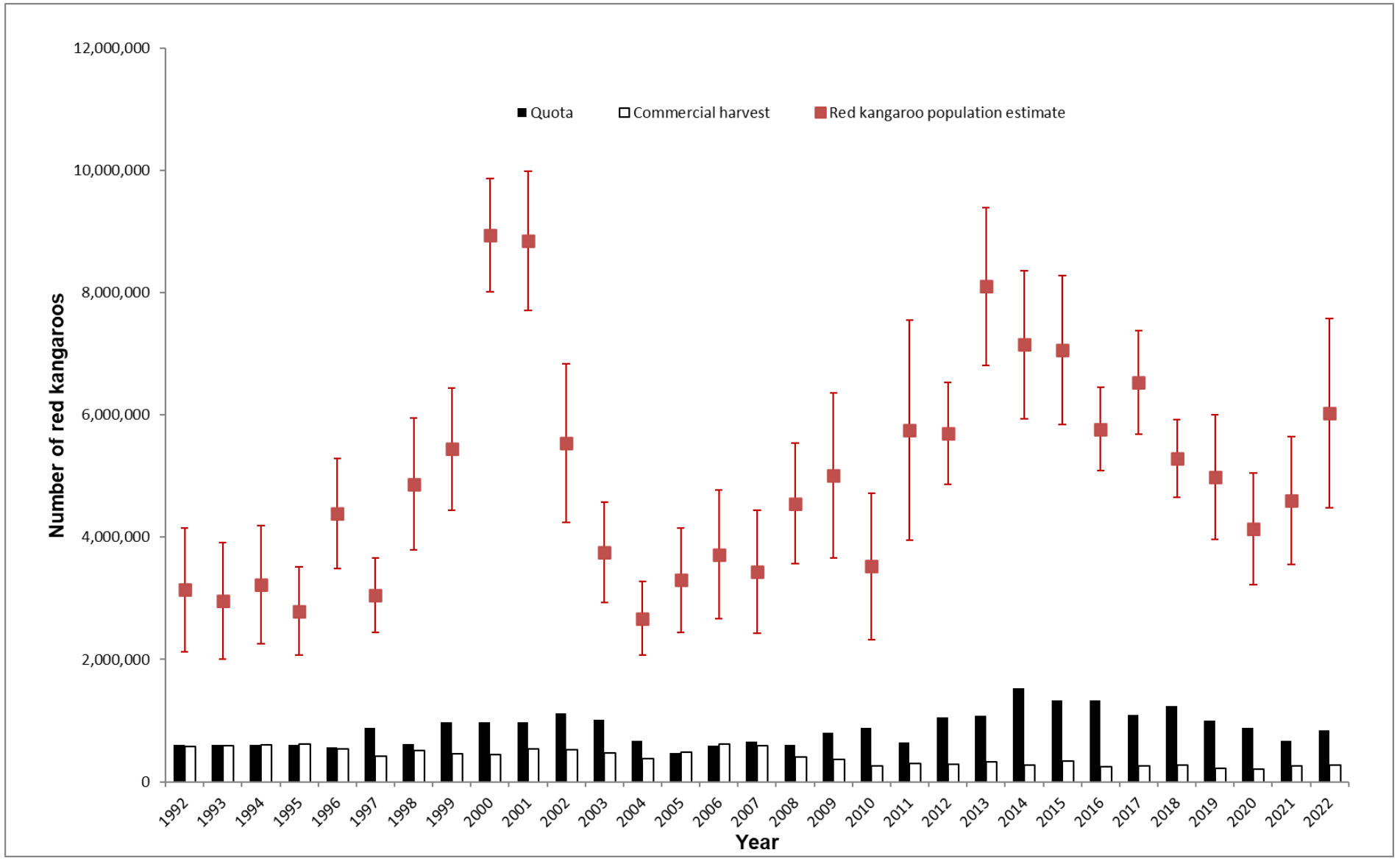


Figure 18—Long-term estimated populations (± SE), commercial harvest quotas and actual harvest of eastern grey kangaroos. Note: Harvest quotas are based on survey estimates from the previous year

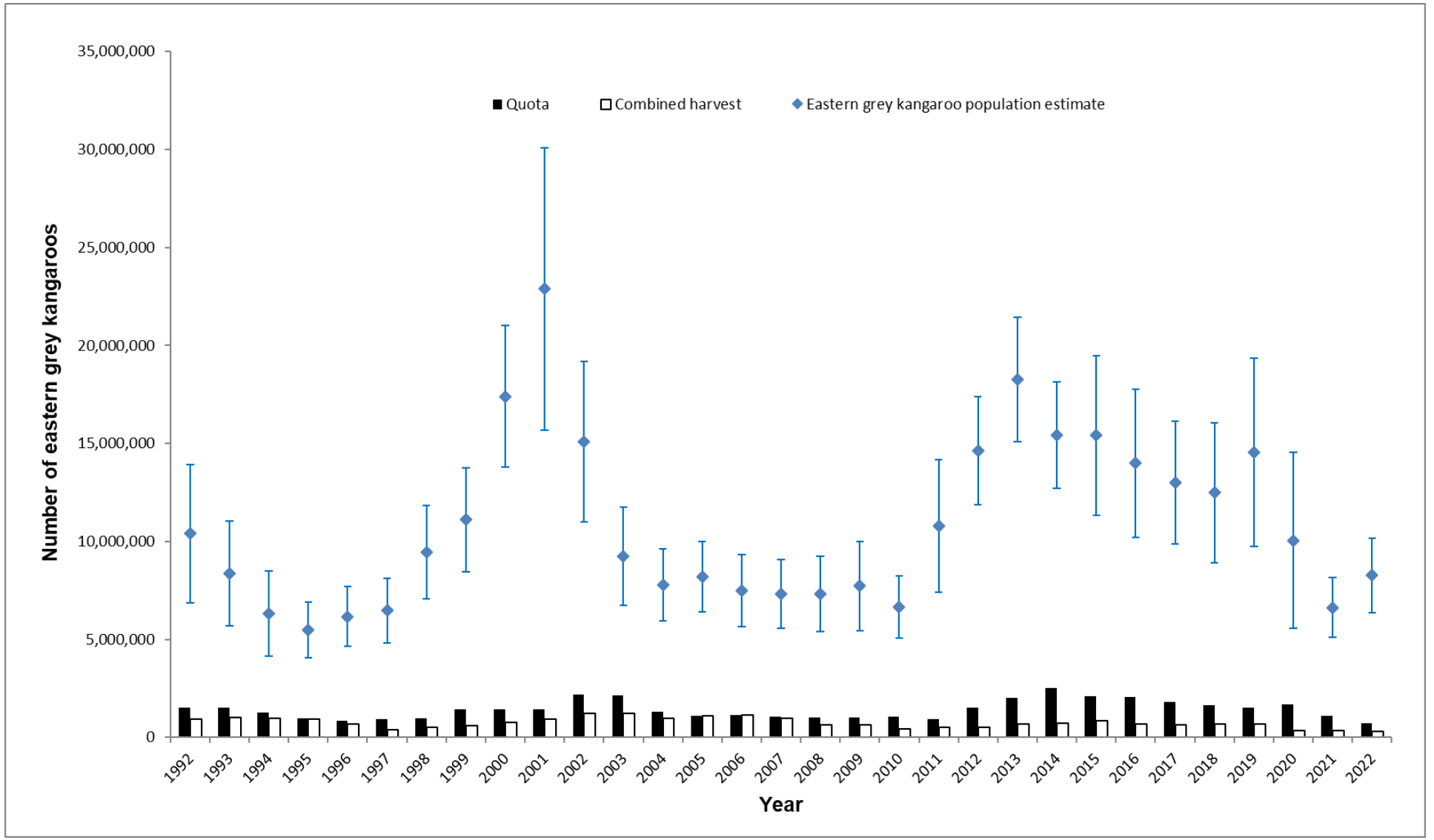
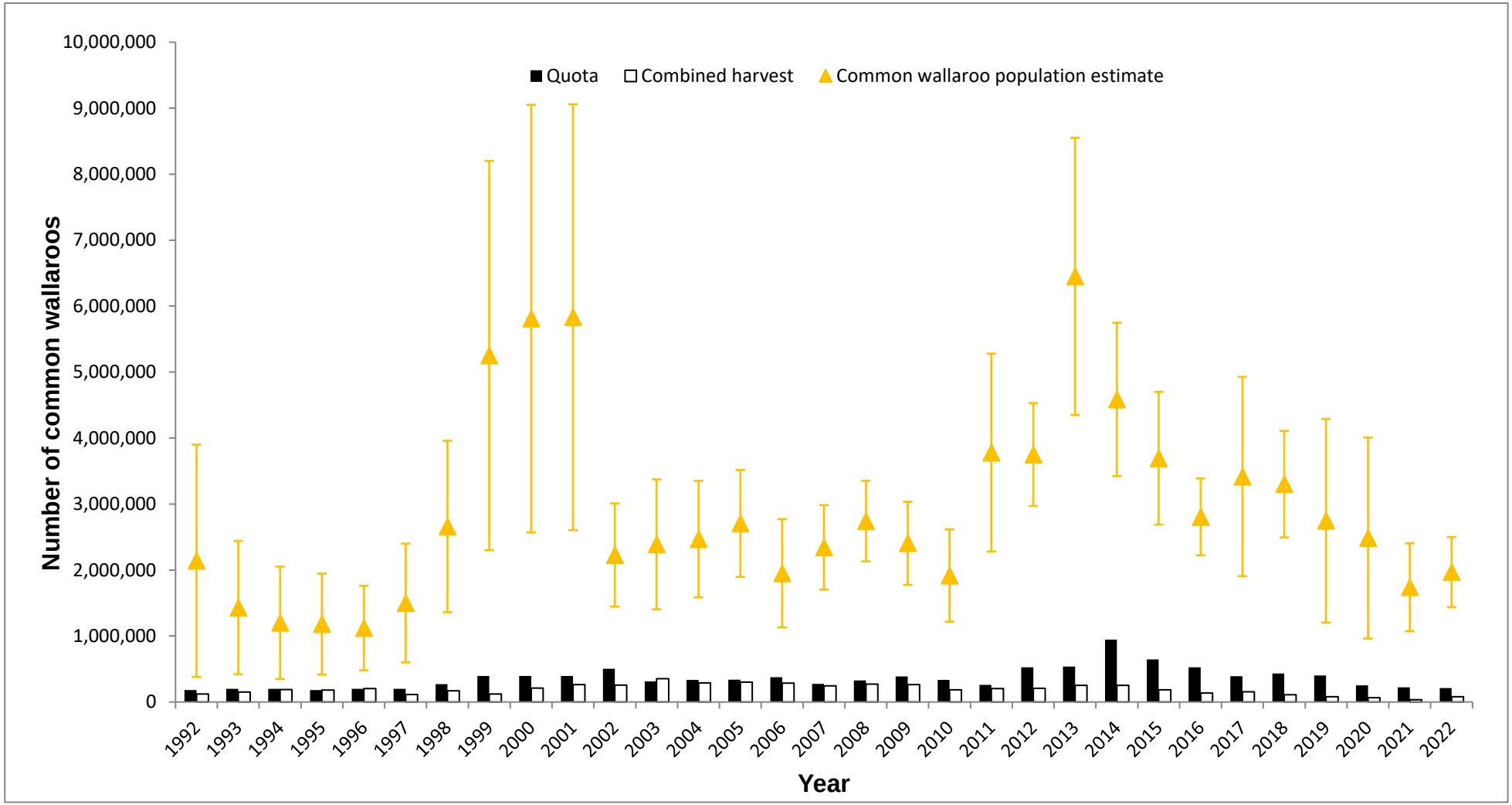


Figure 19—Long-term estimated populations (± SE), commercial harvest quotas and actual harvest of common wallaroos. Note: Harvest quotas are based on survey estimates from the previous year



9. Compliance

During the 2022 harvest period, inspections of dealer sites, processor sites and harvesters were completed state wide. Overall compliance was considered good. Inspections were targeted towards higher risk sites.

The harvest of macropods in Queensland requires compliance, investigation and enforcement resources. Compliance activities are conducted both infield and through desktop auditing. There are five compliance officers authorised under the *Nature Conservation Act 1992* within the Macropod Management Unit. The majority of macropod harvest field compliance activities are undertaken by these officers; however the department undertakes collaborative compliance work with wildlife rangers, the Queensland Police Service, and Safe Food Production Queensland (SFPQ).

Other compliance activities are conducted by the Macropod Management Unit including licence audits, harvest return analysis, report compilation and licence application assessment. Licensees are assessed at time of application against suitability criteria. These include accrual of 10 or more demerit points, convictions against the *Nature Conservation Act 1992* or any other matters relevant to the person's ability to carry out the activities authorised by the licence in a competent and ethical way.

Compliance priorities for the 2022 harvest period were:

- Harvesters hold the appropriate licence.
- Macropods are correctly tagged with a valid 2022 harvest period tag.
- Macropods are tagged with the correct species/zone tag.
- Prohibited (non-head-shot) macropods are not traded.
- Compliance with the National Code of Practice for the Humane Shooting of Kangaroos and Wallabies for Commercial Purposes 2020.
- Harvesters produce/carry valid written landholder consent as per licence conditions.
- Ensure timely, complete, and accurate harvest returns.

The integrity of a quota relies upon the premise that tags are not reused or applied to the wrong species or used in the wrong harvest zone. To objectively and adequately demonstrate effective compliance levels, an inspection target of 1% of the overall harvest; with 10% of the sample inspected at a detailed level has been established.

9.1 Inspections

The department conducted both programmed and unannounced inspections of harvesters, dealers and processors. During the 2022 harvest period, officers conducted 25 harvester inspections and 69 licensed dealer site inspections which included 13 licensed processor site inspections. Other complaints and evidence of non-compliance were also investigated.

Throughout the harvest period, inspection targets were a minimum of 1% of the harvest being visually inspected and 0.1% of the harvest being inspected in detail. The visually inspection target of 1% was met, with 1.8% of the total harvest visually inspected. The detailed inspection target of 0.1% was also met, with 0.27% of the harvest inspected in detail (Table 6). All operating processor sites were inspected during the 2022 harvest period. In addition to planned inspections, compliance officers investigate reports of illegal harvesting to the fullest extent possible.

Table 6—Inspection targets

	Inspection target	**Inspections conducted**
Visual inspection—1% of overall harvest	6,122 – (1%)	11,396 – (1.8% of harvest)
Detailed inspection of 0.1% of harvest	612 – (0.1%)	1,684 – (0.27% of harvest)

9.2 Compliance and enforcement measures

Breaches of legislation are subject to enforcement action such as warning notices, fines, licence cancellation or suspension and prosecution.

Enforcement action is taken in accordance with the department's enforcement guidelines. Written warnings or infringement notices are given at the discretion of compliance officers, in accordance with the department's enforcement guidelines and in consultation with the Manager. Decisions on possible prosecutions involve consultation with the Manager and department's litigation unit.

During the 2022 harvest period, a total of 33 infringement notices and 346 warning notices were issued (Table 7). During the 2022 harvest period nine licences were suspended and one was cancelled due to compliance issues.

Two licence holders appeared in the magistrate's court during 2022 for separate offences under the Nature Conservation Act 1992. One licence holder pleaded guilty to one charge and received a $5000 fine with no conviction recorded. The second licence holder pleaded guilty to seven charges and was fined $2000 plus ordered to pay $3,906 in conservation value.

Table 7—Detail of offences during 2022

Dealer	PIN	Warning
Fail to give return for each period/by prescribed time. CWL	2	4
Harvester		
Attach a tag to wildlife of a species other than the species for which the tag is supplied or approved.	1	1
Fail to comply with condition of authority.	2	16
Fail to give return of operations for each month of the harvest period/by prescribed time. CWHL	14	300
Fail to properly attach a tag immediately after macropod is dressed.	8	16
Failure to have record complete, accurate, legible and in ink.	1	2
Failure to keep record at prescribed place.		1
Failure to record relevant particular within prescribed time.		2
Failure to show authority or identification without reasonable excuse. (S318 offence)		4
Keep, use, sell or give away a prohibited macropod.	2	
Take protected animal without lawful authority.	1	
Trespass by taking wildlife on any land, or entering any land for the purpose of taking wildlife - individual	2	
Total	33	346

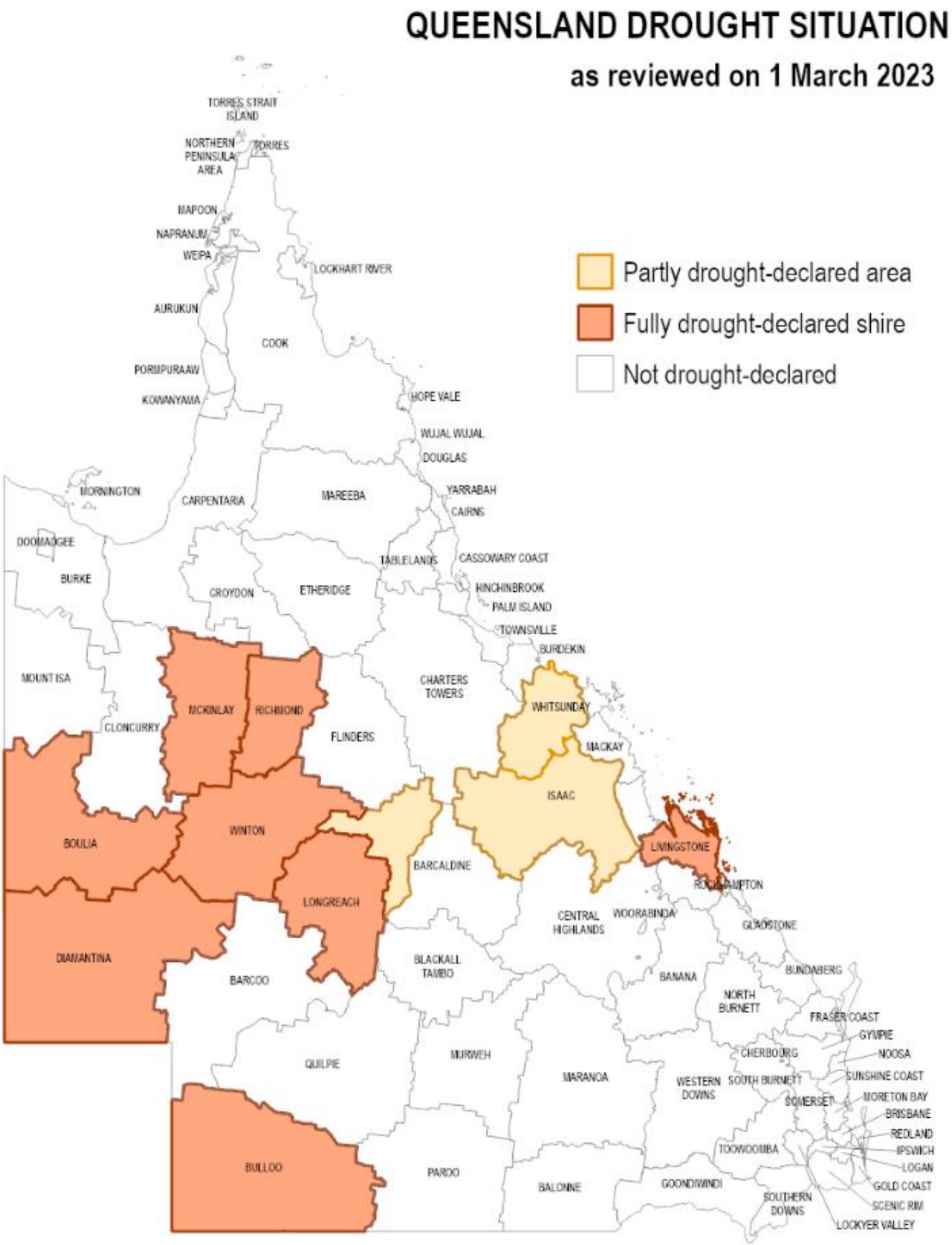
10. Climate

Queensland's temperatures in 2022 were average across much of the macropod harvest zones however some southern areas recorded below average temperatures. Rainfall for the majority of the zones was above average with some local areas particularly in the south eastern harvest areas receiving significantly greater than average rainfall. Overall, it was the wettest year for the Queensland macropod harvest area since 2011.

After seven to eight years of drought the majority of the harvest zones are no longer drought declared. The exception to this is in the far north of the Central north harvest zone and the south west of the western zone (see Figure 20).

Macropod population densities have increased slightly across many aerial survey blocks in 2022 which is consistent with drought and rainfall events in previous decades. It is expected that further density increases are possible in the coming years which will be monitored.

Figure 20— Queensland drought declarations as at 1 March 2023



11. Research and experiments

During 2022 the Macropod Management Unit increased the survey coverage using helicopters and also conducted extensive fixed wing aerial surveys across the Queensland harvest zones. Data collected from these surveys will be analysed and used to inform ongoing population estimate models. Preliminary results from this work is expected to be published in 2023.

In October 2020, the department commenced a collaborative project with the Department of Agriculture and Fisheries. An aspect of the project will be looking into the effects of fencing on macropods. This project will be ongoing to May 2024.

The Macropod Management Unit was approached by the University of Southern Queensland in October 2022 to assist a postgraduate student investigate the role of scavengers accessing macropod carcass dumps as a by-product of the commercial harvest. This work is also expected to start in 2023.

The department continues to respond to requests for data from researchers and other stakeholders as they arise.

12. Program improvements

In early 2022 the Macropod Management Unit based in Charleville underwent a staffing restructure and moved office. All staff within the unit are now authorised officers under the *Nature Conservation Act 1992* and will be integral to the future compliance activities within the unit.

New harvest tags were introduced during the 2021 harvest period. The tags were manufactured in Australia from Tyvek and meet all the requirements of being tamper proof, single use and individually identified. The tags feature a QR code that corresponds to the unique identification number and are colour coded for each species with a section of artwork created by Adrian Combarngo. During 2022 the Tyvek tags were found to meet the majority of conditions encountered during the harvest process but were also found to fray under certain circumstances. During 2022 the Macropod Management Unit explored solutions to this problem and have entered into a contract with a new tag supplier to produce harvest tags manufactured from 100% recyclable HDPE. These tags continue to be manufactured in Australia with all the benefits of the Tyvek tags yet they cannot fray and are also litter free.

During 2020, the department provided the ability for harvester and dealer permit holders to enter and submit their record returns online in the Online Services system. Throughout 2021, the online return function was utilised by approximately 20% of permit holders, while the remaining 80% were still using the paper-based record book. Policies and procedures implemented during the 2022 harvest period by the Macropod Management Unit improved the uptake of online returns to approximately 80% of permit holders. Further initiatives are planned for the 2023 harvest period.

13. References

Anon. 2017. Queensland Wildlife Trade Management Plan for Export – Commercially Harvested Macropods – 2018–2022. Queensland Parks and Wildlife Service; Brisbane.

Bureau of Meteorology, 2020, Annual Climate Summary for Queensland, http://www.bom.gov.au/climate/current/annual/qld/archive/2018.summary.shtml, accessed February 2019.

Caughley, G., Shepard, N. and G. Short. 1987. Kangaroos, their ecology and management in the sheep rangelands of Australia. Cambridge University Press; Cambridge.

Hacker, R., McLeod, S., Druhan, J., Tenhumberg, B. and U. Pradhan. 2002. Managing Kangaroos in the Murray-Darling Basin. Technical Report to the Murray-Darling Basin Commission; Canberra.

Appendix 1

Queensland Wildlife Trade Management Plan for Export—Commercially Harvested Macropods 2018–2022, performance indicators

Aim	Action	Performance indicator	Progress in 2022
Aim 1. Manage and administer commercial operators via licensing.	**Action 1.**1 All relevant activities are licensed in accordance with the applicable Queensland legislation and department policy.	**1.1.1** All licences across Queensland are assessed, processed and issued appropriately in accordance with Queensland legislation.	Achieved
		1.1.2 Databases are maintained to ensure licensee information is current and accurate.	Achieved
	Action 1.2—Licence conditions are applied where required.	**1.2.1.** Licence conditions are imposed on licences where required and in accordance with Queensland legislation.	Achieved
		1.2.2. Information notices explaining conditions and rights of review are provided with all licences with licence conditions.	Achieved
Aim 2. Monitor macropod populations and set quotas.	**Action 2.1**. Populations within the commercial harvest zones will be estimated annually based on aerial surveys.	**2.1.1.** Macropod population estimates are obtained annually via aerial surveys throughout the life of this plan.	Achieved
	Action 2.2. Commercial macropod harvest quotas will be set in accordance with the provisions of this plan.	**2.2.1.** All commercial macropod harvest quotas are set in accordance with the provisions of the plan.	Achieved
		2.2.2. The Commonwealth Government is advised of commercial harvest quotas for the following calendar year by 30 November.	Achieved
		2.2.3. If Commonwealth approval is required for quotas set above the rates specified in this plan as part of an adaptive management experiment, such approval is obtained before the additional quota is implemented.	NA
		2.2.4. The quota report is made available to the public via the department's website.	Achieved
	Action 2.3. Special macropod harvest quotas will be set in accordance with the provisions of this plan.	**2.3.1**. Special macropod harvest quotas are set and utilised in accordance with the provisions of this plan.	NA
	Action 2.4. Macropod populations will be monitored indirectly throughout the life of this plan.	**2.4.1.** Where a harvest zone showed greater than 40 per cent female harvest, then appropriate management action would be taken.	NA
	Action 2.5. Annual population estimates for commercially harvested macropod species will be assessed against predetermined trigger	**2.5.1.** Where an estimated population for a population estimate region within the Central harvest zone falls below a set trigger point of 1.5 standard deviations below the long term average for that region then the harvest quota will be reduced for that region in the next calendar year.	Achieved

Aim	Action	Performance indicator	Progress in 2022
	points in each population estimate region.	**2.5.2.** Where an estimated population for a population estimate region within the Central harvest zone falls below a set trigger point of two standard deviations below the long-term average for that region then the harvest quota will be further reduced or suspended for that region in the next calendar year.	Achieved
		2.5.3. Where an estimated population in the Western or Eastern zones falls below a set trigger point of 1.5 standard deviations below the long term average then the harvest quota will be halved for that zone in the next calendar year. When the estimated population exceeds a trigger point of two standard deviations below the long term average for that zone then the harvest quota will be suspended for that zone in the next calendar year.	Achieved
Aim 3. Ensure humane treatment of commercially-harvested macropods.	**Action 3.1**. The department will work with TAFE Queensland South West or other accredited provider to ensure that all potential harvesters are competent to achieve the standards set out in the code of practice before being issued a license.	**3.1.1.** All successful applicants for harvester's licences have completed the approved training course and the approved shooting test.	Achieved
		3.1.2. Approved course of training is reviewed and revised if necessary during the life of this plan.	Achieved
		3.1.3. The code of practice is provided to all new applicants when they receive their licence and is available on the department website.	Achieved
	Action 3.2. The department will monitor compliance with the code of practice by commercial macropod industry operators.	**3.2.1.** All licensees who are found to have breached licence conditions in relation to animal welfare are issued with warning notices, PINs or are prosecuted as appropriate.	Achieved
	Action 3.3. The department will contribute to nationally-focused research in improving animal welfare outcomes, if requested.	**3.3.1.** Research proposals from universities and other research institutions concerned with the welfare aspects of the commercial harvest of macropods are considered during the life of this plan. Assistance to such research will be provided where appropriate.	Achieved
Aim 4. Monitor macropod industry compliance.	**Action 4.1.** The department will undertake both regular and opportunistic monitoring of compliance by commercial macropod industry operators.	**4.1.1.** A minimum of one per cent of harvested macropods are inspected by departmental staff to ensure compliance with Queensland legislation and licence conditions.	Achieved
		4.1.2. During the life of this plan all macropod processing works in Queensland are inspected by department staff annually and dealer sites are inspected opportunistically to ensure compliance with Queensland legislation and licence conditions.	Achieved
		4.1.3. During the life of this plan, harvester's vehicles loaded with macropod carcasses are inspected opportunistically to ensure compliance with Queensland legislation and licence conditions and the results of these inspections are documented.	Achieved

Aim	Action	Performance indicator	Progress in 2022
	Action 4.2. Activities not in accordance with Queensland legislation and Queensland Wildlife Trade Management Plan 2018–22 will be investigated and where an offence has been committed, and it is appropriate, prosecute.	**4.2.1.** Reports of unlicensed activities and activities in breach of legislation are investigated to the fullest extent possible, and where sufficient evidence is available offenders are issued with warning notices or PINs or prosecuted as appropriate.	Achieved
	Action 4.3. The accuracy of industry returns will be continually monitored during the life of this plan.	**4.3.1.** During the life of this plan, incoming industry returns are scrutinised and discrepancies are investigated and resolved.	Achieved
	Action 4.4. A compliance database will be maintained to support investigations, inspections and audits.	**4.4.1**. A compliance database of investigations, inspections and audits is maintained.	Achieved
Aim 5. Undertake program reporting and review**.**	**Action 5.1.** An annual report on the Queensland Wildlife Trade Management Plan 2018-22 will be prepared and submitted to the Commonwealth.	**5.1.1.** An annual report on the operation of the Queensland Wildlife Trade Management Plan 2018–22 for each calendar year is submitted to the Commonwealth Government by the end of March of the following year.	Achieved
		5.1.2. All annual reports prepared during the life of this plan are available on the department's website.	Achieved
	Action 5.2. The review of this plan will commence no later than 12 months prior to the expiry of this plan in order to assess the success of the plan in achieving its goal.	**5.2.1.** The Queensland Wildlife Trade Management Plan 2018–22 will be reviewed no later than 12 months prior to the expiry of this plan.	Achieved
		5.2.2. The success of the current plan in achieving its goal is assessed by measuring the aims against the performance indicators.	Achieved
		5.2.3. The results of the plan review are presented to the Commonwealth no later than six months prior to the expiry of this plan.	Achieved
Aim 6. Facilitate adaptive management and research.	**Action 6.1.** The department will respond to changes as they arise. Changes made to the management program will be communicated to all relevant stakeholders.	**6.1.1.** Changes to the macropod management program will be communicated to relevant stakeholders via the department’s website and directly to stakeholders where appropriate.	Achieved
	Action 6.2. The department will facilitate research into the ecology and harvest management of macropods.	**6.2.1.** Research proposals from universities and other research institutions concerned with the ecological aspects of the commercial harvest of macropods are considered during the life of this plan. Assistance to such research will be provided where appropriate.	Achieved

Aim	Action	Performance indicator	Progress in 2022
Aim 7. Promote community awareness and participation.	**Action 7.1.** Relevant public documents will be made available on the department's website.	**7.1.1.** Throughout the life of this plan, the department's website contains the following information as a minimum standard: – current and previous wildlife trade management plans – monthly tag issue and commercial harvest statistics – historical harvest statistics – population survey reports – current population estimates – current commercial quotas – contact information for the Macropod Management Unit – current forms for commercial macropod licences.	Achieved
	Action 7.2. Publicly available information will be provided to interested parties on request.	**7.2.1.** Publicly available macropod management information is distributed to interested parties as soon as practicable after such a request.	Achieved
	Action 7.3. Where appropriate, relevant macropod management program staff will participate in media interviews and prepare media releases.	**7.3.1.** Departmental staff participate in interviews with the media where appropriate.	Achieved
		7.3.2. Media releases are prepared when appropriate for issues of interest to the community such as population surveys and the release of the quota for the next calendar year.	Achieved
	Action 7.4. Relevant information regarding licensing arrangements will be developed as required and made available to all licensees.	**7.4.1.** A copy of the current Harvest Period Notice and code of practice is made available to harvesters and dealers throughout the life of this plan to ensure that licensees are aware of relevant licensing requirements and responsibilities.	Achieved