Ministry for Primary Industries
Manatū Ahu Matua

Statistics on the Use of Animals in Research, Testing and Teaching in New Zealand in 2014

MPI Information Paper No: 2016/01

ISBN No: 978-1-77665-131-3 (online)
ISSN No: 2253-394X (online)

February 2016

New Zealand Government

Growing and Protecting New Zealand

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1 Introduction

The use of animals in research, testing and teaching is covered by a self-contained set of provisions - Part 6 - within New Zealand's animal welfare legislation. This is because the nature of such use of animals may mean that general obligations under the legislation cannot be met. This recognises that compromised care and some pain and distress to a small number of animals may result in significant benefits to people, other animals or the environment. However, such use carries with it significant responsibilities and strict legislative obligations. Part 6 of the Animal Welfare Act 1999 allows the use of animals for research, testing and teaching purposes only in accordance with a code of ethical conduct which has been approved by the Ministry for Primary Industries. In 2014, 26 institutions had codes of ethical conduct approved by the Director-General of the Ministry for Primary Industries. These codes set the parameters within which the institutions are allowed to use animals for research, testing and teaching purposes. Code holders undergo review by an accredited reviewer at least once every five years.

Each project must also be scrutinised and approved by an animal ethics committee (AEC) established under the code of ethical conduct. There are currently 30 animal ethics committees (some institutions, because of their geographic spread, operate more than one committee). In addition, as at the end of 2014, another 92 institutions engaging in research, testing and teaching involving animals had an arrangement to use another institution's AEC rather than forming their own. The membership of each AEC must include at least one senior staff member of the institution and at least three people with no other association with the institution carrying out the research. These external members must include a nominee from each of the New Zealand Veterinary Association, the Royal New Zealand SPCA and a local or regional council. The AEC's role is to decide whether or not to approve projects, to set, vary or revoke conditions of project approvals, to monitor compliance with conditions of project approvals and to monitor animal management practices and facilities to ensure compliance with the terms of the organisation's code of ethical conduct.

When considering applications for project approvals, AECs must have regard to a number of criteria specified in the Act including:

- the scientific or educational objectives of the project;
- the harm to or distress felt by the animals and the extent to which that can be alleviated;
- whether the design of the experiment or demonstration is such that it is reasonable to expect the objectives will be met;
- the factors taken into account in the choice of species;
- whether the number of animals is the minimum necessary to achieve meaningful results.

In essence, AECs are required to carry out a cost-benefit analysis in deciding whether an research, testing or teaching protocol should be allowed to proceed: the higher the cost to the animal, the greater the expected benefit must be, whether that benefit be to people, to other animals or to the environment. AECs also ensure that the costs to the animal are minimised through the implementation of the "Three Rs", the internationally accepted principles of

humane experimental technique. They are the *reduction* in the numbers of animals to the minimum necessary to achieve a result; the *replacement* of animals with a less sentient or non-sentient alternative wherever possible; and the *refinement* of procedures as well as of animal environments to minimise pain or distress.

Records of the annual numbers of animals used in research, testing and teaching have been collected since 1987. Up until now, they have been published within the annual report of the National Animal Ethics Advisory Committee (NAEAC) that advises the Minister on ethical and welfare issues arising from research, testing and teaching. However, NAEAC has elected to produce a briefer, electronic version of its report for 2014 (http://www.mpi.govt.nz/document-vault/8665), allowing a much earlier completion date. The 2014 animal use statistics are the first to be produced as a stand-alone document.

All code holders are required to keep records as specified in the Animal Welfare (Records and Statistics) Regulations 1999 in a readily accessible manner. For record keeping purposes, the term “code holder” includes any person or organisation that has made arrangements to use an existing code and AEC, as well as anyone with an approval to use non-human hominids. (It should be noted that any research, testing and teaching involving non-human hominids must be in the best interests of the individual non-human hominid or its species and must be approved by the Director-General of the Ministry for Primary Industries rather than an AEC.)

The records must be retained for a period of five years after the year to which they relate, and an annual return of the figures for the previous calendar year must be submitted to the Ministry for Primary Industries by 28 February each year. In addition, the regulations empower the Director-General of MPI or any inspector appointed under the Animal Welfare Act 1999 to obtain copies of records or details from them at any time. The regulations provide penalties for non-compliance, including for late submission of returns or supplying false or misleading figures.

Records of the number of animals used in long-term projects are not reported annually to MPI but every three years or at the end of the year in which the project is completed (if less than three years). Hence annual animal usage detailed below reflects the numbers of animals used in studies that were completed during the year and reported to MPI.

2 Summary of 2014 Animal Use Statistics

A total of 310 287 animals used in research, testing and teaching were reported in 2014, a 38.5 percent increase over the previous year when numbers were the lowest since 1997 and the lowest under the current legislation. The rolling 3-year average was down.

The most commonly reported species in 2014 (as in 2013) was cattle, making up 50.6 percent of the farm animals used, and 24.3 percent of the total number. Mice replaced sheep as the second most common species in 2014, making up 18.8 percent of the total. Sheep (14.4 percent) and fish (13.1 percent) were the third and fourth most commonly used species. In terms of species groupings,

production animals (cattle, sheep, deer, goats and pigs) made up 48.1 percent of the total, with rodents and rabbits together accounting for 23.7 percent. The rise in numbers in 2014 was reflected in all species except other birds, sheep, cephalopod/crustacea, reptiles, dogs, marine mammals, guinea pigs, pigeons and horses.

Veterinary research (35.1 percent), teaching (27.6 percent), animal husbandry research (16.6 percent) and basic biological research (15.0 percent) were the main reasons for using production animals, accounting for 140 650 animals. Just over 89 percent of the rodents were used in medical research, testing the safety and efficacy of animal health products and basic biological research. The majority (60.4 percent) of birds were fowls/chickens which were used in animal husbandry research.

More than 83 percent of animals were exposed to manipulations which had no, virtually no, or little impact on the animals' welfare. A total of 10 400 animals (3.4 percent of the total) experienced manipulations of "high impact" or "very high impact", 5372 fewer than in 2013, and the lowest number in these two categories under the current legislation. The species that experienced a "very high" impact were rodents, pest species, cattle (16), sheep (8) and cephalopod/crustacea.

New Zealand's usage of animals classified as transgenic/chimera is low by world standards, with only 5937 (1.9 percent of the total) such animals used in 2014.

Nearly 66 percent of animals returned to their normal environment following their use in manipulations. Nearly 97 percent of production animals remained alive following use. However, nearly 97 percent of rabbits and rodents were 'dead or euthanased' following manipulation.

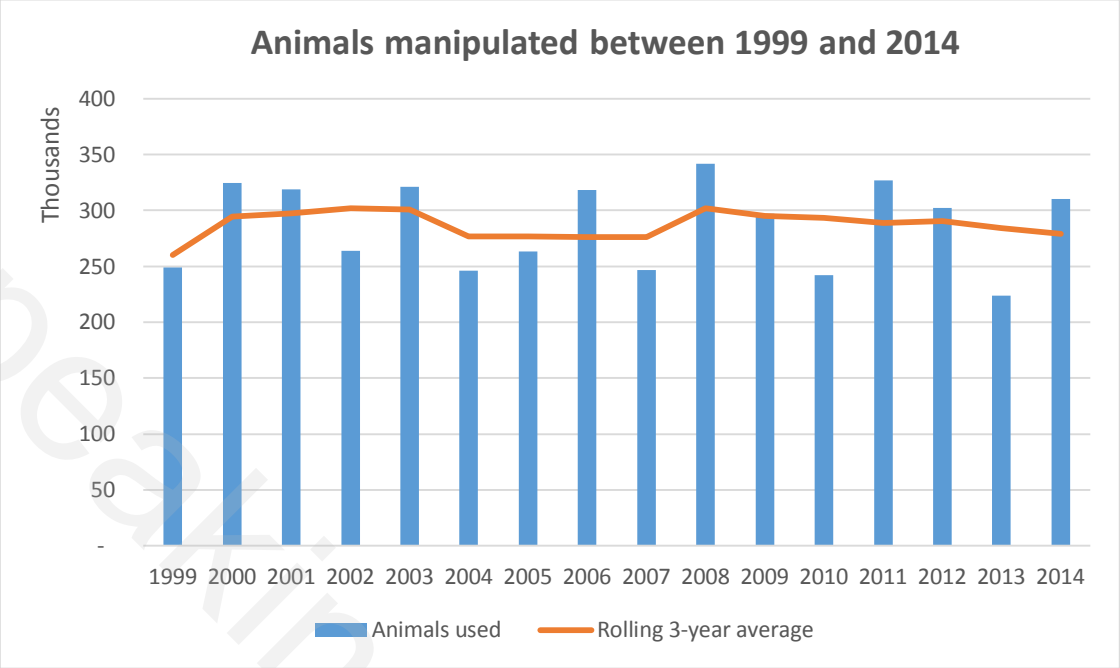
3 Animal Usage

During 2014, a total of 310 287 animals[1] were reported as manipulated[2] in research, testing and teaching[3]. This was an increase of 38.5 percent compared to 2013, when 224 048 animals were reported, the lowest number recorded since 1997.

Much of the annual variability in the statistics can be attributed to the three-yearly cycle of reporting of long-term projects. Reports of the numbers of animals used in long-term projects are not required annually but rather every three years, when the project is completed or when AEC approval of the project expires, whichever comes first. A truer reflection of overall use is given by the three-year rolling average, down slightly in 2014.

To illustrate the influence of the three-yearly reporting cycle, the accompanying graph shows the rolling three-year average compared with the annual totals. Between 2000 and 2003 the rolling average was around 300 000 (294 801 to 302 221); between 2004 and 2007 it was nearer 275 000 (275 942 to 276 906); between 2008 to 2011 it was around 301 900 (242 149 to 341 520); and in the last three years the rolling average was around 280 000 (224 048 to 310 287).

[1] As defined in section 2(1) of the Animal Welfare Act 1999
[2] As defined in section 3 of the Animal Welfare Act. 1999
[3] As defined in section 5 of the Animal Welfare Act. 1999



Those species most commonly reported in 2014 were (in order) cattle, mice, sheep and fish, which collectively accounted for 70.6 percent of the total animals manipulated for research, testing and teaching (RTT). Mice, sheep and cattle have all been included in the four most commonly used animals since 1989. The other species making up this group in those 25 years have been fish (in 13 years), rats (in seven years) and birds (in five years).

The rise in numbers in 2014 was reflected in all species except other birds, sheep, cephalopod/crustacea, reptiles, dogs, marine mammals, guinea pigs, pigeons and horses. The largest numerical increase was recorded in the number of cattle (+ 23 303, a 44.6 percent increase), followed by fowls/chickens (+ 23 028, a 674.7 percent increase), deer (+ 22 742, a 982.0 percent increase), fish (+ 16 201, a 66.5 percent increase), mice (+ 13 361, a 29.7 percent increase), goats (+2595, a 446.6 percent increase), “other species” (+ 2407, a rise of 610.9 percent), possums (+1357, a 51.7 percent increase), rats (+ 1001, a 9.3 percent rise), amphibia (+ 533, a 223.9 percent increase), pigs (+ 488, a 206.8 percent increase), rabbits (+ 59, a 4.3 percent increase) and cats (+ 52, a 7.7 percent increase). The largest numerical decrease was reported for “other birds”, (- 17 084, a 77.2 percent drop). The other species with lower numbers were sheep (- 11473, down 3.2 percent), cephalopod/crustacea (- 729, a 13.3 percent drop), reptiles (- 666, an 67.2 percent decrease), dogs (- 431, up 30.0 percent decrease), marine mammals (- 84, a decrease of 9.1 percent), guinea pigs (- 345, a 15.6 percent fall), pigeons (- 41, a 28.3 percent decrease) and horses (- 35, a 12.9 percent decrease).

Overall, the use of agricultural livestock increased by 46.9 percent (+ 47 655), with only sheep numbers falling. Cattle were again the most numerous (50.6 percent) of the agricultural livestock, with just over half (53.2 percent) being used for teaching, and another 29.0 percent reported as used for veterinary research. Deer, whose numbers increased more than tenfold, were used in veterinary

research (72.1 percent), animal husbandry research (15.6 percent) and basic biological research (12.3 percent). Over three quarters (78.4 percent) of goats - whose numbers increased more than fivefold - were used in animal husbandry research. More pigs were used, with 408 (56.4 percent) used in animal husbandry research and 225 (31.1 percent) in basic biological research. Sheep were mostly used in animal husbandry research (30.2 percent), basic biological research (28.5 percent) and veterinary research (27.7 percent).

Rodent use rose by 24.2 percent (+ 14 017), mainly due to a near doubling of use in medical research (+13 241), as well as more being used in basic biological research (+ 5126) and environmental management (+ 2366). This was offset to some extent by decreased numbers reported as used for testing (- 3957) and production of biological agents (- 2830). Mice made up the majority (81.0 percent) of rodent numbers, followed by rats (16.4 percent) and guinea pigs (2.6 percent).

The increase in fish numbers in 2014 was largely due to the rise in the numbers reported for use in basic biological research (+ 8593), veterinary research (+ 3517), species conservation (+ 1434) and environmental management (+1368). The other main area where fish were used was for teaching (4663).

Bird use rose from 25 685 in 2013 to 31 588 in 2014, mainly due to a total of 19 079 fowls/chickens used for animal husbandry research. These made up 72.2 percent of fowls/chickens and 60.4 percent of all birds. Fowls/chickens were also used in basic biological research (5863), veterinary research (1041) and teaching (458). Numbers of “other birds” fell from 22 127 to 5043, mainly due to fewer being used for environmental management (29 compared to 10 069 in 2013), species conservation (1667 compared to 7430 in 2013) and basic biological research (1339 fewer than in 2013). Pigeons were used for basic biological research (74) and teaching (30).

The number of possums reported in 2014 rose 51.7 percent to 3983, with 99.2 percent of these being used in research into environmental management. The numbers of amphibia rose by 533. These were mainly used for basic biological research (523) and species conservation (246). The fall in numbers of cephalopod/crustacea was mainly due to 1688 fewer being used for teaching, partially offset by an increase (+1220) in those used for basic biological research. Fewer reptiles were used in 2014, mainly due to a drop in the number used for basic biological research (91 compared to 661 in 2013). Reptiles were also used for species conservation (125), veterinary research (99) and teaching (10). Eighty-four fewer marine mammals were used in 2014. All these (843) were used for the purposes of species conservation.

The majority of dogs were used for teaching (38.8 percent), basic biological research (25.2 percent), veterinary research (23.7 percent) and testing (11.6 percent). Dogs were also used for environmental management research (6) and medical research (1). Most cats were used for teaching (55.8 percent) and veterinary research (21.3 percent) and were also manipulated for testing (12.4 percent), environmental management (6.5 percent) and basic biological research purposes (4.1 percent). Horse numbers were down 12.9 percent in 2014. This species was used for teaching (121), veterinary research (102) and basic biological research (14) purposes.

The number of rabbits used rose by 4.3 percent (+59), mainly due to more being used for testing (+ 205), medical research (+ 90) and basic biological research (+22), although only one rabbit was reported as used in the production of biological agents compared to 199 in the previous year.

In 2014, 2801 animals were reported in the "other species" category, a marked increase from the 394 reported in 2013. The rise was mainly due to two projects involving 2239 bats between them, one for species conservation purposes and the other for basic biological research. Other animals in this category were 315 mustelids (stoats, ferrets and weasels) for environmental management and species conservation; 109 hedgehogs for environmental management, basic biological research and teaching; and, for teaching purposes, 136 alpaca and two chinchillas.

Wherever it appears, the category "cats" includes feral cats. Likewise, wild rats and mice are included in the "rats" and "mice" categories and feral pigs in the "pigs" category.

4 Source of Animals

Code holders are required to report on the source of the animals manipulated according to specified categories. The table below shows the percentage of animals that came from each source in the past two years.

Source of animals	**2014**	**2013**
	%	**%**
Farms	47.4	37.8
Breeding units	20.9	26.1
Captured	12.0	13.2
Commercial sources	9.6	9.1
Born during project	6.6	7.6
Public sources	3.2	6.1
Imported	0.2	<0.1

The higher number of animals used in 2014 was reflected across all source categories except public sources. The largest increase was in those sourced from farms, up 62 336 or 73.5 percent, reflecting the higher numbers of cattle and deer. Numbers sourced from breeding units rose by 6537 (11.2 percent), with rodents and rabbits accounting for 95.5 percent of these. Commercial enterprises were the source of 9253 more animals in 2014, an increase of 45.4 percent. Chickens made up 20 381 (68.7 percent) of this total. A total of 7621 more animals were captured, an increase of 25.7 percent. These included fish (18 006), other birds (4409), cephalopod/crustacea (4426), possums (2908), "other" species (2642), mice (1767), rats (1688), marine mammals (843), amphibia (353), reptiles (169) and 48 cats. Numbers of animals imported rose from 83 to 694 - 685 mice and nine rats. Numbers of animals born during projects rose by 21.2 percent to 20 634. The majority of these were fish (7287), sheep (6290) and mice (5296). Fewer animals were obtained from public sources (- 27.1 percent) in 2014.

In 2014, 94.7 percent of farm animals were sourced from farms or commercial organisations, with a further 4.7 percent - 6290 sheep, 376 pigs, 182 cattle and 94 goats – born during projects. Farm animals were also sourced from breeding units (0.5 percent) and public sources (0.2 percent). Reflecting New Zealand's focus on agricultural research, farm animals were used by 49 organisations or individuals (hereafter referred to as organisations), 31 of which used only sheep and/or cattle.

The majority of rodents (84.5 percent) (used by 30 organisations) and rabbits (79.9 percent) (used by 16 organisations) came from breeding units. Rodents were also born during projects (8.4 percent), captured (4.8 percent), obtained from commercial sources (1.2 percent), imported (1.0 percent) and obtained from public sources (0.3 percent). Rabbits were also obtained from commercial sources (12.5 percent), from public sources (5.9 percent) and from farms (1.8 percent).

Capture was the main method for obtaining fish (44.4 percent). Fish, used by 16 organisations, were also born during projects (18.0 percent), obtained from farms (15.2 percent), from public sources (14.7 percent), from breeding units (4.2 percent) and from commercial sources (3.5 percent). All the 843 marine mammals (used by 3 organisations) were classified as "captured".

The majority of chickens, which made up 83.7 percent of total birds used and were used by 13 organisations, were obtained from commercial sources (77.1 percent), with the remainder coming from farms (22.3 percent), public sources (0.4 percent), breeding units (0.2 percent), or born during projects (<0.1 percent). "Other birds", i.e. birds excluding chickens and pigeons and used by 19 organisations, made up 16.0 percent of total birds used, with most being classified as either captured (87.4 percent) or obtained from public sources (6.6 percent). Most pigeons, used by 4 organisations, were obtained from public sources (97.1 percent), with three sourced from commercial organisations.

The amphibia (used by 4 organisations), cephalopods/crustaceans (10 organisations), possums (5 organisations), and reptiles (7 organisations) were mostly captured or obtained from public sources. Dogs (19 organisations) were obtained from public sources (85.4 percent), from farms (8.0 percent), from breeding units (5.7 percent) or from commercial sources (1.0 percent). Cats (used by 16 organisations) came from public sources (54.9 percent) and breeding units (38.5 percent), with 48 (6.6 percent) captured. Horses were used by a total of 10 organisations and supplied from public sources (46.8 percent), from farms (32.5 percent), from commercial organisations (19.0 percent) and from breeding units (1.7 percent).

5 Status of Animals

Code holders are required to categorise the status of the animals they use. The following table breaks down the animal status for the past two years.

Status of animals	2014	2013
	%	%
Normal/conventional	89.1	87.5
SPF/germ-free	4.2	3.1
Unborn/pre-hatched	2.3	2.5
Protected species	2.1	4.7
Transgenic/chimera	1.9	1.3
Diseased	0.3	0.1
Other	0.1	0.9

As in previous years, the majority (89.1 percent) of animals manipulated in RTT in New Zealand in 2014 were classified as normal, healthy, conventional animals.

More animals manipulated for RTT had a specific pathogen-free (SPF) or germ-free status than in 2013 (+ 6054). All of these animals were mice (89.0 percent) or rats (11.0 percent).

The number of animals in the unborn/pre-hatched category increased by 1389 to 7047. Most of these were fish eggs (42.6 percent) and prenatal sheep (32.0 percent), with the remainder made up of chicken eggs (14.7 percent) and unborn mice (10.7 percent).

Fewer animals with protected species status were manipulated in 2014 (- 3797). The fall was mostly due to a 64.8 percent decrease in the number of "other birds" to a total of 3082. Other protected species reported as manipulated for RTT in 2014 included bats (2239), marine mammals (843), reptiles (248) and amphibia (246).

The number of animals classified as transgenic/chimera rose by 3069 or 107.0 percent from 2013. The majority of these were mice (79.5 percent) and fish (14.6 percent), with rats (3.1 percent), cattle (1.4 percent) and goats (also 1.4 percent) making up the total. As in 2013, five organisations used transgenic/chimera animals in 2014. Reflecting our relatively small biomedical research industry, New Zealand's usage of this category of animal is low by world standards.

Numbers of animals with a "diseased"[4] status rose by 610 to 873 in 2014. These included cattle (710), sheep (116), horses (27), dogs (10) and fish (10).

[4] Animals afflicted with naturally occurring disease, the focus of study usually being the cause, effects, cure or prevention of the disease.

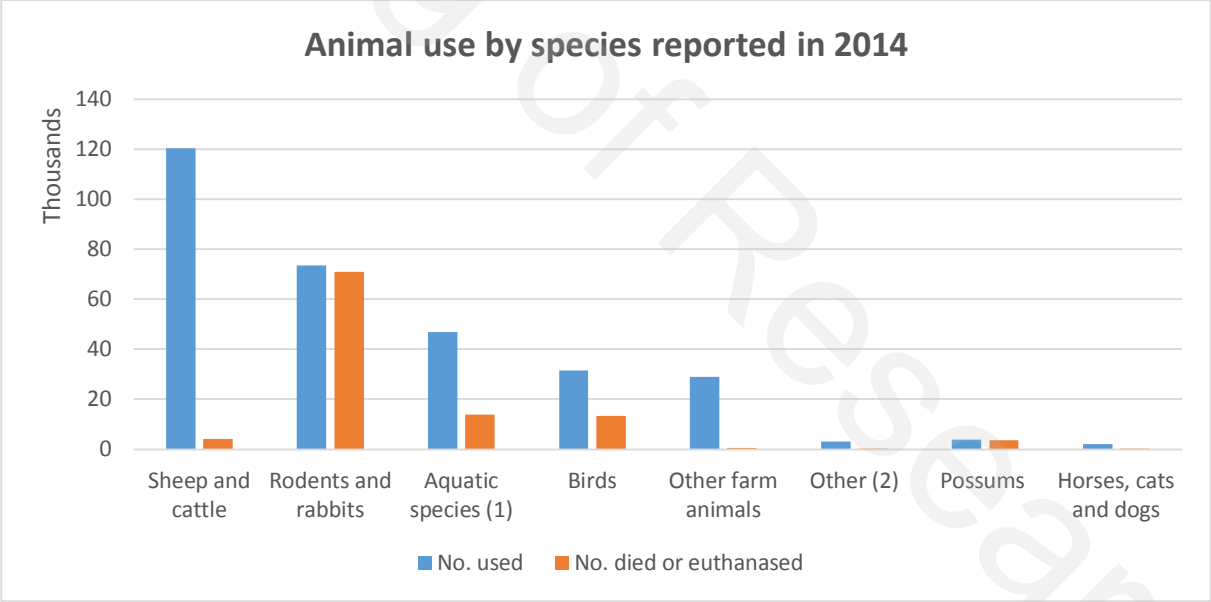
6 Outcome

Appendix 1 shows the five-year summary of the animals used (by species) and the percentages that died or were euthanased during, or after, manipulations. 65.6 percent of animals remained alive after use, compared to 64.0 percent in 2013. Of these 45.4 percent were returned to owners, 30.4 percent were disposed of to others, 15.9 percent were released to the wild and 8.3 percent were retained by the institution. The majority of animals released to the wild were fish (60.7 percent), “other birds” (14.7 percent) and other species (mainly bats - 7.7 percent).

The number of animals that died or were euthanased during, or after, manipulations in 2014, rose by 26 097 to 106 678. This was a slightly lower proportion of the total (34.4 percent) than in 2013.

The high survival rates (96.8 percent) for livestock reflect the number of trials of low invasiveness that take place while the animals remained in their normal farm environment and continued as part of the herd/flock at the conclusion of the trial. On the other hand, only 3.6 percent of rodents and rabbits remained alive following projects.

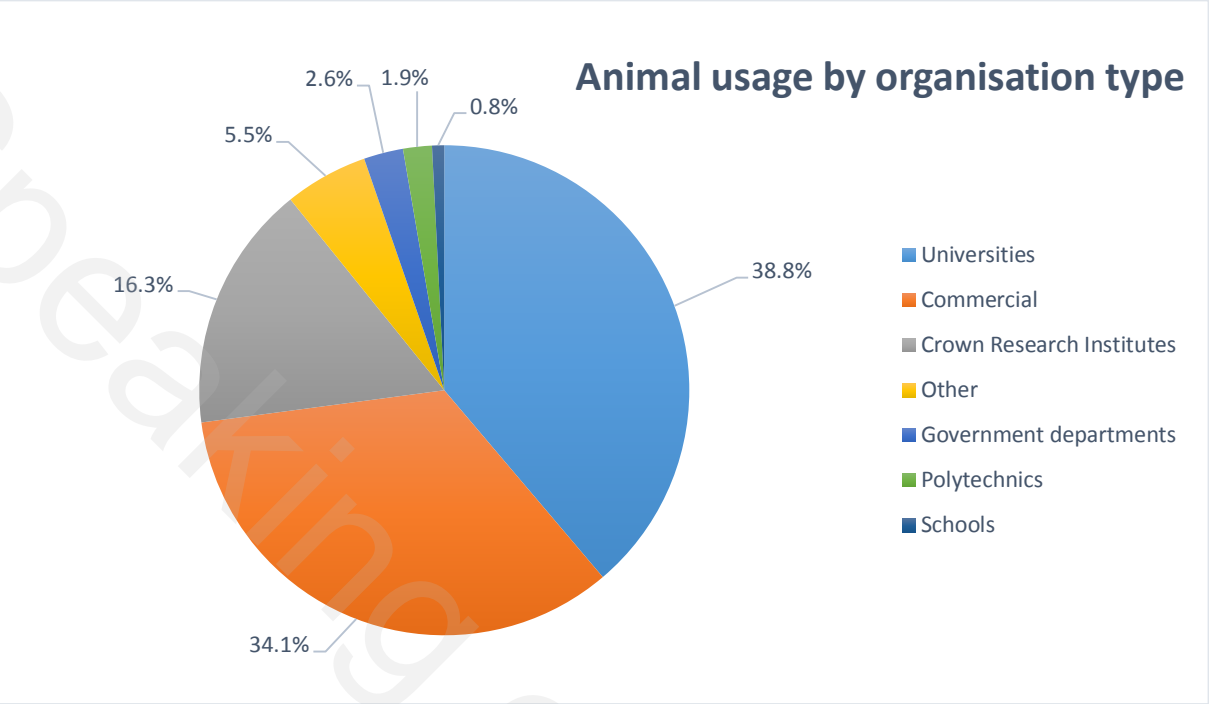
The following bar graph shows information on the proportion of animals that died or were euthanased for the major groups of species.



(1) - ‘Aquatic species’ includes amphibia, fish, marine mammals and cephalopods/crustaceans.
(2) - ‘Other’ includes reptiles and ‘other species’

7 Organisation Type

Appendix 2 tabulates animal usage by organisation type over the past five years. The pie chart below shows the 2014 information graphically. The top three user groups in 2014 were (in order) universities, commercial organisations and CRIs.



Universities reported 67 185 more animals than in 2013. Animals reported by universities were used for basic biological research (30.5 percent), veterinary research (26.0 percent), animal husbandry research (21.0 percent), medical research (10.1 percent), teaching (4.4 percent), species conservation (4.1 percent), environmental management (2.6 percent), testing (1.0 percent), development of alternatives (<0.1 percent) and production of biological agents (<0.1 percent).

Commercial organisations used 3586 more animals than in 2013. Animals reported by commercial organisations were used for teaching (36.9 percent), veterinary research (21.2 percent), testing (18.2 percent), basic biological research (9.0 percent), animal husbandry research (8.4 percent), environmental management (3.2 percent), “other” purposes (1.9 percent), medical research (0.9 percent), production of biological agents (0.1 percent) and development of alternatives (<0.1 percent).

CRIs’ animal use fell by 440 to 50 657 in 2014. Animals reported by CRIs were used for basic biological research (56.6 percent), animal husbandry research (26.6 percent), veterinary research (7.8 percent), environmental management (6.6 percent), testing (1.2 percent), species conservation (0.7 percent), medical research (0.4 percent) and teaching (0.2 percent).

Organisations in the ‘other’ category include non-university medical research institutes, zoos/wildlife parks and individuals. The number of animals reported from this sector rose by 10 793 in 2014. The vast majority of these (98.4

percent) were rodents used for medical research. Other animals were used for basic biological research (216 cephalopod/crustacea), environmental management (50 fish) and animal husbandry (4 other birds).

Government departments reported the use of 8103 animals in 2014, up 2447 from 2013. The majority of these (65.7 percent) were used in research into environmental management. Veterinary research, specifically, for investigation and surveillance of exotic avian diseases, accounted for 23.6 percent, made up of birds, including chicken eggs. Species conservation accounted for 10.3 percent, with the remaining 0.4 percent used for teaching purposes.

Polytechnics and institutes of technology reported 1436 more animals in 2014 compared with 2013. The wide variety of animals manipulated by this sector were nearly all (95.6 percent) used for teaching, usually for low impact animal husbandry / veterinary nursing or similar training. Other animals were used for basic biological research (215), species conservation (30) and “other purposes” (8).

The use of animals in RTT reported by schools rose to 2448 in 2014. The wide range of animals included cephalopods/crustaceans (2159), sheep (115), fish (50), chickens (41), dogs (33), cats (15), mice (15), horses (10), cattle (8), rats (1) and “other species” (1).

8 Animal Reuse

In 2014, 4.7 percent of animals were used more than once for RTT. The average rate of re-use since 1999 when this measure was first recorded is 6.5 percent. Domestic animals (including livestock) made up 77.9 percent of the animals that were reused. With the exception of cephalopod/crustacea, numbers of every animal species were reported as being used more than once in 2014, although in many cases the numbers were very low.

9 Purpose of Manipulation

Organisations are required to provide information on the purpose of manipulations (in broad categories). The table below shows the breakdown and compares the 2014 figures with those reported in 2013. Descriptions of the "purpose of manipulation" categories are outlined in Appendix 3.

Purpose of manipulation	% of animals used	
	2014	2013
Basic biological research	24.3	23.4
Veterinary research	19.2	19.5
Teaching	16.9	6.7
Animal husbandry	15.4	9.0
Medical research	9.7	7.5
Testing	6.8	13.7
Environmental management	4.9	7.7
Species conservation	2.0	3.9
Other	0.8	0.8
Production of biological agents	<0.1	7.9
Development of alternatives	<0.1	0

The main purpose for which animals were manipulated in 2014 was again for basic biological research, with the numbers in this category rising 43.8 percent to 75 334. The rise was mainly due to more use of sheep (+ 8675), fish (+ 8593), fowls/chickens (+ 5765), mice (+ 4886) and deer (+ 3042) in this category. The numbers of goats, pigs, amphibia, cephalopod/crustacea, "other" species, cats, dogs, horses and rabbits also rose. The largest fall was in the number of cattle used for basic biological research (- 8904). Universities (48.7 percent), CRIs (38.0 percent) and commercial organisations (12.7 percent) conducted the bulk of this research, with "other" organisations and polytechnics using the remaining 431 of the 75 334 animals altogether in this category.

Veterinary research accounted for 59 624 animals reported in 2014, 36.8 percent up on the previous year. This was mainly due to increased numbers of farm animals being used in this category. The number of deer rose significantly (+ 17 681). These deer were part of a large-scale study looking to establish and quantify the role of fetal wastage (abortions) in overall reproductive wastage of farmed deer in New Zealand, and to identify and determine the role that infectious agents play in that wastage. Cattle numbers rose slightly (+ 494), while goats (19) and pigs (10) were used for veterinary research in 2014, but not in 2013. Sheep numbers were down 1697 on the previous year. Fish (3517) and reptiles (99) were used in 2014 but not in 2013. More horses (+ 34) were used for veterinary research, while numbers of chickens (- 1705), mice (- 1292), dogs (- 484), cats (- 223), other birds (- 222), rabbits (- 78) and possums (- 33) fell. No guinea pigs or rats were used in this category in 2014. Veterinary research was undertaken by universities (52.5 percent), commercial organisations (37.7 percent), CRIs (6.6 percent) and government departments (3.2 percent).

The number of animals reported as used in teaching rose more than 250 percent in 2014 to 52 534. The rise was mainly due to the number of cattle reported for teaching purposes (40 159). The majority of these were included in a three-year ethics application to train approximately 150 artificial breeding technicians per year in the procedure of trans-cervical artificial insemination. All species except deer, marine mammals and possums were used for teaching. Apart from cattle, the most common species used were fish (4663) and cephalopod/crustacea (2310). Commercial organisations reported most animal use in teaching in 2014, accounting for 74.4 percent of the total compared to 19.3 percent in 2013. Other organisations involved in teaching were polytechnics (10.6 percent), universities (10.1 percent), schools (4.7 percent), CRIs (0.2 percent) and government departments (<0.1 percent).

A total of 47 698 animals were reported as used for animal husbandry research in 2014, up 27 495 from the previous year. Farm animals (51.9 percent) and chickens (40.0 percent) made up the majority of this category. Other species reported in 2014 as manipulated for animal husbandry include fish (3163), mice (692), rats (10) and other birds (4). Universities (53.0 percent), CRIs (28.3 percent), commercial organisations (18.7 percent) and "other" organisations (<0.1 percent) reported manipulating animals for animal husbandry purposes in 2014.

The number of animals reported as being manipulated for medical research rose from 16 698 to 29 976 in 2014. Rabbits and rodents made up 94.6 percent of the total, with numbers of these species in this category rising 13 331 over 2013. Other animals manipulated in this category included 1221 sheep, 401 fish and one dog. Medical research was undertaken by "other" organisations (55.7 percent), universities (40.4 percent), commercial organisations (3.3 percent) and CRIs (0.6 percent).

The number of animals manipulated for the purposes of testing fell from 30 674 reported in 2013 to 21 082 in 2014, a 31.3 percent decrease. The decrease can largely be attributed to a fall in the number of farm animals (- 5982) and rodents (- 3957). Rabbits and rodents accounted for the majority (93.6 percent) of the animals used in this category, with farm animals (905 sheep and 223 cattle) accounting for a further 5.4 percent. Other animals used for testing included 117 dogs, 90 cats and 15 "other" birds. Commercial organisations carried out 91.5 percent of the testing reported in 2014, with the remainder done by universities (5.5 percent) and CRIs (2.9 percent).

Environmental management research used 15 163 animals in 2014, 2139 fewer than in 2013. This was mainly due to a fall in numbers of "other" birds from 10 069 in 2013 to 29 in 2014. Possums were the main species (26.1 percent) used in this category in 2014, followed closely by fish (20.1 percent). Other species used for environmental management were sheep (2850), rats (1911), mice (1829), cattle (834), other species (381), cephalopod/crustacea (255), cats (47), other birds (29), pigs (15) and dogs (6). Government departments (35.1 percent), commercial organisations (22.1 percent), CRIs (22.1 percent), universities (20.4 percent) and "other institutions" (0.3 percent) carried out environmental management research.

Animal numbers reported for species conservation in 2014 fell 30.5 percent to 6114. These were made up of other species (1674), other birds (1667), fish (1559), marine mammals (843), amphibia (246) and reptiles (125). The majority of this work was undertaken by universities (80.3 percent) with the remainder made up of government departments (13.7 percent), CRIs (5.5 percent) and polytechnics (0.5 percent).

Animals reported as used for purposes other than those already specified rose 35.5 percent to 2497 in 2014. These included 2307 farm animals, 188 rats and two "other" birds. Research in the "other" category was undertaken by commercial organisations (80.0 percent), universities (19.7 percent) and polytechnics (0.3 percent).

The number of animals reported as utilised in the production of biological agents fell from 17 616 in 2013 to just 199 in 2014. These were made up of 155 sheep, 43 mice and one rabbit. Commercial organisations carried out 77.9 percent of this work, with the remaining 22.1 percent carried out by universities.

A total of 66 animals were reported as used in the development of alternatives in 2014. These included 39 sheep (used by a university) and 27 mice (used by a commercial organisation). Details of these are given in Section 10.

10 Grading of Animal Manipulations

Animal manipulations are graded according to a five point scale as specified in the Animal Welfare (Records and Statistics) Regulations. The name and description of the scale was changed in 2008 to better reflect the overall estimate of the impact or invasiveness of each animal use. The five grades are:

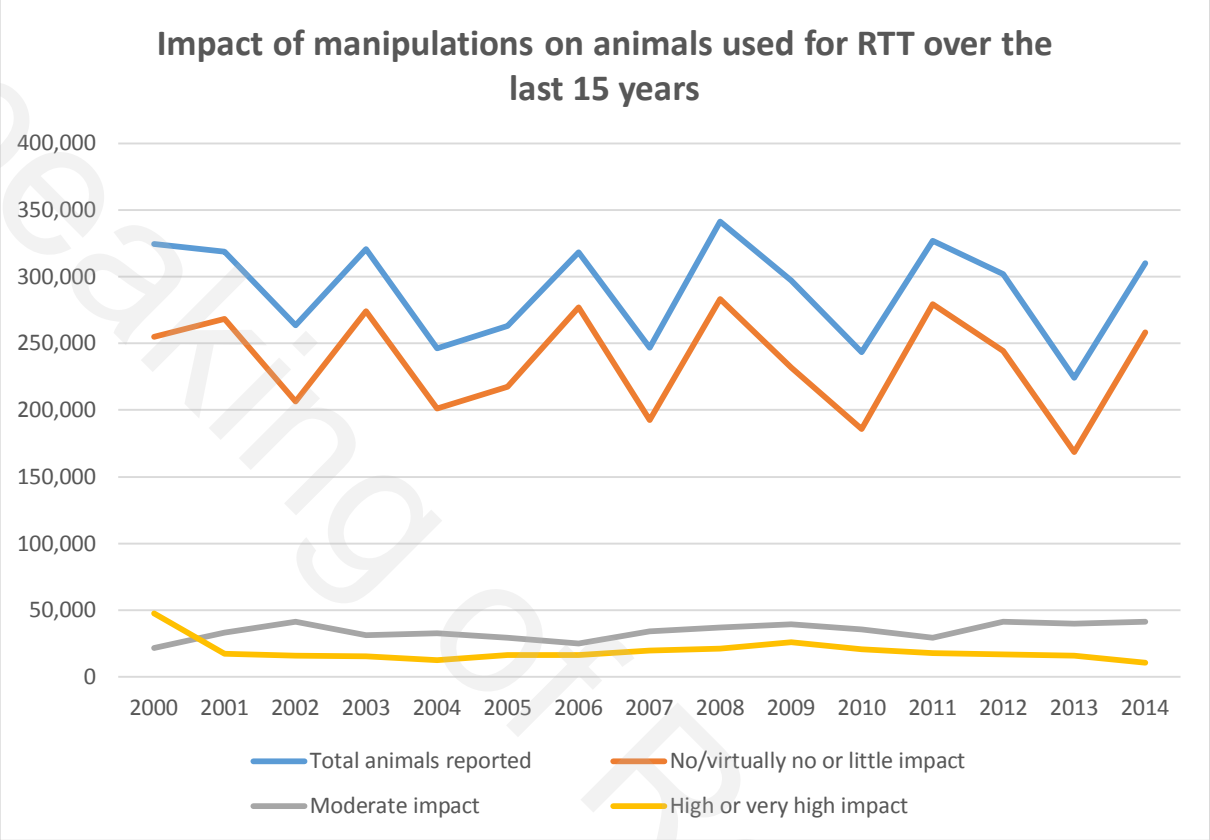
- "no impact or virtually no impact" - manipulations that causes no stress or pain or virtually no stress or pain
- "little impact" - manipulations of minor impact and short duration
- "moderate impact" - manipulations of minor impact and long duration or moderate impact and short duration
- "high impact" - manipulations of moderate impact and long duration or high impact and short duration
- "very high impact" - manipulations of high impact and long duration.

A more comprehensive description of the grading system has been published in the MPI publication *Animal Use Statistics* and is available on the website http://www.mpi.govt.nz/protection-and-response/animal-welfare/animals-in-research-testing-teaching/resources/

Appendix 4 summarises the impact grade allocated to animals manipulated for RTT and reported in 2014.

10.1 LONG-TERM TRENDS OF THE IMPACT OF RTT ON THE ANIMALS USED IN NEW ZEALAND

The percentage of animals that experience “no/virtually no” or “little impact” has averaged 81.2 percent since 2000 with a range from 75.2 percent to 87.0 percent. In 2014, 83.3 percent (258 469) of animals were exposed to manipulations in these categories.



The percentage of animals that experience “moderate impact” has averaged 12.1 percent over the last 15 years with a range from 6.7 percent to 17.8 percent. In 2014, 13.3 percent (41 418) of animals were classified in this category.

The percentage of animals that experience “high impact” or “very high impact” has averaged 6.7 percent over the last 15 years with a range from 3.4 percent to 14.7 percent. In 2014, a total of 10 400 animals (3.4 percent of the total) experienced manipulations in these categories, the lowest number in this category under the current legislation.

10.2 MANIPULATION GRADING OF ANIMALS REPORTED IN 2014

The increase in the number of animals manipulated for RTT in 2014 was reflected across all manipulation gradings except the “high” and “very high impact” category. Compared to 2013 statistics, numbers rose by 4.0 percent (+ 1588) in the “moderate impact” category, by 77.6 percent (+ 83 285) in the “little impact” category and by 11.0 percent (+ 6738) in the “no or virtually no impact”

category. Numbers fell by 59.1 percent (- 2661) in the “high impact” category, and by 24.1 percent (- 2711) in the “very high impact” category.

Of the farm animals, 95.2 percent fell into the “no/virtually no” or “little impact” category, as did 95.9 percent of other domestic mammals (cats, dogs and horses), 94.6 percent of rabbits, 90.2 percent of birds, 87.9 percent of miscellaneous species, 54.5 percent of rodents and 12.4 percent of “other” species. The largest percentages of groups represented in the “moderate impact” category were “other” species (86.4 percent) and rodents (33.9 percent). Birds (9.4 percent), miscellaneous species (8.7 percent), rabbits (5.4 percent), farm animals (4.7 percent) and other domestic mammals (3.8 percent) were also recorded as experiencing moderate impact on their welfare. Details of animals recorded in the “high” or “very high impact” category are shown below.

Summary of impact of manipulations in animals used for RTT in 2014

2014 summary	Total reported	Number in each manipulation grade				
		No/virtually no impact	Little impact	Moderate impact	High impact	Very high impact
Rodents and rabbits	73 495	10 605	30 007	24 502	1167	7214
Sheep and cattle	120 241	24 059	89 536	6552	70	24
Aquatic species[1]	46 925	17 394	25 163	3867	333	168
Other domestic species	30 929	1353	29 022	549	5	0
Birds	31 588	14 153	14 352	2959	124	0
Possums	3983	0	2346	378	146	1113
Other[2]	3126	243	236	2611	0	36
Grade totals	**310 287**	**67 807**	**190 662**	**41 418**	**1845**	**8555**
Grade percentages		**21.9%**	**61.4%**	**13.3%**	**0.6%**	**2.8%**

[1] ‘Aquatic species’ includes amphibians, fish, marine mammals and cephalopods/crustaceans.
[2] ‘Other’ includes reptiles and miscellaneous species as described in section 2.

Animals featuring in the “very high” impact group were rodents, pest species, cephalopod/crustacea, cattle fish and sheep. Animals were classified in this and the “high” impact grades for the following reasons:

- **Fish**
  - Attachment of satellite tags to great white sharks to determine their fine scale movements and to determine the sharks’ overlap/interaction with fisheries, as well as providing models of their distribution and preferred habitat;
  - Reduction of oxygen levels to clarify hypoxia tolerance limits of fish (kingfish and hapuku) that may be farmed, as fast-growing fish can have poor heart health and/or are unable to cope with stress such as low oxygen;
  - Six fish died as a result of equipment problems rather than experimental manipulation;
  - Fish were enrolled in a treatment trial to assess hormonal treatment during spawning.

- **Horses**
  - Five had two manipulations of moderate impact but long duration in a six-month trial of an intra-articular treatment. Apart from the two treatments, the horses were simply monitored under normal daily management.
- **Rats**
  - Research into treatment of drug addiction;
  - Medical research, specifically testing of various drug therapies for hypertension, stroke, and heart attacks;
  - Establishment of a procedure for standard brain cannulations and injections.
- **Sheep**
  - An adverse reaction to a new drug formulation resulted in euthanasia on compassionate grounds;
  - A study to find animals that are genetically resistant to developing footrot, a condition that has significant industry-wide welfare issues;
  - Animals on trial became fly-struck, were treated and recovered without incident.
- **Cattle**
  - An adverse reaction to a new drug formulation resulted in euthanasia on compassionate grounds;
  - Calves were used to assess pain from horn disbudding.
- **Other birds**
  - Attachment of radio transmitters to wild birds to track migration (red knots) and habitat use and dispersal (New Zealand falcons);
  - A study to determine whether a walk-in trap containing a call bird will attract wild cockatoos and could therefore be used as trap.
- **Guinea pigs**
  - Batch release testing for animal vaccines. This is a regulatory requirement to demonstrate potency;
  - Veterinary research, and production and evaluation of biological reagents.
- **Mice**
  - Testing of antigens and animal vaccines mandated by regulation;
  - Veterinary research, and production and evaluation of biological reagents;
  - To provide data for the on-going reduction in the use of mice for testing toxicity of shellfish harvested in New Zealand waters for export and domestic consumption;
  - To evaluate a potential treatment against a ubiquitous infective parasite that causes abortion or fetal abnormalities in cattle worldwide;
  - In a project that has resulted in discoveries that reveal cell metabolic processes important to cancer cell survival and growth;
  - In a project that examined the question of whether high dose vitamin C can reduce cancer cell survival and by what mechanism.
- **Pest Control**
  - Possums, rats, stoats and mice were used in studies designed to improve effectiveness and humaneness of pest control methods. These studies were largely driven by the quest to find alternatives to sodium monofluoroacetate (1080);
  - Possums were used in cage trials to test palatability and efficacy of new types of 1080 possum bait in comparison with industry-standard baits.

The findings are of great value to pest managers in confirming the suitability of new products;

- Possums were used in cage trials to assess suitability of oil of wintergreen as an alternative salicylate to aspirin for use in combination with cholecalciferol (vitamin D3) as a possum poison. Oil of wintergreen was unpalatable at the concentration required;
- Rats were used to test the relative humaneness of a multi-release rat trap for conservation purposes;
- Possums were part of a study on the development of a serological assay for the detection of the Wobbly Possum Disease Virus.

11 The Three Rs

There were two projects recorded as using animals in the development of alternatives in 2014.

Thirty-nine sheep were used in an experiment which was part of a long-term project aimed at developing an *in silico* (i.e. performed on computer or via computer simulation) biological model representing lamb growth on pasture. Estimation of milk and pasture intake of suckling lambs under field conditions is difficult as neither of the dietary components can be controlled, so the lambs were reared indoors under controlled conditions to give a better understanding of lamb energy intake and utilisation. Information on the amount of fat, protein and energy at the start of the trial and how each of these components was deposited in different body pools allowed modelling of how energy intake was partitioned into the body.

Twenty-seven mice were used to test process improvements, leading to a permanent reduction of future animal testing required.

Appendix 1

Animal Usage Report: Five-year summary of the number of animals used and the percentage that died or were euthanased (by species)

	2014		2013		2012		2011		2010	
	No. used	% died or euthanased	No. used	% died or euthanased	No. used	% died or euthanased	No. used	% died or euthanased	No. used	% died or euthanased
Amphibia	771	51	238	3	2021	64	606	13	811	7
Birds	31588	42	25685	13	14638	15	40937	35	7492	33
Cats	728	<1	676	3	695	<1	978	10	554	1
Cattle	75496	<1	52193	2	124582	<1	106601	<1	42341	2
Cephalopods/ crustaceans	4756	28	5485	24	4288	27	5118	86	3107	7
Deer	25058	<1	2316	6	3927	8	16779	<1	9094	1
Dogs	1006	3	1437	8	915	2	1048	12	814	7
Fish	40555	30	24354	53	28044	32	15531	64	15611	15
Goats	3176	6	581	24	1568	<1	1983	<1	1161	5
Guinea pigs	1864	95	2209	97	2090	96	2394	97	2316	96
Horses/ donkeys	237	2	272	2	758	<1	659	3	840	2
Marine mammals	843	0	927	<1	783	0	292	0	212	0
Mice	58379	97	45018	98	55 870	99	74133	98	84620	94
Pigs	724	42	236	83	264	58	809	54	513	69
Possums	3983	94	2626	84	5570	54	1629	84	1223	76
Rabbits	1445	91	1386	92	1519	95	1921	94	1846	95
Rats	11807	92	10806	94	10523	92	10 674	93	11166	96
Reptiles	325	<1	991	5	5349	<1	1664	1	1686	14
Sheep	44745	8	46218	3	38544	7	42571	6	55859	5
Other species	2801	5	394	20	245	28	443	10	883	31
Total no. used	310287		224048		302193		326770		242149	
Yearly %		34%		36%		29%		37%		43%

Appendix 2

Animal Usage Report: Five-year summary of animal usage (by organisation type)

Group	Year	Rats, mice guinea pigs, rabbits	Sheep, cattle, goats	Other domestic animals	Birds	Fish	All other species	Total
Universities	2010	26,388	13,694	7,551	6,170	12,817	3,373	69,993
	2011	36,085	12,348	2,399	31,533	7,279	6,770	96,414
	2012	25,261	14,301	1,373	6,343	22,729	10,296	80,303
	2013	21 286	9297	2064	4393	10,301	5919	53,260
	2014	**31,346**	**16,822**	**19,681**	**23,258**	**22,877**	**6461**	**120,445**
Commercial organisations	2010	49,032	38,142	520	4	2	278	87,978
	2011	37,994	102,589	12,426	107	1	175	153,292
	2012	24,319	123,849	755	32	23	117	149,095
	2013	28,087	63,468	225	10,120	341	32	102,273
	2014	**20,436**	**82,185**	**218**	**24**	**2984**	**12**	**105,859**
Crown research institutes	2010	4,162	42,261	3,055	1,014	977	1,057	52,526
	2011	3,407	31,157	4,522	294	5,026	2,131	46,537
	2012	2,586	24,168	3,648	7,951	1,838	5,022	45,213
	2013	3818	25,446	2001	6183	10,972	2677	51,097
	2014	**1866**	**22,975**	**7108**	**6103**	**11,174**	**1431**	**50,657**
Polytechnics	2010	172	4,030	636	130	109	188	5,265
	2011	121	4,612	589	116	3,158	70	8,666
	2012	152	1,715	549	116	3,187	168	5,658
	2013	174	729	614	73	2707	67	4364
	2014	**206**	**1312**	**641**	**77**	**3418**	**146**	**5800**
Government departments	2010	19	-	256	91	-	140	290
	2011	51	-	8	8,824	60	459	9,632
	2012	167	-	122	133	-	19	195
	2013	-	-	43	4815	-	841	5656
	2014	**2920**	**-**	**47**	**2081**	**2**	**3053**	**8103**
Other	2010	20,062	1152	-	24	1,600	5	22,843
	2011	11,292	449	162	7	-	-	11,910
	2012	17,662	600	162	8	263	28	18,723
	2013	6025	52	24	62	16	3	6182
	2014	**16,705**	-	-	**4**	**50**	**216**	**16,975**
Schools	2010	81	82	45	59	106	2,881	3,254
	2011	56	-	53	56	7	147	319
	2012	22	61	29	55	4	2,606	2,777
	2013	29	-	9	39	17	1122	1216
	2014	**16**	**123**	**58**	**41**	**50**	**2160**	**2448**
TOTAL	2010	99,948	99,361	11,815	7,492	15,611	7,922	242,149
	2011	89,122	151,155	20,273	40,937	15,531	9,752	326,770
	2012	70,002	164,694	6,559	14,638	28,044	18,256	302,193
	2013	59 419	98 992	4937	25 685	24 354	10 661	224 048
	2014	**73,495**	**123,417**	**27,753**	**31,588**	**40,555**	**13,479**	**310,287**

Appendix 3

'Purpose of Manipulation' Categories

Category	Description
Teaching	Animals used for teaching or instruction, at any level.
Species conservation	Work directed towards species conservation. The species to be conserved may or may not be directly involved, e.g. nutrition studies using more common species can benefit an endangered species.
Environmental management	Environmental management, including the control of animal pests and research into methods of reducing production of greenhouse gases.
Animal husbandry	Animal husbandry, including reproduction, nutrition, growth and production.
Basic biological research	Basic biological research.
Medical research	Research aimed at improving the health and welfare of humans, but not research on human subjects.
Veterinary research	Research aimed at improving the health and welfare of production and companion animals.
Testing	Animals used for public health testing or to ensure the safety, efficacy or quality of products to meet regulatory requirements for human or animal products, either in New Zealand or internationally.
Production of biological agents	Animals used for raising antibodies or for the supply of blood products.
Development of alternatives	Work aimed at developing methods to replace or reduce the use of live animals in research, testing and teaching.
Other	Manipulations for purposes other than those listed above.

Appendix 4

Summary of the impact grade allocated by species in 2014

Species	No impact	Little impact	Moderate impact	High impact	Very High impact	Total
Amphibians	2	769	-	-	-	771
Birds	14 153	14 352	2959	124	-	31 588
Cats	388	273	67	-	-	728
Cattle	10 078	64 308	1083	11	16	75 496
Cephalopods/ crustacea	2915	1448	233	-	160	4756
Deer	-	24 931	127	-	-	25 058
Dogs	454	548	4	-	-	1006
Fish	14 477	22 814	2923	333	8	40 555
Goats	11	2818	347	-	-	3176
Guinea pigs	78	386	-	840	560	1864
Horses	87	141	4	5	-	237
Marine mammals	-	132	711	-	-	843
Mice	9268	21 010	21 419	36	6646	58 379
Pigs	413	311	-	-	-	724
Possums	-	2346	378	146	1113	3983
Rabbits	176	1191	78	-	-	1445
Rats	1083	7420	3005	291	8	11 807
Reptiles	56	77	192	-	-	325
Sheep	13 981	25 228	5469	59	8	44 745
Misc. species	187	159	2419	-	36	2801
TOTAL	67 807	190 662	41 418	1845	8555	310287
Percentage	21.9%	61.4%	13.3%	0.6%	2.8%	