Animal Research Statistics Tasmania

Annual Report

Number 26 (2021)

September 2022

Department of Natural Resources and Environment Tasmania

Tasmanian Government

This report has been compiled in accordance with Section 35 of the *Animal Welfare Act 1993* from animal usage statistics submitted by institutions licensed under the Act for the period 1 January 2021 to 31 December 2021.

Animal Research Statistics Tasmania Annual Report Number 26 (2021)
Animal Biosecurity and Welfare Branch
Biosecurity Tasmania
Department of Natural Resources and Environment
GPO Box 44 Hobart 7001
Published September 2022

Summary

This report details animal use for research and teaching purposes in Tasmania from 1st January to 31st December 2021. The summaries and analyses in this report are compiled from project data submitted by licensed institutions as required by the *Animal Welfare Act 1993*. The report complies with nationally agreed definitions for the collation of statistics of animal use for scientific purposes and includes data collected on live, non-human vertebrates and cephalopods.

Of the 51 licensed institutions required to report, 32 used animals during the reporting period, comprising 15 Tasmanian resident institutions and 17 institutions head quartered interstate. The Department of Natural Resources and Environment Tasmania (NRE Tas) and Commonwealth Scientific and Industrial Research Organisation (CSIRO) were the only government departments reporting animal use in 2021. There were also 10 academic, 8 not-for-profit institutions and 12 commercial entities.

There were 2 animal ethics committees (AECs) resident in Tasmania supervising projects within the Tasmanian jurisdiction during 2021 – the NRE Tas AEC and the University of Tasmania (UTAS) AEC.

The NRE Tas AEC provided project assessment and monitoring services to 23 external licensed institutions during 2021. 18 of these external institutions reported animal use in 23 projects. The NRE Tas AEC also supervised 17 internal departmental projects that reported animal use during the reporting period.

A total of 205 individual projects were reported in 2021, which is a small increase on the previous year when 194 projects were reported. Of these, 79 were projects involved in understanding biology and 58 were environmental studies. The remaining projects were undertaken for the purposes of education, health and welfare and/or management and production. In 2021, a total of 322,842 animals or sightings of animals were reported, recording a decrease from the 353,177 reported in 2020. State border restrictions during 2021, due to COVID-19, prevented some researchers from interstate jurisdictions undertaking planned projects in Tasmania. Birds were the animal category accounting for the majority of this decrease in animal use numbers or sightings of animals in 2021.

UTAS continued to be the most active research institution using animals for scientific purposes in Tasmania, reporting data from 131 projects representing 65% of all projects reported. The number of animals reported by UTAS decreased from 338,937 in 2020 to 285,163 in 2021. Several wild bird and native mammal observational projects accounted for most of this change. Such significant fluctuations in specific animal use from one year to the next is common in a dynamic research context.

Native mammals were the most numerous category recorded in 2021, accounting for 168,318 animals in 44 projects. Camera trap sighting accounted for 151,625 (90.1%) of native mammal use. Fish and birds were the next most common animal categories reported. Fish accounted for 60,003 of animals used and birds (mainly in observational studies) accounted for 52,806 in 54 projects. Consistent with this, most animals reported were in environmental studies.

Laboratory rodent use during 2021, involved 14,686 rats and mice. This is an increase from the 7,258 reported in 2020, but less than the 22,616 reported in 2019. Many of these laboratory mammals were used in colony establishment or maintenance which fluctuates from time to time. The other major contributor to overall numbers was the exotic feral animal category representing 16,067 animals, of which most were camera trap sightings. Relatively small numbers of domestic mammals, reptiles and amphibians were reported in 2021, as occurred in 2020.

Relatively low impact procedures were applied to 89% of animals and were utilised in 72.2% of projects in 2021. Only one project in Tasmania in 2021, involving the eradication of feral cat species, had procedures where death was an end point or deliberate measure.

1 Introduction

This report details animal use for research and teaching purposes in Tasmania from 1 January to 31 December 2021. Section 1 provides background information about the legislative requirements for reporting and how the data is compiled each year, noting any significant changes to the procedures that may affect comparisons. Section 2 outlines the animal use in Tasmania during the reporting period. Summary statistics are provided in Section 3.

1.1 Regulation of animal research in Tasmania

Animal research in Tasmania is regulated via several mechanisms:

(a) Animal Research Legislation

Part 4 of the *Animal Welfare Act 1993* (the Act) deals with animal research including teaching. Since proclamation of this part of the Act on 1 April 1996, institutions are required to be licensed by the Minister if they wish to use animals in research and teaching in Tasmania.

The Act allows licensed institutions to conduct animal research as approved by Animal Ethics Committees (AECs) in a self-regulatory environment. The institutions are, however, subject to inspection by Inspectors of Animal Research at least on an annual basis. In practice this is applied as an ongoing monitoring program with emphasis on ensuring the respective AECs are compliant and functioning and institutions are fulfilling their responsibilities according to the approved Code of practice.

The definition of 'animal research' in the Act is:

'a procedure, test, experiment, inquiry or study on an animal which –

(a) is undertaken to develop, demonstrate or acquire knowledge, or techniques, in an area of science or teaching; and

(b) is likely to have a significant adverse effect on the welfare of the animal.'

Regulation 7 of the *Animal Welfare (General) Regulations 2013* provides for an inspector to determine whether an activity is or is not animal research. A precautionary approach is used in these determinations, based on an assessment of the risk of welfare compromise from the proposed use of, for example, novel techniques, therapeutics, nutrients, or changes in habitat. It should be noted that an institution may permit their AEC to approve research activities that require approval, for example for funding or publishing purposes, that have been previously determined by the inspector not to be research.

The Act has provision for the inclusion of additional species by regulation within the meaning of 'animal' for particular purposes under the Act. The class *Cephalopoda* which includes octopus, cuttlefish, nautilus and squid, was afforded this status of 'animals' for the purposes of research in January 2009. The reporting of cephalopods has been mandatory since then.

(b) The Code

A core condition of licensing is compliance with the approved Code of Practice. Currently this is the nationally agreed *Australian Code for the Care and Use of Animals for Scientific Purposes 8th edition (2013)* (the Code). The Code and associated reference documents are published by the National Health and Medical Research Council (NHMRC) and provide specific requirements and guidance for the use of animals for scientific purposes to investigators, teachers, institutions and AECs. The eighth edition of the Code received Ministerial approval in October 2013, superseding the seventh edition. The Code was updated in 2021 to incorporate a new Section 7: Cosmetic Testing. No change in statistical reporting came about as a result of the new Code coming into operation.

The Code requires that a decision to use animals must be properly justified, and animals may only be used after due consideration of the '3Rs' (replacement, reduction and refinement). The principles of the '3Rs' are, in brief, that animals may only be used where there are no alternatives enabling ***replacement*** of animals with other methods; where ***reduction*** is applied such that the number of animals used is absolutely necessary to achieve the aims of the project; and where ***refinement*** of techniques is used to reduce the welfare impact on animals approved for use and promote the animals' wellbeing.

Provided research and teaching activities are properly approved and monitored within a licensed institution by its AEC, and the institution, its AEC and researchers and teachers comply with the Code, the use of animals for research and teaching is protected from sections 8 and 9 of the Act *(*cruelty and aggravated cruelty). While sections 8, 9 and 10 of the Act do not apply to the reasonable use of fish in commercial and recreational activities, the research provisions do apply to aquatic vertebrates and cephalopods as well as terrestrial vertebrates.

Research project proposals are examined, approved and monitored by an AEC that has been constituted and authorised by the institution in compliance with the approved Code. Institutions that have too few projects or are not sufficiently resourced to have their own AEC may use the services of another institution's AEC. For instance, in 2021, 23 external institutions were approved to use the NRE Tas AEC services for project assessment and monitoring: of these institutions, 18 used animals in the reporting period.

(c) Licensing

Any individual or organisation may apply to be a licensed 'institution' for the purposes of conducting animal research in Tasmania. The conditions of the licence require compliance of the institution and any persons under its auspices with the Tasmanian animal welfare legislation and the approved Code.

Licence applicants from outside Tasmania must agree to comply with the Code and provide evidence that they are equivalently licensed in their resident jurisdiction to ensure adequate monitoring of their AEC's compliance with the Code by an equivalent regulator.

Institutions that share another institution's AEC must do so via a formal sharing agreement that complies with the principles set down in the Code and that also address any other issue specific to the host or external institution.

(d) Annual reporting

Institutions are required to provide an annual report to the Minister on their activities in relation to animal research under section 35 of the Act. The report is to contain *the numbers and types of animals used* and *the types of animal research carried out*. A report summarising the institutional reports (this document) is to be tabled in both Houses of Parliament prior to 30 September each year.

(e) Inspectors

The Minister appoints inspectors under section 36 of the Act. Inspectors advise the Minister on matters relating to the granting and cancellation of licenses, the conduct of the AECs and general compliance with the approved research Code of Practice. The monitoring of compliance includes the inspection of animal holding facilities within each institution, attending meetings of AECs and the collation of the annual State report. Inspectors have specific powers to investigate suspect non-compliance with the animal research provisions of the Act.

(f) Permits for wildlife and fisheries

Institutions intending to use wildlife, including native fish, for scientific purposes must also apply to the NRE Tas Environment Heritage and Land Division and Inland Fisheries Service for appropriate permits.

1.2 Annual reporting in Tasmania

A reporting format was developed by the then Code Liaison Group (now known as the Code Reference Group or CRG) of the NHMRC for the purpose of compiling annual national statistics. It was endorsed by the Tasmanian Animal Welfare Advisory Committee as suitable for State reports to avoid NHMRC-funded institutions having to duplicate reporting effort.

During 2007, regulators from all states and territories agreed on an amended animal category and type list with animals grouped into more logical categories. This list was supported by the CRG and was used for the 2007 report in Tasmania and nationally from 2008. The calendar year reporting period is used as it is consistent with most other agencies collecting animal use statistics.

Data is submitted by the responsible investigator for each project during the calendar year and collated into a standard spread sheet by their institution. If no animals were used in the reporting period despite approval to do so, the project is not included in this report.

Meaningful reporting of wild animal use that may be described as using indirect or proxy procedures, such as the collection of feathers from vacated nests, remains a contentious area and is best resolved on a case-by-case basis by the AEC involved during the project approval process where factors such as animal disturbance and damage to habitat can be explored.

Only animals used in the Tasmanian jurisdiction are required to be noted in this report. There are, however, animals used in other jurisdictions or Commonwealth waters that are reported by licensees where they have no alternative means of reporting. Where these reports impact significantly on the data or interpretations presented in this report they are noted.

Each jurisdiction collects data on animals that fall within its legislative scope. If comparing data across jurisdictions, it should be noted that, for example, fish or cephalopods may not be required to be reported in some jurisdictions. Similarly, Tasmania does not require reporting of decapod crustaceans although 'crustaceans' are included if reported.

The Tasmanian animal use statistics are published on the NRE Tas website once they have been tabled in Parliament (https://nre.tas.gov.au/biosecurity-tasmania/animal-biosecurity/animal-welfare/animal-research#Annualreportingofanimalusestatistics). Most other Australian jurisdictions also publish a summary report at least. A national repository of animal use statistics is no longer maintained.

1.2.1 Explanation of the reporting format

The reporting spread sheet requires the selection of one option from a drop-down list in each of the three main areas listed below (purposes, procedures, and animals). All projects are reported separately.

A project sometimes has multiple purposes, and it is quite common for a project to deploy multiple procedures and use multiple animal categories, and these are reported separately for each project. Examples of the types of activities that should be reported within each procedure group are provided in the reporting spread sheet to improve reporting precision.

Like previous reports, animals may be deployed to or simply observed in multiple projects in the reporting period. This leads to a degree of double counting that cannot be avoided. The overall number of individual animals used is therefore likely to be an overestimate and may be more precisely understood to be 'uses'. The numbers reported against purposes and procedures are considered accurate, however.

The inclusion of comments within the reporting format enables some contextualisation of the animal use and assists with resolving double counting issues.

1.2.2 Application of categories

Animal categories - within each animal category there are several types. Sub-types may also be included where it is considered they are of particular interest to the State. For reporting purposes, the term 'animal' covers fully metamorphosed juveniles, embryos in the latter half of gestation, eggs in the latter half of incubation and larval fish that can feed independently. This definition complies with the National Statistics of Animal Use for Scientific Procedures and is consistent with the Code. All life stages of relevant species are included under the Act, however.

The categories routinely reported against are:

Amphibians

Aquatic animals (non-mammalian)

Birds

Domestic mammals (including livestock species)

Exotic feral mammals

Exotic zoo animals

Laboratory mammals

Native mammals (including marine mammals)

Primates

Reptiles

Projects involving exotic zoo animals or primates have not been conducted in Tasmania for some time although those options remain available.

Purpose of Project – categorises the reason/s for the study.

Understanding Biology eg comparative anatomy studies, animal physiology, adaptations of wild animals, wildlife survival studies.

Health and Welfare eg cancer research, drug therapy, residue and toxin testing, vaccine development.

Management or Production eg effect of nutrition supplements, evaluating husbandry techniques, animal production trials.

Education eg classroom studies on animal behaviour or physiology.

Environmental Study eg population surveys, acquisition of museum specimens.

Procedures used – broadly describes the severity of the procedures used (ie the impact on the animal).

The following procedures are reported on:

Camera Trapping Only: This category was introduced in the 2014 report. It was previously included in *Observation Involving Minor Interference*). It refers to studies exclusively using continuous or motion-triggered photographic recording of animals via fixed cameras with or without lures/baits in the aquatic or terrestrial environment. Note that camera trap numbers relate to sightings rather than individual animals as it is usually not possible to differentiate between individuals of the same species.

Observation Involving Minor Interference: studies in which the normal activities of animals are impacted in a minor way.

Examples of Observation Involving Minor Interference:

- Wildlife studies involving repeated spotlighting or intrusion into groups of animals or nursing animals.
- Feeding trial, such as Digestible Energy determination of feed in a balanced diet.
- Behavioural study with minor environmental manipulation.
- Teaching of normal, non-invasive husbandry such as handling, grooming, etc.
- Production of products, such as hormones or drugs, in milk or eggs from genetically modified animals that are subject to normal husbandry procedures only.

Note some observational data collection has no conceivable impact on animals. For instance, the detection of bat species by recording echolocation calls or collection of scats in the wild environment. Where an institution identifies and reports such activity it is recorded against their name but no further reference is made in the report.

Minor Conscious Procedure: animal is subjected to minor procedures that would normally not require anaesthesia. Any pain is minor or short term and analgesia is usually considered unnecessary although it may be used; some distress may occur as a result of trapping or handling.

Examples of Minor Conscious Procedure:

- Tail tipping and toe clipping for identification of animals.
- Injections, blood sampling in conscious animal.
- Minor dietary or environmental deprivation or manipulation, such as feeding nutrient-deficient diets for short periods.
- Trapping and release as used in species impact studies, etc.
- Trapping and humane euthanasia for collection of specimens.
- Shearing and similar livestock management practices.

Minor Operative Procedure with Recovery: animal is rendered unconscious, with as little pain or distress as possible. A minor procedure such as cannulation or skin biopsy is carried out and the animal is allowed to recover. Depending on the procedure, pain may be minor or moderate and post-operative analgesia may be appropriate.

Field capture using chemical restraint methods is also included here.

Examples of Minor Operative Procedure with Recovery:
- Biopsies under anaesthesia or sedation.
- Cannulations under anaesthesia or sedation.
- Sedation/anaesthesia for relocation, examination, or injections/blood sampling.

Major Surgery With Recovery: generally, animal is rendered unconscious, with as little pain or distress as possible. A major procedure such as abdominal or orthopaedic surgery is carried out and the animal allowed to recover. Post-operative pain is expected to be considerable and requiring analgesia if possible.

Examples of Major Surgery with Recovery:
- Orthopaedic surgery.
- Abdominal or thoracic surgery.
- Transplant surgery.

Minor Physiological Challenge: animal remains conscious for some or all of the procedure. There is interference with the animal's physiological or psychological processes. The challenge may cause only a small degree of pain/distress or any pain/distress is quickly and effectively alleviated.

Examples of Minor Physiological Challenge:
- Minor infection, minor or moderate phenotypic modification, early oncogenesis.
- Arthritis studies with pain alleviation.
- Prolonged deficient diets, induction of metabolic disease.
- Polyclonal antibody production.
- Antiserum production.

Major Physiological Challenge: animal remains conscious for some or all of the procedure. There is interference with the animal's physiological or psychological processes. The challenge causes a moderate or large degree of pain/distress which is not quickly or effectively alleviated.

Examples of Major Physiological Challenge:
- Major infection, major phenotypic modification, oncogenesis without pain alleviation.
- Arthritis studies with no pain alleviation, uncontrolled metabolic disease.
- Isolation or environmental deprivation for extended periods.
- Monoclonal antibody raising in mice.

Animal Unconscious Without Recovery: the animal is rendered unconscious under controlled circumstances with as little pain or distress as possible. Any pain is minor and brief and does not require analgesia. Procedures are carried out on the unconscious animal that is then killed without regaining consciousness.

Examples of Animal Unconscious Without Recovery:
- Laboratory mammals killed humanely for dissection, biochemical analysis.
- Teaching surgical techniques on live, anaesthetised animals that are not allowed to recover following the procedure.

Note that in Tasmania research involving trawling of wild fisheries is included within this procedural group as it is considered to describe more accurately the impact on the individual animal captured this way. Although trawling results in the death of most animals captured, death is not a measure in itself and is thus not considered to be a 'death as the end point' activity (see below).

Death as the End Point: the aim of the experiment requires the animal to die unassisted, ie not euthanased, as death is a critical measure of the experimental treatment.

Examples of Death as the End Point:
- Toxicological experiments (eg ascertaining LD50s)
- Assessing the relative resistance to the effects of infections if euthanasia cannot be provided at any stage to achieve the aim of the experiment.

2 Animal research activities for 2021

2.1 Institutions

There were 51 licensed institutions required to report animal use during 2021. They are listed below.

ADE Consulting Group (QLD) Pty Ltd, Queensland (no animal use in 2021)

Agersens IC Pty Ltd (Gallagher eShepherd Pty Ltd), Queensland *

Apiam Animal Health, Victoria

Australian Museum, New South Wales (no animal use in 2021)

Australian National University (ANU), Australian Capital Territory

Biosis Pty Ltd, Victoria (no animal use in 2021)

Birdlife Tasmania (Birdlife), Tasmania

Central Queensland University, Queensland (no animal use in 2021)

Charles Sturt University, New South Wales

Commonwealth Scientific and Industrial Research Organisation, (CSIRO)

DairyTas, Tasmania (no animal use in 2021)

Dawbuts Pty Ltd, NSW (no animal use in 2021)

Deakin University (Deakin), Victoria

Department of Natural Resources and Environment Tasmania (Primary Industries, Parks, Water and Environment, includes the Inland Fisheries Service), Tasmania*

Elanco, New South Wales (no animal use in 2021)

Entura (Hydro Tasmania Group), (Entura), Tasmania

Freshwater Biomonitoring (Freshwater), Tasmania

Friends of Maatsuyker Island (FoMI), Tasmania

GHD Pty Ltd (GHD), New South Wales

Gray, Paul, (Independent researcher), Tasmania

Huon Aquaculture Co Pty Ltd, Tasmania (no animal use in 2021)

James Cook University, Queensland (no animal use in 2021)

Jacobs Group, Victoria

Jurox Pty Ltd, New South Wales (no animal use in 2021)

Macquarie University, New South Wales (no animal use in 2021)

Monash University (Monash), Victoria (no animal use in 2021)

Mooney Nick Independent researcher, Tasmania

Murdoch University (Murdoch), Western Australia

Natural Resource Management – South (NRM Sth), Tasmania

Natural Resource Management –North (NRM Nth), Tasmania

Nature Advisory P/L, Victoria

New South Wales Department of Primary Industries, New South Wales (no animal use in 2021)

North Barker Ecosystem Services (North Barker), Tasmania

Pocus Team (Point of Care Ultrasound Scanning), New South Wales (no animal use in 2021)

Robertson, Dr Bruce Ingram, (Independent researcher), Victoria (no animal use in 2021)

Scibus, New South Wales (no animal use in 2021)

Sustainable Timber Tasmania (STTAS), Tasmania

TasNature (Peter Tonelli), Tasmania

Tassal Operations Pty Ltd (Tassal), Tasmania

Tasmanian Land Conservancy, Tasmania

Treidlia Biovet Pty Ltd (Treidlia), New South Wales

University of Adelaide (UAdelaide), South Australia

University of New England, New South Wales(no animal use in 2021)

University of New South Wales (UNSW), New South Wales

University of Queensland (UQLD), Queensland

University of Sydney (USydney), New South Wales

University of Tasmania (UTAS), Tasmania

University of Technology Sydney, New South Wales (no animal use in 2021)

Victorian Wader Study Group Inc (VWSG), Victoria

Western Sydney University, New South Wales

Zoetis Australian Research and Manufacturing, New South Wales, (no animal use in 2021)

* Agersens IC Pty Ltd changed its name to Gallagher eShepherd Pty Ltd in June 2021 upon acquisition by Gallagher (New Zealand).

*Department Primary Industries, Parks Wildlife and Environment was renamed Department Natural Resources and Environment Tasmania on 1st December 2021.

There were two AECs resident in Tasmania (NRE Tas and UTAS) in 2021. While the Australian Antarctic Division's AEC is also resident in Tasmania, the Division was not licensed in Tasmania during 2021 as it was not conducting animal research within the Tasmanian jurisdiction.

Of the 51 licensed institutions, 32 reported animal use in Tasmania in 2021. The active institutions comprised 15 Tasmanian resident and 17 head quartered interstate.

The number and variety of institutions conducting animal research in Tasmania fluctuates according to academic and commercial interests for the period. Licensed institutions include the CSIRO, environmental consultants, corporate farmers, individuals, or not-for-profit organisations as well as the conventional academic and government research entities.

The 15 Tasmanian resident institutions using animals in 2021 comprised 1 academic institution (UTAS), 1 government department (NRE Tas), 6 commercial entities and 7 not-for-profit organisations. Interstate institutions using animals comprised one Australian Government corporate entity, 9 academic institutions, 6 commercial entities, and 1 not-for-profit organisation. There were no overseas institutions licensed in the state during 2021.

Table 1 lists the institutions that used animals and the categories and numbers of animals involved, including a comparison with 2020 data. Table 2.1 summarises animal categories used; Table 3 provides detail on the types of animals used by each institution, and Figure 1 provides a 5-year visual comparison.

In 2021, 322,842 animals or sightings of animals were reported within 205 projects (compared to 353,177 in 194 projects in 2020).

The major contributor to this decrease in animal use over 2020 figures, was a decrease in the numbers of birds (see sections 2.2 and 2.4) reported in camera trapping projects.

Changes in the number of individual projects provides a rough guide to the level of activity an institution is engaged in or the level of interest an animal category or purpose is attracting from one reporting period to the next. This report includes figures illustrating the relative level of activity over the past five years in terms of project number per categories of animals (Figure 2), purposes (Figure 4) and procedures (Figure 6). Care should be taken interpreting this data on an institutional basis as projects may be the result of a licensed institution contracting or otherwise collaborating with another licensee ('lead' institution) to provide the research service entirely or a proportion of projects. The data from collaborative projects is therefore reported by the 'lead' institution to avoid double counting and maintain commercial-in-confidence.

UTAS continued to be the most active institution in Tasmania during 2021, with 131 or 65% of all projects reported (Table 1), using or sighting 285,163 animals. All animal categories except amphibians were represented in the UTAS report. The number of animals reported by UTAS in 2021 was decreased compared to the number of animals used or sighted in 2020 (338,937). The decrease was due mainly to decreased sightings recorded in wild bird observational projects.

The NRE Tas Environment, Heritage and Land Division and Biosecurity Tasmania reported animal use in 7 and 10 projects respectively identifying a total of 16,545 animals or 5.15% of all animals reported in 2021. There was a substantial increase in the number of animals reported by the NRE Tas divisions on 2020 figures, attributed to two camera trap projects which resulted in significantly higher number of native and feral mammals reported in the NRE Tas projects than in previous years. The NRE Tas projects included a wide variety of subjects from shy albatross, Tasmanian devil and orange bellied parrot conservation to the development of fish vaccines and feral cat and feral pig control strategies.

Projects conducted by commercial entities involved aquatic animals in ecological surveys of waterways for various development or monitoring purposes, fauna and bird surveys for terrestrial development purposes and sheep and cattle in projects aimed at improving sheep and cattle health, welfare, and production.

In 2021, all not-for-profit organisations reporting animal use in 2021 were supervised by the NRE Tas AEC and accounted for 4,933 animals in 9 projects. Of these projects, 7 involved wild bird research and 2 involved native wildlife research.

Ten academic institutions were active in Tasmania during 2021. Apart from UTAS, academic institutions reported a total of 3,197 animals (compared with 3,695 were reported in 2020), with each institution having between 1 to 9 projects targeting a small range of animal categories, with aquatic animals, birds, domestic and native mammals featuring.

Of the 24 external licensees using the NRE Tas AEC in 2021, 18 reported animal use, totalling 14,429 animals in 21 projects. Commercial enterprises using the NRE AEC (Apiam, Entura, Freshwater, Jacobs Group, Nick Mooney, Nature Advisory, North Barker, STTAS, Tassal and Treidlia) reported a total of 9,496 animals across 13 projects.

CSIRO has now moved to using their own interstate AECs for all new projects. Projects conducted by CSIRO under NRE AEC supervision have now been completed. CSIRO undertook 4 projects in Tasmania in 2021 involving 1831 animals (1320 sheep, 500 birds and 11 fish).

2.2 Animal categories

Tables 1 and 2.1 summarise the number of animals and projects reported within animal categories for 2021. Table 3 provides detail on the types of animals within each category used by each institution. Figures 1 and 2 illustrate a rolling 5 year distribution of animals and projects respectively within animal categories.

Native mammals was the most commonly reported category with 168,318 being reported. This is similar to that reported in 2020 (163,775 native mammals). There were 44 projects using native mammals, up from 36 in 2020. UTAS projects accounted for 157,209 native mammals of which most were camera trap sightings. One project alone, using camera traps only, accounted for 134,000 native mammal sightings.

Aquatic animals accounted for 60,812 animals in 2021, which is similar to the number (60,954) used in 2020. The number of projects using aquatic animals decreased from 62 in 2020 to 51 in 2021 but was still the second most active area of research for 2021 in project terms. The largest user of aquatic animals was UTAS with a total of 51,672, of which 50,869 were fish. Only 168 cephalopods were reported (in a single project) by UTAS in 2021. (2020, where

26,363 cephalopods were reported in a single project.) Aquatic research projects included a range of subjects including the development of fish vaccines, aquaculture production, feral fish species control strategies, conservation strategies for threatened marine species, impacts of climate change on marine species and ecological surveys. One biomedical project, using 12,026 zebra fish, is an example of the increasing use of 'laboratory' fish in this field of research. Crustaceans do not need to be reported. However, sometimes institutions may include crustaceans' numbers despite this not being a requirement. If reported, these animal numbers are usually included in this report for interest. In 2021 there were 446 crustaceans reported by UTAS in 3 projects.

Birds were the most active area of research for 2021 in terms of project numbers, while being the third most common category in terms of animal numbers reported. In 2021, 52,806 birds were reported. This is a decrease over the number reported for 2020 (98,220). While there was an increase in the number of projects using birds, from 48 in 2020 to 54 in 2021, the number of bird sightings recorded in camera trap projects were less than the number recorded in 2020. Fluctuations in specific animal use and sightings from one year to the next is common in a research context. In 2021, state border restrictions, due to COVID-19, prevented some researchers from interstate jurisdictions undertaking planned bird survey projects in Tasmania. This also impacted recorded bird use/sightings in 2021. One UTAS project, using camera traps only, accounted for 34,000 bird sightings. Another 3 UTAS projects recorded a further 6,262 wild bird observations, and together, these 4 UTAS projects contributed the majority of bird use. The remainder of bird use was mostly population surveys of wild birds.

Laboratory mammal use involved 14,686 mammals (all rodents) in biomedical research in 2021. This was a 102% increase on 2020 figures when 7,258 laboratory mammals were reported. (cf. 22,616 in 2019 and 17,204 reported in 2018). Some of these fluctuations in animal use numbers may occur due to colony establishment and maintenance, which varies from time to time. The number of animals maintained in breeding colonies fluctuates with specific project requirements and is therefore highly unpredictable. There were 34 projects using laboratory mammals in 2021, a decrease from the 51 projects in 2020. Some 778 rats and mice were used for training and assessment of rodent experimental techniques.

Exotic feral mammal use involved 16,067 animals, which was similar to that reported in 2020 (15,940). Of these, 98% were camera trap sightings. The projects involved mainly cats, rabbits, hares, rats and mice.

Domestic mammal use remained comparatively low in 2021 with 8,538 head used in 16 projects, which is an increase on the number reported in 2020 (5,516 in 18 projects). The majority were reported in livestock management projects, aimed for instance, at calf management, grazing behaviour, improved animal welfare or breeding success of terrestrial livestock species.

Reptile use in 2022 involved 1,598 lizards and skinks in 13 projects, up from 1,324 reptiles used in 21 projects in 2020. UTAS projects accounted for most (97%) of the reptiles reported in 2021. The remainder were reported as part of ecological surveys.

Amphibian use in 2021 involved 17 frogs across 2 projects. Commercial organisations undertaking environmental and ecological surveys (GDH and North Barker) accounted for all the users of amphibians in 2021 (compared with 2020 where 178 frogs and tadpoles were used across 3 projects, all of which were ecological surveys).

2.3 Purposes

Table 2.2 summarises the research and teaching purposes for which animals were used during 2021. Figure 3 and 4 illustrates a rolling 5-year distribution of animals and projects respectively within purposes. Table 4 presents detail on the purposes and procedures applied to animal types within categories.

Environmental studies used 224,807 animals (or 70%) in 2021. This represents a 12% decrease in the number of animals used or sighted for this purpose compared to that used or sighted in 2020 (252,606). However, the number of projects (58) increased compared to the 49 projects undertaken in 2020 for this purpose. Environmental projects involved large numbers of macropods, wild birds, fish, and possums, however, almost all animal categories and types were represented.

Understanding biology projects used 40,784 animals in 79 projects in 2021, compared to 86,054 animals and 82 projects in 2020. This is a decrease in animal use numbers and reverses the upward trend that has occurred over the past 3 years. Fish (19,110), native mammals (8,995) and wild birds (7,733) featured, accounting for over 88% of animals reported in this type of project.

Management and production research accounted for 38,116 animals used in 24 projects, compared to 10,770 animals in 22 projects in 2020. The majority of animals used for this purpose were fish (21,748), laboratory mice and rats (8,689 and 738 respectively), as part of rodent colony management, maintenance and breeding projects, followed by cattle (4,238) and sheep (1,320). Of the 21,748 fish recorded in this category, 16,510 were camera trap sightings in a single UTAS camera trap project with the remainder mostly farmed salmonids).

Health and welfare studies reported a substantial increased level of animal use in 2021 (15,771 animals) when compared to that used in 2020 (4,098). However, the number of projects conducted for this purpose only increased from 43 in 2020 to 46 in 2021. As has been the case for several years, the majority of projects and animals used in this area were fish (12,011), livestock (1,661) or laboratory mice and rats (1,152) aimed at improving salmonid, livestock or human health and welfare respectively.

Education projects reported for 2021, used significantly more animals (4,951) than reported in 2020 (459), and involved eight projects. 778 of animals used in this category were laboratory rodents used in the training of experimental techniques. Observational fauna surveys undertaken as part of a teaching program by UTAS accounted for majority of increased animal use (3,148) in this category. 497 fish and 284 domestic mammals were also used or sighted in educational projects.

2.4 Procedures

Table 2.3 summarises the procedures used on animals during 2021. Figures 5 and 6 illustrate rolling 5-year distributions of animals and projects respectively, according to various procedural categories. The procedures are listed below in descending order of animal use; procedures are listed in the tables in ascending order of welfare impact.

Camera Traps Only sightings decreased slightly during 2021 with 221,177 sightings reported in 20 projects. This is compared to 250,116 sightings in 17 projects in 2020. The vast majority of sighting were recorded in environmental projects, with the remainder in management and production projects. Most sightings were of native mammals (151,624) followed by birds (36,811), fish (16,510) and exotic feral mammals (15,641).

Observation with Minor Interference procedures were applied to 44,975 animals in 78 projects in 2021. This is an increase on 2020 figures of 40,631 animals in 44 projects. Birds (14,789), native mammals (14,700) and aquatic animal (11,013) surveys were the main users of observational procedures in 2021.

Animal Unconscious, No Recovery procedures were applied to 29,677 animals in 50 projects. While the number of projects using these procedures, is similar to that in 2020 (46 projects), the number of animals used in these projects was greater than in 2020 (20,737). These procedures were applied mainly to fish (24,035) and laboratory mammals (5,282) as has been the case for several years. With regard to aquatic animals, these procedures were applied in wild fisheries, aquaculture disease management and production projects and a biomedical project involving zebrafish. The large representation of laboratory mammals is consistent with the invasive nature of some biomedical research where recovery is not in the interests of the animal.

Minor Conscious Procedures were applied to 20,375 animals across 55 projects in 2021, which was an increase in relation to both the number of projects and the number of animals used compared to 2020 figures (11,514 animals used in 52 projects). These procedures were applied mainly to laboratory mammals (8,943), cattle (3,132) and aquatic animals (3,047). A number of the projects involving laboratory mammals in this category were addressing routine laboratory rodent colony maintenance. Minor conscious procedures were also applied in projects addressing, population monitoring (eg via bird banding and telemetry), domestic and wild animal disease and genetic surveillance, and habitat use.

Minor Physiological Challenge was applied to 2,915 animals across 7 projects in 2021. Farmed fish projects accounted for 2,712 of animals reported in this category. Laboratory mice accounted for a further 90 animals. These procedures were applied to 26,963 animals across 11 projects in 2020. However, a single project addressing the impact of seismic surveys on marine species, which involved 26,363 cephalopods accounted for most of the animal use in this category in 2020 and accounts for the significant decrease in animal use numbers in this category in 2021 compared to 2020.

Major Physiological Challenge was applied to 5,974 animals in 11 projects in 2021. This was a slight decrease in project numbers but an increase in animal use numbers compared to the 2,142 animals used in 12 projects in 2020. As for previous years, the majority of projects using these procedures were concerned with farmed salmonid disease

prevention, accounting for 5,883 animals reported. Laboratory rodents accounted for the remaining animals subjected to this procedure (22 mice and 69 rats).

Minor Operative Procedures With Recovery were applied to 2,844 animals. This is an increase on 2020 figures (563 in 2020). There was also a slight increase in the number of projects using this procedure, with 14 in 2021 (compared to 12 in 2020). These procedures are generally applied to a wide range of animals as they include anaesthesia with recovery – a common procedure for restraining wild mammals, fish, and birds. In 2021 44% of animals subjected to these procedures were fish species addressing specific disease issues.

Major Surgery With Recovery procedures were applied to 80 animals in 2021 in 5 projects. (In 2020 these procedures were applied to 473 animals in 6 projects). These procedures were applied exclusively to mice involved in neuropathology research.

Death as the End Point procedures are rarely used in Tasmania. Only one project, involving the eradication of feral cat species, had procedures where death was an end point or deliberate measure in Tasmania in 2021.

The relatively low impact procedures of *Camera traps only, Observation with Minor Interference, Minor Conscious Procedures* and *Minor Physiological Challenge* were applied to 89% (or 292,286) animals and in 72% of projects in 2021.

3 Tables and figures All summarised data is displayed in this section.

Table 1 Summary of animal categories used by institutions in 2021

Institution	Project number	Amphibia	Aquatic animals	Birds	Domestic mammals	Exotic feral mammals	Lab mammals	Native mammals	Reptiles	Total
Agersens IC	1				83					83
Apiam An Health	2				4306					4306
ANU	5			298				16		314
Birdlife Tas	2			3562						3562
Charles Sturt Uni	1			300						300
CSIRO	4		11	500	1320					1831
Deakin Uni	2			336						336
DPIPWE	17		5030	266		868		10381		16545
Entura	2		1948						7	1955
FoMI	1			1087						1087
Freshwater Bio	1		154							154
GDH	6	5		34				37		76
Gray, Paul	1							1		1
Jacobs group	1					28		114		142
Mooney, Nick	1			20						20
Murdoch Uni	2					19		87		106
NRM Nth	1			33						33
NRM Sth	1			125						125
Nature Advisory	2			2830						2830
North Barker	1	12							32	44
STTAS	2			20						20
Tas Nature	1			2						2
Tassal	1							1		1
Tas Land Conservancy	1			2				56	1	59
Treidlia	1				24					24
UAdelaide	1				1223					1223
UNSW	1		497							497
UQLD	1		1500							1500
USydney	9							416		416
UTAS	131		51672	43304	1582	15152	14686	157209	1558	285163
VWSG	1			66						66
WestSyd Uni	1			21						21
2021 Totals	**205**	**17**	**60812**	**52806**	**8538**	**16067**	**14686**	**168318**	**1598**	**322842**
2020 Totals	**194**	**178**	**60954**	**98220**	**5516**	**15952**	**7258**	**163775**	**1324**	**353177**

Table 2 **Animal categories, purposes and procedures in 2021**

Table 2.1 Animal categories used in 2021

Animal category	Animals per category	Projects per category *
Amphibia	17	2
Aquatic animals	60812	51
Birds	52806	54
Domestic mammals	8538	16
Exotic feral animals	16067	19
Lab mammals	14686	34
Native mammals	168318	44
Reptiles	1598	13
Total	**322842**	***233**

*A project may use multiple animal categories.

Table 2.2 Research and teaching purposes used in 2021

Purpose	Animals per purpose	Projects per purpose *
Education	4951	8
Environmental study	224807	58
Health & welfare	15771	46
Management & production	38116	24
Understanding biology	40784	79
Total	**324429***	**215***

***A project may have multiple purposes.

Table 2.3 Research and teaching procedures used in 2021

Procedure	Animals per procedure*	Projects per procedure*
Camera Traps only	221177	20
Observation with minor interference	44975	78
Minor conscious procedure	20375	55
Minor physiological challenge	2915	7
Minor operative procedure with recovery	2844	14
Major physiological challenge	5974	11
Major surgery with recovery	80	5
Animal unconscious no recovery	29677	50
Death as end point	2	1
Total	**328,019 ***	**241***

*A project may use multiple procedures**.**

Table 3 Summary of animal types used by institutions in 2021

Institution>	Agersens IC	Apiam AH	ANU	Birdlife Tas	Charles Sturt	CSIRO	Deakin	DPIPWE	Entura
Amphibia									
Amphibia									
Aquatic animals									
Cephalopods									
Crustaceans									
Fish						11		5030	1948
Other Aquatic Animals									
Birds									
Exotic wild							23	5	
Native captive									
Native wild			298	3562	300	500	313	261	
Other birds									
Poultry									
Domestic Mammals									
Cats									
Cattle	83	4306							
Deer									
Dogs									
Goats									
Horses									
Pigs									
Sheep						1320			
Exotic feral Mammals									
Cats								493	
Mice									
Other exotic feral mammals									
Pigs								3	
Rabbits									
Rats								372	
Laboratory mammals									
Mice									
Rats									
Native Mammals									
Cetaceans								2	
Echidna									
Macropods								4971	
Native Rats and Mice									
Other Native Animals									
Platypus									
Possums and Gliders			16					5267	
Quoll								141	
Tasmanian Devils									
Wombats									
Reptiles									
Lizards									7
Total	83	4306	314	3562	300	1831	336	16545	1955

Table 3 Summary of animal types used by institutions in 2021

Institution>	FoMI	Freshwater Bio	GDH	Paul Gray	Jacobs Group	Mooney, Nick	Murdoch Uni	NRM Nth	NRM Sth
Amphibia									
Amphibia			5						
Aquatic animals									
Cephalopods									
Crustaceans									
Fish		148							
Other Aquatic Animals		6							
Birds									
Exotic wild									
Native captive									
Native wild	1087		34			20		33	125
Other birds									
Poultry									
Domestic Mammals									
Cats									
Cattle									
Deer									
Dogs									
Goats									
Horses									
Pigs									
Sheep									
Exotic Feral Mammals									
Cats							3		
Mice									
Other exotic feral mammals									
Pigs									
Rabbits					28				
Rats							16		
Laboratory mammals									
Mice									
Rats									
Native Mammals									
Cetaceans									
Echidna									
Macropods			29		114		33		
Native Rats and Mice									
Other Native Animals				1			42		
Platypus							4		
Possums and Gliders							6		
Quoll							2		
Tasmanian Devils			8						
Wombats									
Reptiles									
Lizards									
Total	1087	154	76	1	142	20	106	33	125

Table 3 Summary of animal types used by institutions in 2021

Institution>	Nature Advisory	North Barker	STTAS	Tas Nature	Tassal	Tas Land Conservancy	Treidlia
Amphibia							
Amphibia		12					
Aquatic animals							
Cephalopods							
Crustaceans							
Fish							
Other Aquatic Animals							
Birds							
Exotic wild							
Native captive							
Native wild	2830		20	2		2	
Other birds							
Poultry							
Domestic Mammals							
Cats							
Cattle							
Deer							
Dogs							
Goats							
Horses							
Pigs							
Sheep							24
Exotic Feral mammals							
Cats							
Mice							
Other exotic feral mammals							
Pigs							
Rabbits							
Rats							
Laboratory mammals							
Mice							
Rats							
Native Mammals							
Cetaceans							
Echidna							
Macropods							
Native Rats and Mice							
Other Native Animals					1		
Platypus							
Possums and Gliders						4	
Quoll						33	
Tasmanian Devils						19	
Wombats							
Reptiles							
Lizards		32				1	
Total	2830	44	20	2	1	59	24

Table 3 Summary of animal types used by institutions in 2021 continued

Institution	UAdelaide	UNSW	UQLD	USyd	UTAS	VWSG	UWestSyd
Amphibia							
Amphibia							
Aquatic animals							
Cephalopods					168		
Crustaceans					446		
Fish		497	1500		50869		
Other Aquatic Animals					189		
Birds							
Exotic wild					4098		
Native captive							
Native wild					39206	66	21
Other birds							
Poultry							
Domestic mammals							
Cats					6		
Cattle	1223				767		
Deer							
Dogs					7		
Goats					5		
Horses							
Pigs							
Sheep					797		
Exotic feral mammals							
Cats					10383		
Mice					28		
Other exotic feral mammals					1588		
Pigs							
Rabbits					448		
Rats					2705		
Laboratory mammals							
Mice					13370		
Rats					1316		
Native mammals							
Cetaceans					120		
Echidna					1563		
Macropods					100364		
Native Rats and Mice					557		
Other Native Animals					3383		
Platypus							
Possums and Gliders					18100		
Quoll					3713		
Tasmanian Devils				416	16590		
Wombats					12819		
Reptiles							
Lizards					1558		
Total	1223	497	1500	416	285163	66	21

Table 4 Purposes and procedures used for animal types in 2021

	Amphi-bians	Aquatic animals			
	Amphibians	Cephalo-pods	Crust-aceans	Fish	Other Aquatics
Purpose					
Education				497	
Environmental study	12		39	7970	171
Health & welfare				12011	
Management & production		168	407	21752	24
Understanding biology	5			19110	
Procedure					
Camera traps only				16510	
Observation with minor interference	5		24	10856	133
Minor conscious procedure	12	32	407	2578	30
Minor physiological challenge				2825	
Minor operative procedure with recovery				1251	
Major physiological challenge				5883	
Major surgery with recovery					
Animal unconscious no recovery		136	15	24035	32
Death as End Point					

Table 4 Purposes and procedures used for animal types in 2021 continued

	Birds				
	Exotic wild	Native captive	Native wild	Other birds	
Purpose					
Education	27		221		
Environmental study	4094		39837		
Health & welfare		5	787		
Management & production			297		
Understanding biology			7733		
Procedure					
Camera traps only	4071		32740		
Observation with minor interference	50		14739		
Minor conscious procedure		1	1198		
Minor physiological challenge		4			
Minor operative procedure with recovery					
Major physiological challenge					
Major surgery with recovery					
Animal unconscious no recovery			3		
Death as End Point					

Table 4 Purposes and procedures used for animal types in 2021 continued

	Domestic mammals								
	Cats	Cattle	Deer	Dogs	Goats	Horses	Pigs	Sheep	other
Purpose									
Education				4				280	
Environmental study	6	504		3				72	5
Health & welfare		1637						24	
Management & production		4238						1765	
Understanding biology									
Procedure									
Camera traps only	6	504		3				72	5
Observation with minor interference		2743		4				200	
Minor conscious procedure		3132						549	
Minor physiological challenge									
Minor operative procedure with recovery								1320	
Major physiological challenge									
Major surgery with recovery									
Animal unconscious no recovery									
Death as End Point									

Table 4 Purposes and procedures used for animal types in 2021 continued

	Exotic feral mammals						Laboratory mammals		
	Cats	Mice	Other exotic feral mammals	Pigs	Rabbits	Rats	Mice	Rats	other
Purpose									
Education	7				233	30	746	32	
Environmental study	10818	28	1588	3	243	3063			
Health & welfare							719	433	
Management & production							8689	738	
Understanding biology	54						2949	113	267
Procedure									
Camera traps only	10817	22	1588		243	2971			
Observation with minor interference	8	6			233	75	44		
Minor conscious procedure	46					47	8349	594	
Minor physiological challenge							90		
Minor operative procedure with recovery	2			3			156		
Major physiological challenge							22	69	
Major surgery with recovery							80		
Animal unconscious no recovery	4						4362	653	267
Death as End Point	2								

Table 4 Purposes and procedures used for animal types in 2021 continued

	Native mammals					
	Cetaceans	Echidnas	Macropods	Native Rats and Mice	Other native mammals	Platypus
Purpose						
Education		8	1649		195	
Environmental study	100	1555	101572	546	367	4
Health & welfare					1	
Management & production	20				18	
Understanding biology	2		2290	11	2846	
Procedure						
Camera traps only		1555	98658	520	6	
Observation with minor interference	120	8	6812	17	3369	
Minor conscious procedure	2		40	20	10	
Minor physiological challenge						
Minor operative procedure with recovery					42	4
Major physiological challenge						
Major surgery with recovery						
Animal unconscious no recovery			1			
Death as End Point						

Table 4 Purposes and procedures used for animal types in 2021 continued

	Native mammals continued				Reptiles
	Possums and gliders	Quolls	Tas Devils	Wombats	Lizards
Purpose					
Education	1006		16		
Environmental study	22337	3518	16224	10087	41
Health & welfare	7		60	87	
Management & production					
Understanding biology	45	404	752	2645	1558
Procedure					
Camera traps only	21578	3358	15862	10087	1
Observation with minor interference	1703		56	2645	1125
Minor conscious procedure	107	498	1086	87	304
Minor physiological challenge					
Minor operative procedure with recovery	4	33	29		
Major physiological challenge					
Major surgery with recovery					
Animal unconscious no recovery	1				168
Death as End Point					

Figure 1 Animal categories used between 2017 and 2021

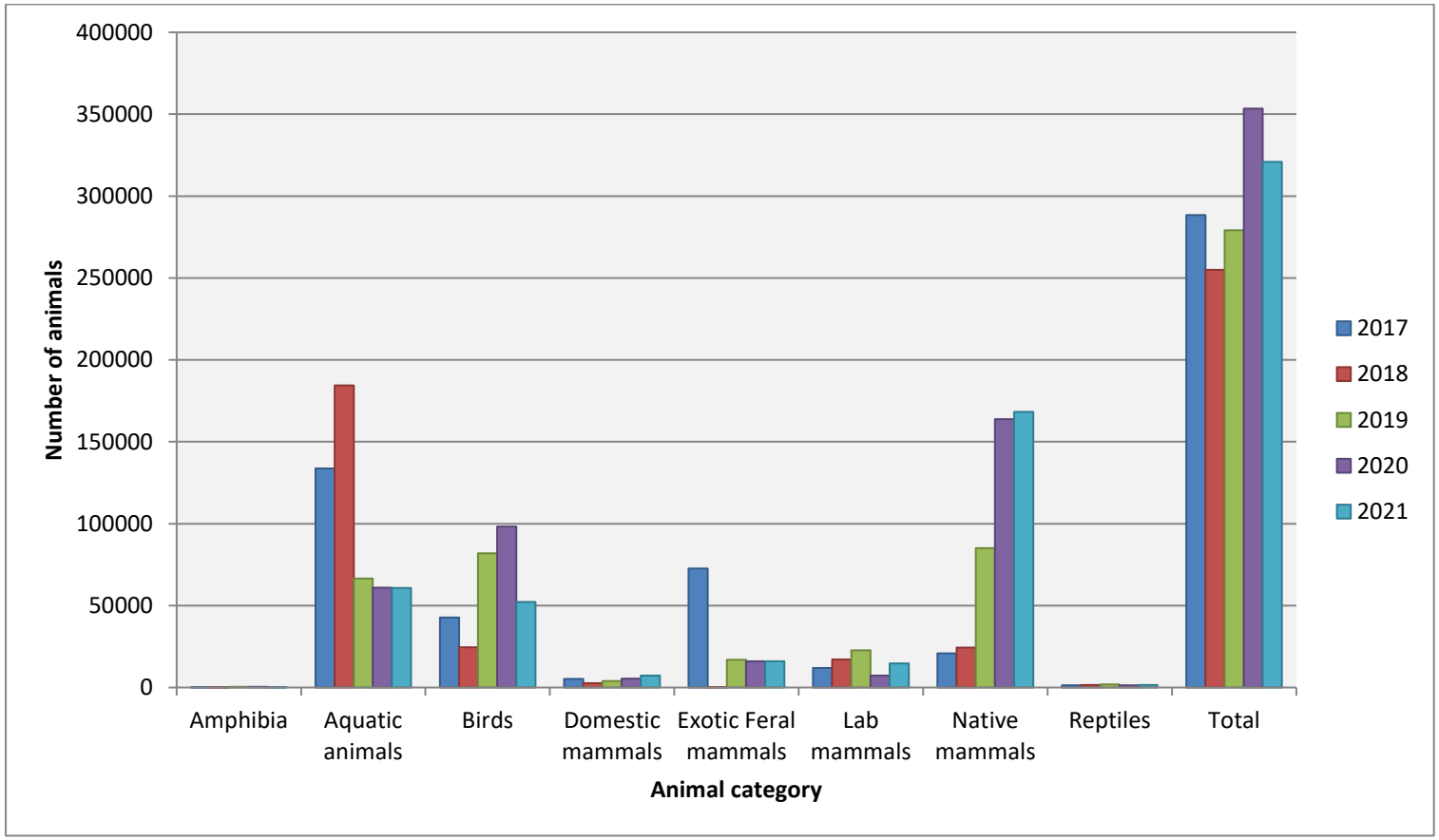


Figure 2 Projects per animal category between 2017 and 2021

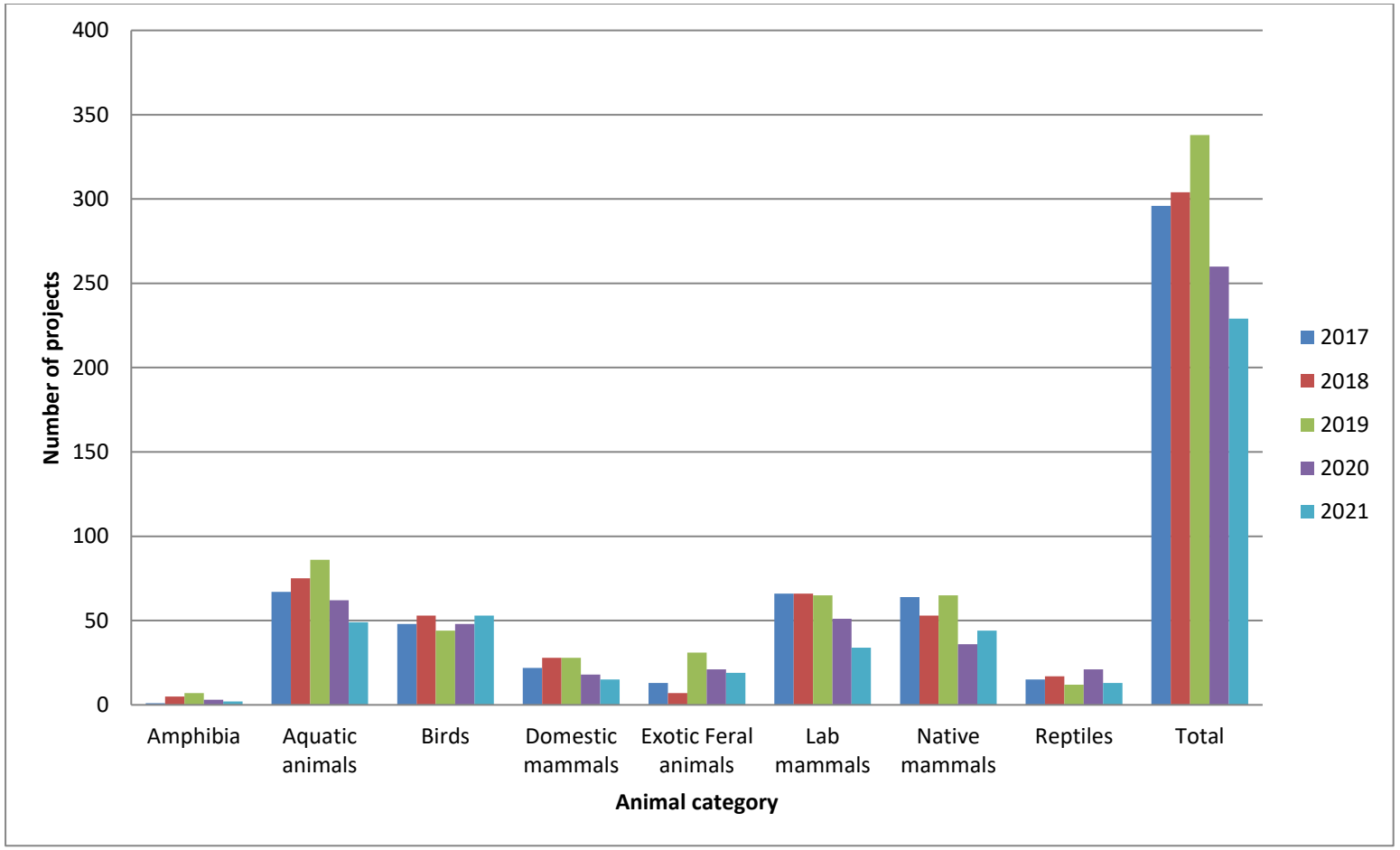


Figure 3 Purposes for which animals were used between 2017 and 2021

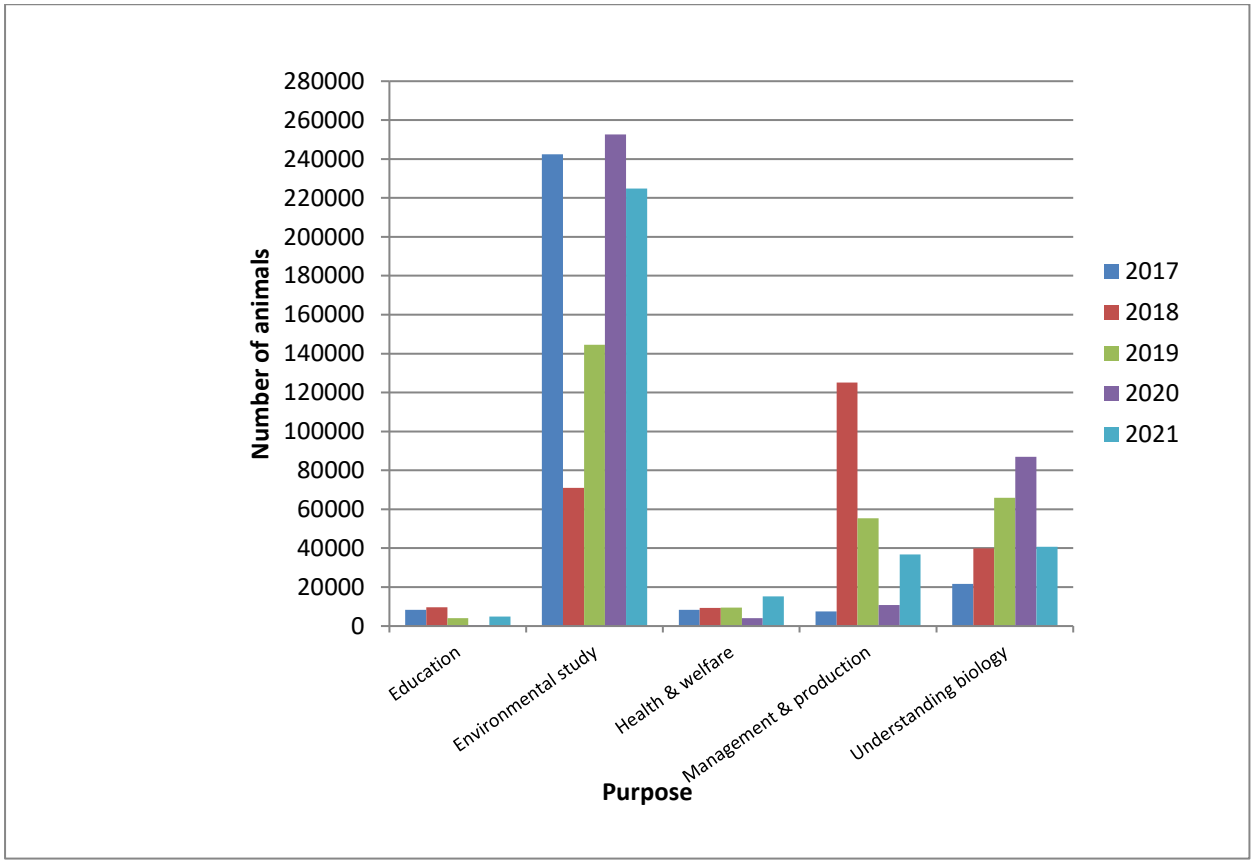


Figure 4 Projects per purposes between 2017 and 2021

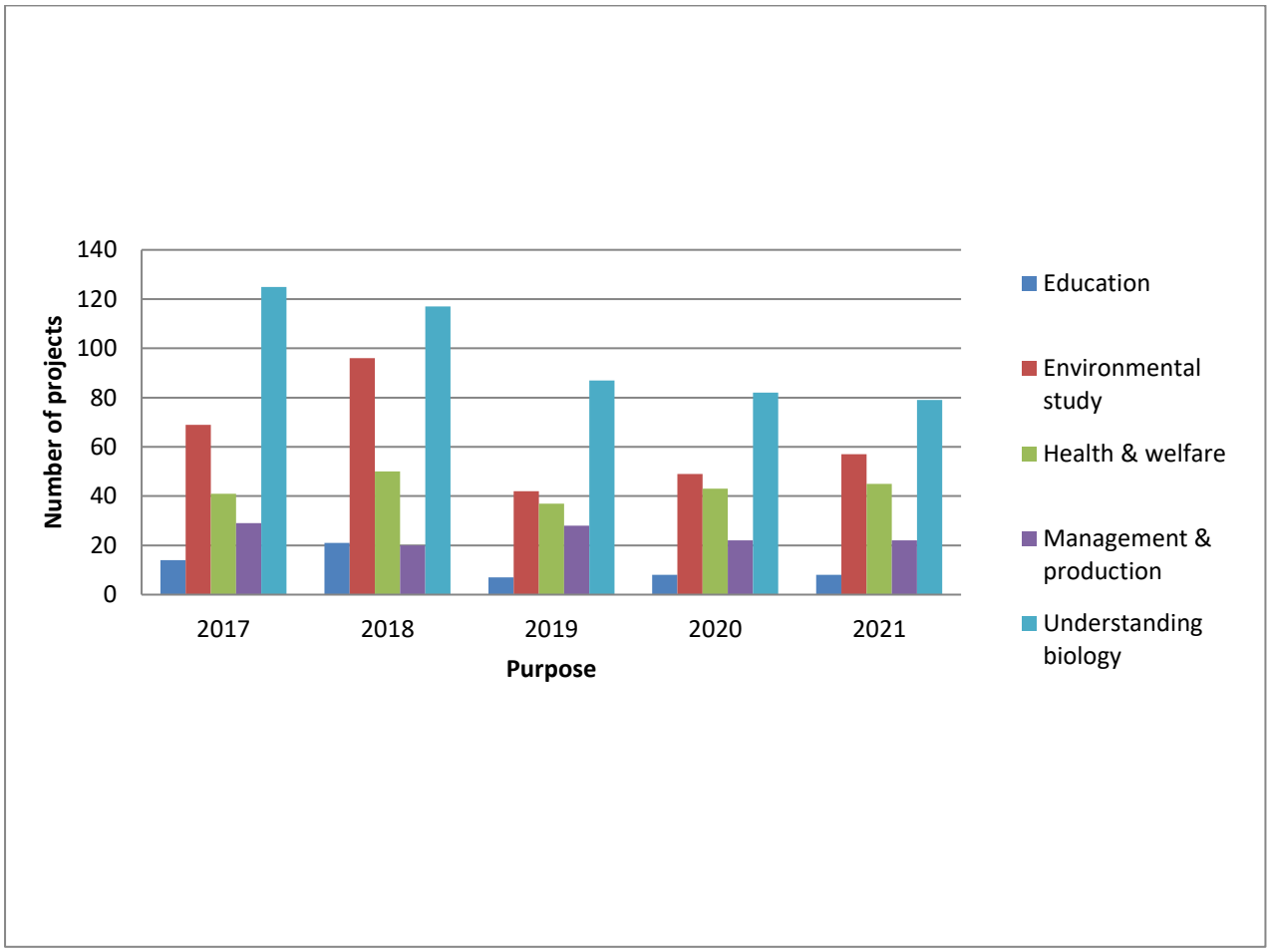


Figure 5 Procedures used between 2016 and 2021

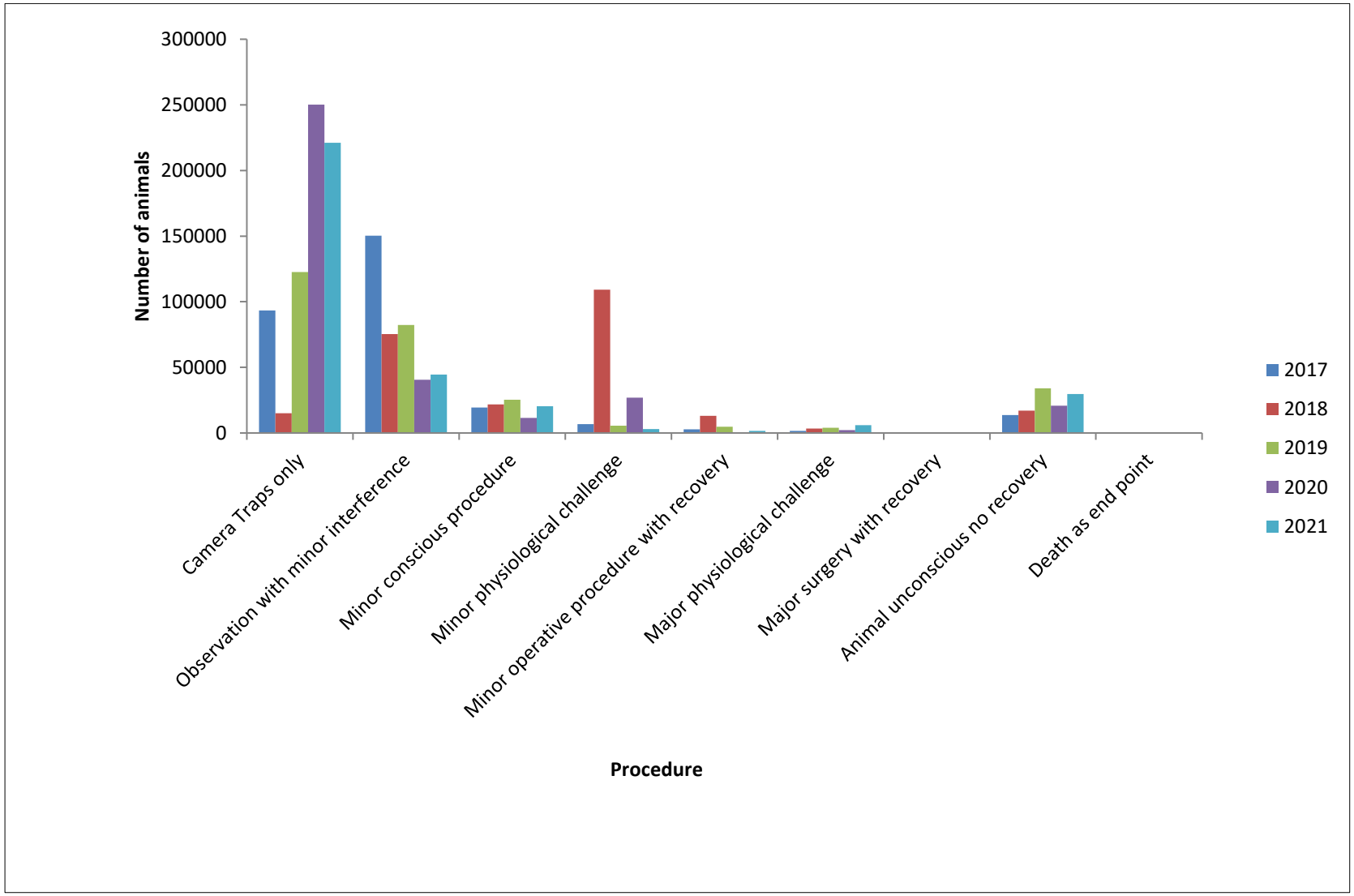
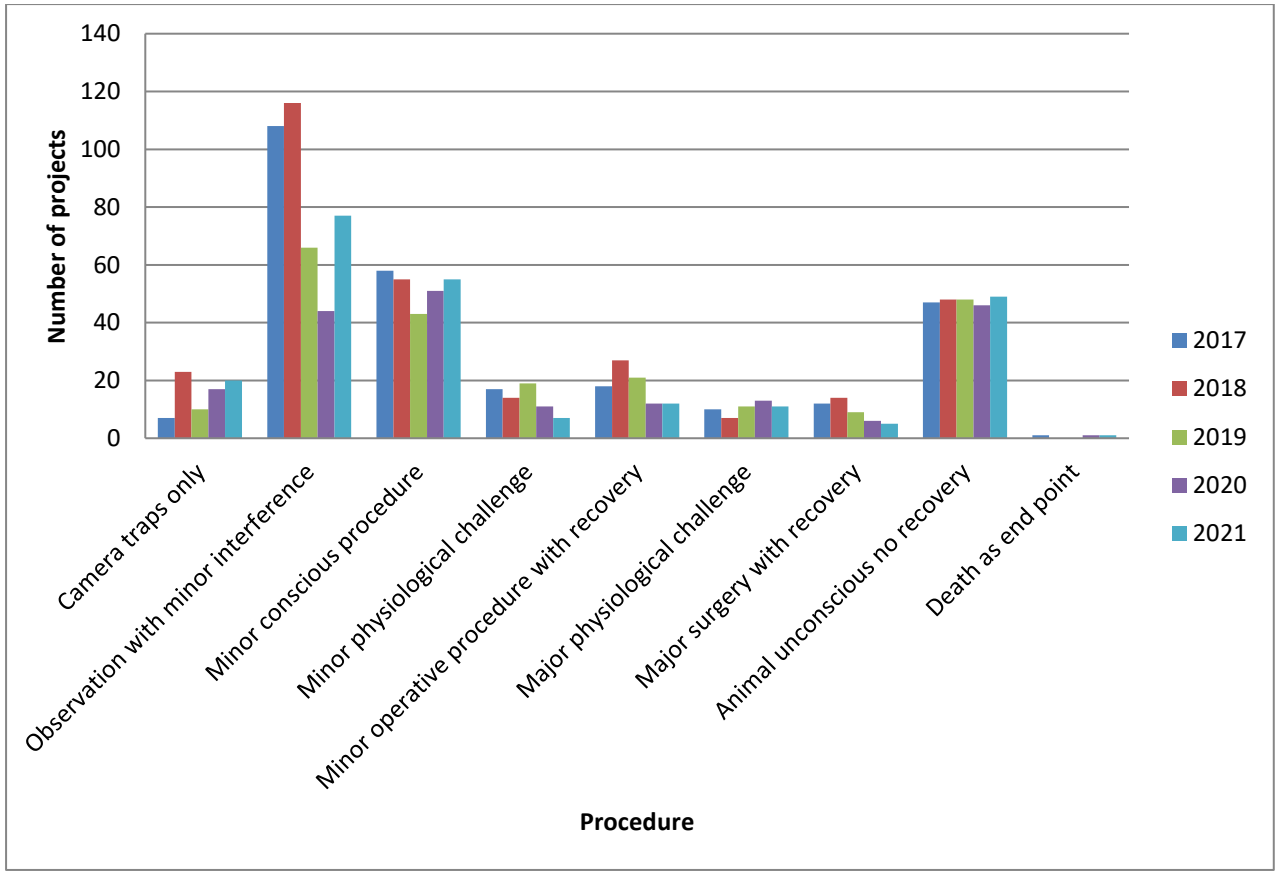


Figure 6 Projects per procedures used between 2016 and 2021



Left intentionally blank

ABBREVIATIONS

AEC	Animal Ethics Committee
ANU	Australian National University
Birdlife	Birdlife Tasmania
CRG	Code Reference Group (NHMRC)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Deakin	Deakin University, Victoria
DPIPWE	Department of Primary Industries, Parks, Water and Environment
Entura	Entura (Hydro Tasmania Group)
FoMI	Friends of Maatsuyker Island
Freshwater	Freshwater Biomonitoring
GHD	GHD Pty Ltd
Monash	Monash University
Murdoch	Murdoch University
NHMRC	National Health and Medical Research Council
North Barker	North Barker Ecosystem Services
NRE Tas	Department Natural Resources and Environment Tasmania
NRM Sth	Natural Resource Management – South
NSW DPI	New South Wales Department Primary Industry
STTAS	Sustainable Timber Tasmania
Treidlia	Treidlia Biovet Pty Ltd, New South Wales
UAdelaide	The University of Adelaide, South Australia
UNSW	The University of New South Wales
UQLD	The University of Queensland
USydney	University of Sydney, New South Wales
UTAS	University of Tasmania
Virbac	Virbac (Australia) Pty Ltd
VWSG	Victorian Wader Study Group Inc
3Rs	Replacement, Reduction and Refinement

End