Ministry for Primary Industries
Manatū Ahu Matua

Statistics on the Use of Animals in Research, Testing and Teaching in New Zealand in 2017

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New Zealand Government

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1 Executive summary

This report presents numbers of animals used in research, testing and teaching (RTT) studies in New Zealand that were completed and reported to the Ministry for Primary Industries (MPI) in 2017. Numbers of animals used in long-term projects are not reported annually but either every three years or at the end of the year in which the project is completed, if less than three years.

Any RTT activities involving animals in New Zealand can only be carried out under the strict requirements of the Animal Welfare Act 1999 (the Act). No animal manipulations can be carried out without the prior approval of an animal ethics committee (AEC), membership of which must include at least three independent members: one a veterinarian nominated by the New Zealand Veterinary Association (NZVA), one a nominee of the Royal New Zealand Society for the Prevention of Cruelty to Animals (SPCA) and one from a local territorial authority. The AEC is tasked with assessing the necessity for any RTT activities, including weighing up the potential benefits against the cost to animal welfare. In addition, the AEC must be confident that researchers have fully addressed the Three Rs – *replacement* of animals with non-sentient or less sentient alternatives; *reduction* in animal numbers to the minimum required for statistical significance; and *refinement* of procedures to ensure the minimum possible impact on animal welfare.

A range of animals are used in RTT, as described in this report. The largest individual species grouping in 2017 was fish – of the more than 100 000 used, only 18 percent remained alive at the end of the work to be either retained by an institution, returned to owners, released to the wild or disposed of to others. In general, though, the majority of animals used for RTT in New Zealand are agricultural animals. This was the case again in 2017 with nearly 34 percent of the total of 314 571 animals reported to MPI being farm animals. Ninety-eight percent of farm animals used for RTT returned to their normal lives following their temporary use as research animals.

Some research, however, does have a greater impact on animals. Efforts to find the most humane methods of pest control, for instance, can carry a relatively high welfare cost. As an example, researchers may need to measure the length of time from ingestion of a poison until an animal is unconscious or dead in order to ascertain the efficiency or otherwise of that method of pest control. Such activities may cause considerable distress, and these are the type of issues that AEC members are required to weigh very carefully against the benefits of improving the survivability of our vulnerable native wildlife populations. Details of RTT activities that are graded as having a high or very high impact on animal welfare are given later in the report.

2 Introduction

The use of animals in RTT is covered by a self-contained set of provisions within New Zealand's animal welfare legislation - Part 6 of the Animal Welfare Act 1999 (the Act). 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 allows the use of animals for RTT purposes only in accordance with a code of ethical conduct which has been approved by MPI. In 2017, 26 institutions had codes of ethical conduct approved by the Director-General of MPI. These codes set the parameters within which the institutions are allowed to use animals for RTT 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 AEC established under the code of ethical conduct. There were 30 AECs (some institutions, because of their geographic spread, operate more than one committee). In addition, another 119 institutions engaging in RTT 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 NZVA, 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 a RTT 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 RTT have been collected since 1987. While previously published within the annual report of the National Animal Ethics Advisory Committee (NAEAC), since 2014 animal use statistics have been reported in 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 RTT 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 MPI 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 MPI by 28 February each year. In addition, the regulations empower the Director-General of MPI or any inspector appointed under the Act 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.

The 21 more common species used in RTT in New Zealand are grouped into the following categories:
- Birds (fowls/chickens, "other birds", pigeons)
- Farm animals (cattle, deer, goats, pigs, sheep)
- Miscellaneous (amphibia, cephalopod/crustacea, fish, marine mammals, possums, reptiles)
- Other domestic mammals (cats, dogs, horses)
- Rabbits
- Rodents (guinea pigs, mice, rats)

A further category – "other" – covers any other species, including zoo animals and wild animals.

3   Summary of 2017 Animal Use Statistics

A total of 314 571 animals used in RTT were reported in 2017, a 24 percent increase (+ 60 508) over the previous year. The rolling 3-year average was 264 648, up 0.5 percent on the previous year.

The most commonly reported species in 2017 was fish – a total of 101 167 making up 32.2 percent of the total. Sheep were the second most common species in 2017 – 57 436 making up 18.3 percent of the total. Mice (52 196 - 16.6 percent) and cattle (44 007 -14.0 percent) were the third and fourth most commonly used species. Reflecting the importance of research relating to agriculture, production animals (cattle, sheep, deer, goats and pigs) made up 33.9 percent of the total (106 732), with rodents and rabbits together accounting for 20.0 percent (62 948).

Most fish were used in basic biological research (78 947 – 78.0 percent), with other main uses being teaching (9390), environmental management (5574), species conservation (4504) and animal husbandry (1941). Teaching (30 537), basic biological research (29 465), veterinary research (25 701), animal husbandry (15 495), testing (3881) and medical research (1239) were the main reasons for using production animals, accounting for 106 318 animals. Nearly 90 percent of the rodents were used in medical research, testing the safety and efficacy of animal health products and basic biological research. The majority (92.3 percent) of cats, dogs and horses were used in veterinary research, teaching and basic biological research, with 500 horses reported used in the production of biological agents.

Nearly 82 percent of animals were exposed to manipulations which had no, virtually no, or little impact on their welfare. A total of 9789 animals (3.1 percent of the total) experienced manipulations of "high impact" or "very high impact". The species that experienced a "very high" impact were rodents (7283), fish (66), possums (18) and rabbits (3).

New Zealand's usage of animals classified as transgenic/chimera is low by world standards, with 6075 (1.9 percent of the total) such animals used in 2017.

More than 53 percent of animals were dead or euthanased following their use in manipulations. While 96 percent of production animals remained alive following use, nearly 82 percent of fish, and over 95 percent of rabbits and rodents were 'dead or euthanased' following manipulation.

A total of 145 institutions reported using animals for research, testing and teaching in 2017.

4 Animal Usage

During 2017, a total of 314 571 animals[1] were reported as manipulated[2] in RTT[3]. This was an increase of 23.8 percent (+ 60 508) compared to 2016 when 254 063 animals were reported.

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, up nearly 10 000 in 2017.

To illustrate the influence of the three-yearly reporting cycle, the accompanying graph shows the rolling three-year average compared with the annual totals. From 1999 to 2001, the rolling average was 297 417; for the years 2002 to 2004 the rolling average was 276 906; for the years 2005 to 2007 the rolling average was 276 123; for the years 2008 to 2010 it was 293 593; for the years 2011 to 2013 it was 284 337; for the years 2014 to 2016 the rolling average was 263 220. For the last three years (2015 to 2017) the average was 264 648.

Animals manipulated between 1999 and 2017
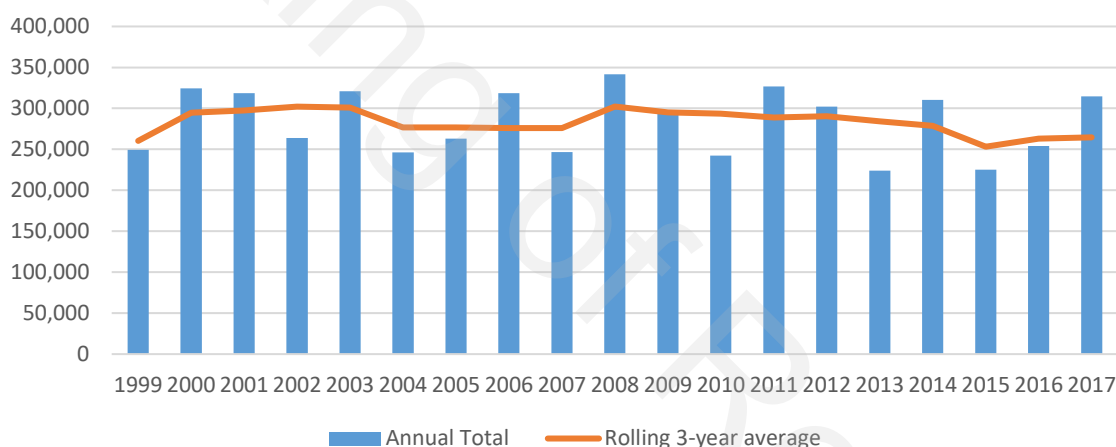
Those species most commonly reported in 2017 were (in order) fish, sheep, mice and cattle, which collectively accounted for 81.0 percent of the total animals manipulated for RTT. Mice, sheep and cattle have all been included in the four most commonly used animals since 1989. The other species making up this group in those 26 years have been fish (in 16 years), rats (in seven years) and birds (in five years).

With livestock numbers down on the previous year, the rise in numbers in 2017 was mainly due to increased use of fish and birds. Fish numbers rose by 81 535 and made up 32.2 percent of all animals used. Bird numbers were up by 23 639, mainly due to 22 907 more fowls/chickens being used. "Other" birds rose 715 and 17 more pigeons were used. Numbers of mice rose by 18 183; cats by 173; "other" species by 395; and guinea pigs by 52. Of the livestock species, only sheep numbers rose (+ 9888). The largest fall numerically was in cattle numbers – down 60 331. Deer were down 6151; goats down 1103; and pigs down 78. Other species with fewer numbers in 2017 were marine mammals (- 2276), rats (- 1178), cephalopod/crustacea (- 787), amphibia (- 527), dogs (- 416), possums (-186), horses (- 168), reptiles (-139) and rabbits (- 17).

The most common species used in 2017 – fish – were mainly used in basic biological research (78 947). Fish were also used in teaching (9390), environmental management (5574), species conservation (4504), animal husbandry (1941), testing (490) and medical research (321).

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[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.

Overall, the use of agricultural livestock fell by 57 775. Sheep (57 436) made up more than half of the agricultural livestock, with 17 344 used for basic biological research, 15 425 for teaching, 13 003 being for veterinary research, and 9163 percent for animal husbandry research. Sheep were also used in medical research (1142), testing (1135), environmental management (137) and the production of biological agents (87). Cattle (44 007) were mostly used for teaching (15 046), veterinary research (12 417), basic biological research (10 098) and animal husbandry research (6062). Cattle were also used in testing (214), environmental management (152), other purposes (14) and the production of biological agents (4). Goats (3297) were used for testing (2499), basic biological research (541) and animal husbandry research (146), with smaller numbers for veterinary research (98) and teaching (13). Deer (1537) were used in basic biological research (1300), veterinary research (177) and animal husbandry research (60). Pigs (455) made up less than one percent of the total livestock and were used for basic biological research (182), medical research (97), animal husbandry research (64), teaching (53), testing (33), "other purposes" (20) and veterinary research (6).

Most rodents were used in medical research (23 531), testing (17 799) and basic biological research (13 849). Rodents were also used for veterinary research (2272), production of biological agents (1799), teaching (1379), "other purposes" (524), environmental management (557), species conservation (17) and animal husbandry (13). Mice made up the majority (84.5 percent) of rodent numbers, followed by rats (12.3 percent) and guinea pigs (3.2 percent).

Most fowls/chickens (24 348) were used in animal husbandry research. Fowls/chickens were also used in veterinary research (1341), teaching (330) and basic biological research (317). One was used for "other purposes". "Other birds" were used in basic biological research (3951), for veterinary research (1514), species conservation (870), teaching (228) and environmental management (191). Pigeons (264) were used for "other purposes" (121), teaching (95) and basic biological research (48).

Cephalopod/crustacea (4028) were used for teaching purposes (1786), species conservation (1206), basic biological research (566), testing (245) and animal husbandry (225). Marine mammals numbers dropped from 2974 to 698, most of which (441) were used for basic biological research, with the remaining 257 used for species conservation. Sixty-six amphibia were used in 2017, with the majority (57) used in basic biological research, and the remaining nine use for teaching.

Reptiles (1096) were used for basic biological research (588), veterinary research (429), environmental management (52), teaching (18), and species conservation (9). Possums (983) were used in environmental management (978), species conservation (4) and basic biological research (1).

Cats (1099) were used in basic biological research (515), teaching (396), testing (88), "other purposes" (38), medical research (30), veterinary research (20), production of biological agents (8) and environmental management (4). Dogs (888) used for teaching (469), veterinary research (255), basic biological research (128), testing (24) and medical research (12). Horses (756) were mainly used in veterinary research (690), with 59 being used for teaching, 4 for "other purposes" and 3 for animal husbandry.

Rabbits (1208) were used for testing (860), teaching (162), production of biological agents (121), veterinary research (33), medical research (18), environmental management (6), species conservation (5) and "other purposes" (3).

In 2017, 755 animals were reported in the "other species" category. This group was made up of 404 bats used for species conservation (389) and basic biological research (15); 221 ferrets, 58 stoats and 51 hedgehogs used for environmental management; eight stoats used basic biological research; and five llamas, six alpacas and two chinchillas used in teaching.

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.

5 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	2017	2016
	%	%
Farms	38.6	52.2
Breeding units	22.2	17.8
Captured	19.0	9.3
Commercial sources	10.9	15.2
Public sources	5.7	2.6
Born during project	3.3	2.8
Imported	0.3	0.2

A total of 121 462 animals were sourced from farms in 2017. While nearly two thirds of these were indeed farm animals (80 048), well over a third of the fish used also classified as coming from farms (41 171). In addition 132 fowls/chickens, 62 horses, 40 "other birds" and nine llamas/alpacas were sourced from farms.

The number of animals sourced from breeding units (69 771) rose by 24 659 in 2017. The majority of these were mice (50 535), fish (8796), rats (5896), guinea pigs (1892) and rabbits (1029). Also sourced from such units were 466 sheep, 388 cattle, 272 cats, 157 "other birds", 131 goats, 95 pigs, 65 dogs, 29 reptiles, 16 pigeons and 2 horses.

A total of 59 809 animals were captured in 2017 for RTT purposes. The majority of these were fish (48 356), followed by "other birds" (5246), cephalopod/crustacea (2598), possums (982), reptiles (868), "other species" (734), rats (507), fowls/chickens (194), marine mammals (179), pigeons (90), cats (27), pigs (20), rabbits (6) and amphibia (2).

A total of 34 440 animals came from commercial sources. Most of these were fowls/chickens (25 934) but there were also 3745 sheep, 2332 cattle, 1342 fish, 370 rats, 257 mice, 127 pigs, 121 pigeons, 75 horses, 58 deer, 47 goats, 11 rabbits and 11 "other birds", 5 dogs, 3 reptiles and 2 amphibia.

A total of 17 929 animals came from public sources, with the majority being cattle (12 783). Others were "other birds" (1300), dogs (815), cats (800), horses (617), marine mammals (519), sheep (252), reptiles (196), rabbits (142), rats (135), goats (86), fowls/chickens (69), mice (67), guinea pigs (60), pigeons (37), fish (26), "other species" (10), pigs (8), cephalopod/crustacea (5), and one each of possums and amphibia.

A total of 10 366 animals were born during projects. The majority of these were sheep (5774), but this category also included 1476 fish, 1425 cephalopod/crustacea, 672 rats, 593 mice, 290 deer, 68 goats, 23 amphibia, 20 rabbits, 14 cattle, 8 fowls/chickens and three dogs.

794 animals were imported into New Zealand for RTT purposes in 2017. These included 744 mice, 38 amphibia and 12 rats.

In 2017, 39 institutions used cattle in RTT, 19 of which only used cattle, while another 6 only used sheep and cattle. Sheep were used by 28 institutions, 8 of which used only sheep, while another 6 used both sheep and cattle. Rats were used by 25 institutions; dogs by 21; "other birds" and mice by 19; rabbits, cats and fish by 17; guinea pigs by 13; horses by 11; fowls/chickens by 10; "other species" by nine; goats and cephalopod/crustacea by eight; pigs and reptiles by seven; pigeons, deer and marine mammals by four; amphibians by three and possums by two institutions.

6 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	2017	2016
	%	%
Normal/conventional	89.9	85.5
SPF/germ-free	3.3	3.3
Unborn/pre-hatched	3.0	3.4
Transgenic/chimera	1.9	2.2
Protected species	1.5	3.7
Diseased	0.3	1.8
Other	<0.1	0.1

As in previous years, the majority of animals manipulated in RTT in New Zealand in 2017 were classified as normal, healthy, conventional animals.

More SPF/germ-free animals were manipulated in 2017 (10 463). Most of these were rodents (9791 mice, 577 rats and 10 guinea pigs). This category also included 67 pigs and 18 possums.

9522 animals were included in the unborn/pre-hatched category, made up of 8000 fish eggs, 1286 chicken eggs, 217 fetal lambs, 12 fetal mice and 7 reptile eggs.

A total of 6075 animals were classified as transgenic/chimera, most of which were mice (5487). This category also included 233 rats, 211 fish, 84 cattle and 60 goats. Five institutions used transgenic/chimera animals in 2017, the same as in the previous year.

Protected species included 3524 "other birds", 621 reptiles, 404 bats and 257 marine mammals.

A total of 860 animals were classified as "diseased"[4] and included 445 cattle, 208 mice, 86 rats, 72 dogs, 23 sheep, 15 deer and 11 horses.

Thirty-three sheep and 16 cattle were classified as having a status other than those listed above.

7 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. A total of 168 452 animals died or were euthanased during, or after, manipulations in 2017. Of the remaining 146 119 animals, 84 689 were returned to owners, 25 541 were disposed of to others, 18 558 were retained by the institution and 17 331 were released to the wild. The majority of animals released to the wild were fish (6749), "other birds" (6163), cephalopod/crustacea (1763), reptiles (949), marine mammals (698) and "other species" (579). Also released were fowls/chickens (194), rats (130), possums (75), cats (23), mice (7) and one dog.

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

Animal use by species reported in 2017
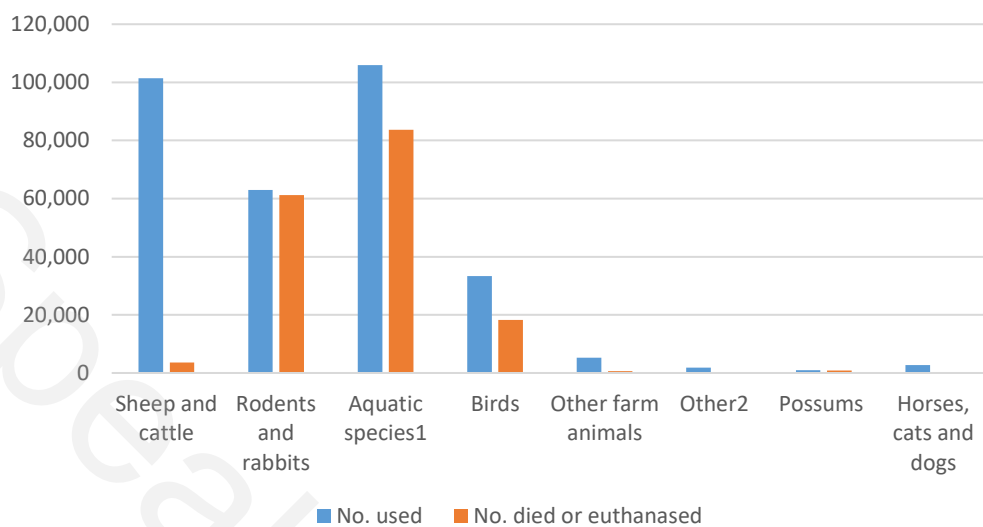
(1) - 'Aquatic species' includes amphibia, fish, marine mammals and cephalopods/crustaceans
(2) - 'Other' includes reptiles and "other species"

8 Organisation Type

Appendix 3 tabulates animal usage by organisation type over the past five years. The pie chart below shows the 2017 information graphically. The top three user groups in 2017 were (in order) universities, commercial organisations and CRIs (Crown Research Institutes).

Animal usage by organisation type
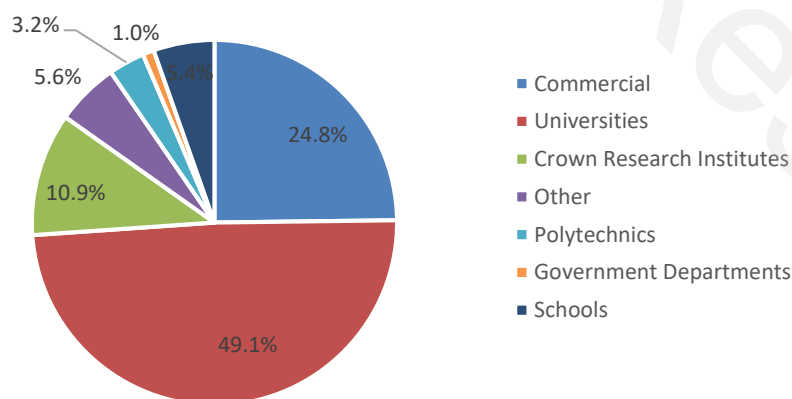
Universities reported using 154 515 animals in 2017. Animals reported by universities were used for basic biological research (96 249), animal husbandry research (32 612), medical research (9139), species conservation (4950), veterinary research (4861), teaching (3292), environmental management (2451), other purposes (695), testing (247) and production of biological agents (19).

Commercial organisations used 77 893 animals in 2017. Animals reported by commercial organisations were used for testing (22 373), veterinary research (17 828), teaching (14 714), basic

biological research (14 059), animal husbandry research (6131), production of biological agents (1975), medical research (741) and environmental management (72).

CRIs used 34 336 animals in 2017. Animals reported by CRIs were used for basic biological research (16 189), veterinary research (7072), environmental management (5406), animal husbandry research (3211), species conservation (1456), testing (767), medical research (156), teaching (44), production of biological agents (25) and other purposes (10).

Organisations in the 'other' category include non-university medical research institutes, zoos/wildlife parks and individuals. The number of animals reported from this sector was 17 702 in 2017. The majority of these (15 059) were used for medical research. Other animals were used for basic biological research (2208), teaching (263), species conservation (119), veterinary research (33) and other purposes (20).

The number of animals in RTT reported by schools was 16 951 in 2017. The wide range of animals, including sheep (15 025), cephalopod/crustacea (1725), cattle (127), fowls/chickens (37), fish (10), pigs (10), dogs (6), pigeons (5), rats (2), horses (2) plus one cat and one rabbit, were all used for teaching purposes.

Polytechnics and institutes of technology reported 9925 animals in 2017. The wide variety of animals manipulated by this sector were nearly all (9607) used for teaching, usually for low impact animal husbandry/veterinary nursing or similar training. Other animals were used for basic biological research (191), animal husbandry research (71) and medical research (56).

Government departments reported the use of 3249 animals in 2017. The majority of these (2461) were used in veterinary research, mainly for investigation and surveillance of exotic avian diseases. Species conservation accounted for 736 animals and research into environmental management for 52.

9   Animal Reuse

In 2017, 22 048 animals used in RTT were reported as having been used previously. Domestic animals (including livestock) accounted for 19 588 of the animals that were reused. With the exception of marine mammals, cephalopod/crustacea and possums, a proportion of every animal species was reported as having been previously.

10 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 2017 figures with those reported in 2016. Descriptions of the "purpose of manipulation" categories are outlined in Appendix 3.

Purpose of manipulation	% of animals used	
	2017	2016
Basic biological research	41.0	17.7
Teaching	14.3	12.0
Animal husbandry	13.4	4.7
Veterinary research	10.3	23.0
Medical research	8.0	6.5
Testing	7.4	20.9
Environmental management	2.5	2.9
Species conservation	2.3	1.8
Production of biological agents	0.6	10.1
Other	0.2	0.4
Development of alternatives	0	<0.1

The main purpose for which animals were manipulated in 2017 was for basic biological research, with 128 896 animals in this category. Most of these were fish (78 947) followed by sheep (17 344), mice (10 215), cattle (10 098), "other birds" (3951), rats (3634), deer (1300), reptiles (588), cephalopod/crustacea (566), goats (541), cats (515), marine mammals (441), fowls/chickens (317), pigs (182), dogs (128), amphibia (57), pigeons (48), "other species" (23) and one possum. No horses, rabbits or guinea pigs were used for this purpose. Basic biological research was undertaken by universities (74.7 percent), CRIs (12.6 percent), commercial organisations (11.0 percent), other organisations (1.7 percent) and polytechnics (<0.1 percent).

A total of 44 871 animals were reported as used in teaching in 2017, 30 537 of which were farm animals. Other animals used in this category were fish (9390), cephalopod/crustacea (1786), mice (905), dogs (469), rats (397), cats (396), fowls/chickens (330), "other birds" (228), rabbits (162), pigeons (95), guinea pigs (77), horses (59), reptiles (18), "other species" (13) and amphibia (9). All species except deer, marine mammals and possums were used for teaching purposes. In 2017, schools used the most animals for teaching (16 951), followed by commercial organisations (14 714), polytechnics (9607), universities (3292), "other organisations" (263) and CRIs (44). Government departments did not use animals for teaching.

Animal husbandry research used 42 025 animals in 2017. The majority of these were fowls/chickens (24 348) followed by sheep (9163) and cattle (6062). Other species used for animal husbandry research included fish (1941), cephalopod/crustacea (225), goats (146), pigs (64), deer (60), guinea pigs (5), mice (4), rats (4) and horses (3). Universities (32 612), commercial organisations (6131), CRIs (3211) and polytechnics (71) reported manipulating animals for animal husbandry purposes in 2017.

A total of 32 255 animals were reported as used for veterinary research in 2017. The majority of these were sheep (13 003) and cattle (12 417). Other species reported in this category include mice (2017), "other birds" (1514), fowls/chickens (1341), horses (690), reptiles (429), dogs (255), rats (235), deer (177), goats (98), rabbits (33), cats (20), guinea pigs (20), and pigs (6). Commercial organisations (17 828), CRIs (7072), universities (4861), and government departments (2461) and "other institutions" (33) reported manipulating animals for animal husbandry purposes.

The number of animals reported as being manipulated for medical research was 25 151 in 2017. Mice were the species most frequently used in this category (21 106) followed by rats (2242), sheep (1142), fish (321), guinea pigs (183), pigs (97), cats (30), rabbits (18) and dogs (12). Medical research was undertaken by "other organisations" (15 059), universities (9139), commercial organisations (741), CRIs (156) and polytechnics (56).

The number of animals manipulated for the purposes of testing was 23 387 in 2017. Mice (16 226) were the most frequently used, followed by goats (2499), guinea pigs (1522), sheep (1135), rabbits (860), fish (490), cephalopod/crustacea (245), cattle (214), cats (88), rats (51), pigs (33) and dogs (24). Commercial organisations (22 373), CRIs (767) and universities (247) reported animal numbers for testing in 2017.

Environmental management research used 7981 animals in 2017. Animals used in this category included fish (5574), possums (978), rats (488), "other species" (330), "other birds" (191), cattle (152), sheep (137), mice (69), reptiles (52), rabbits (6), cats (4). CRIs (5406), universities (2451), commercial organisations (72) and government departments (52) carried out environmental management research.

Animal numbers reported for species conservation in 2017 were 7261 made up of fish (4504), cephalopod/crustacea (1206), "other birds" (870), "other species" (389), marine mammals (257), rats (17), reptiles (9), rabbits (5) and possums (4). The majority of this work was undertaken by universities (4950) with the remainder made up of CRIs (1456), government departments (736) and "other organisations" (119).

The number of animals reported as utilised in the production of biological agents was 2019 in 2017. These were made up of 1654 mice, 145 guinea pigs, 121 rabbits, 87 sheep, 8 cats and 4 cattle. Most of this work was carried out by commercial organisations (1975), with CRIs using 25 animals and universities 19 for this purpose.

Animals reported as used for purposes other than those included above numbered 725 in 2017. These included 524 rats, 121 pigeons, 38 cats, 20 pigs, 14 cattle, 4 horses, 3 rabbits and one fowl/chicken.

Research in the "other" category was undertaken by universities (695), "other organisations" (20) and CRIs (10).

No animals were used for the development of alternatives in 2017.

11 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 5 summarises the impact grade allocated to animals manipulated for RTT and reported in 2017.

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

Impact of manipulations on animals used for RTT over the last 18 years
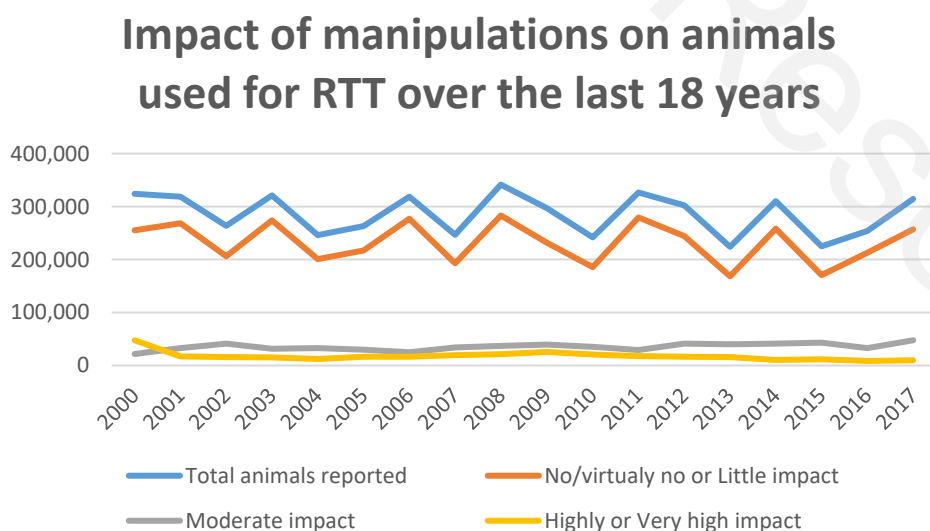
The percentage of animals that experience "no/virtually no" or "little impact" has averaged 81.1 percent since 2000 with a range from 75.2 percent to 87.0 percent. In 2017, 81.7 percent (257 146) of animals were exposed to manipulations in these categories.

The percentage of animals that experience "moderate impact" has averaged 12.7 percent over the last 18 years with a range from 6.7 percent to 19.3 percent. In 2017, 15.1 percent (47 636) of animals were classified in this category.

The percentage of animals that experience "high impact" or "very high impact" has averaged 6.2 percent over the last 18 years with a range from 3.1 percent to 14.7 percent. In 2017, a total of 9789 animals (3.1 percent of the total) experienced manipulations in these categories.

11.2 MANIPULATION GRADING OF ANIMALS REPORTED IN 2017

The majority of animals manipulated for RTT in 2017 fell into the "no" or "low" impact gradings – a total of 257 146 animals making up 81.7 percent of the total. A further 47 636 animals were graded as of "moderate" impact, while a total of 9789 were graded as "high" or "very high" impact. Table 11.2.1 demonstrates that the majority of animals in the high and very high impact grades are rodents, rabbits and fish. Table 11.2.1 gives details of the gradings for various groupings of animals.

11.2.1 Summary of impact of manipulations in animals used for RTT in 2017

2017 summary	Total reported	Number in each manipulation grade				
		No/virtually no impact	Little impact	Moderate impact	High impact	Very high impact
Rodents and rabbits	62 948	3 003	24 516	27 119	1 024	7 286
Sheep and cattle	101 443	23 826	67 935	9 646	36	0
Aquatic species[1]	105 959	36 505	62 956	5 101	1 331	66
Other domestic species	8 032	3 348	4 291	389	4	0
Birds	33 355	9 042	20 353	3 959	1	0
Possums	983	26	468	471	0	18
Other[2]	1 851	142	735	951	23	0
Grade totals	**314 571**	**75 892**	**181 254**	**47 636**	**2 419**	**7 370**
Grade percentages		**24.1%**	**57.6%**	**15.1%**	**0.8%**	**2.3%**

[1] 'Aquatic species' includes amphibians, fish, marine mammals and cephalopods/crustaceans.
[2] 'Other' includes reptiles and "other species".

Animals featuring in the "very high" impact group were fish (66), rabbits (3), guinea pigs (532), mice (6604), rats (147) and possums (18). Animals were classified in this and the "high" impact grades for the following reasons:

Cattle
- Ten cattle were used in an evaluation of clove oil as an alternative method of preventing horn growth in calves. The trial included a control group of 10 which were cautery disbudded without analgesia.
- Four cattle are cannulated for regular collection of rumen fluid used in an *in vitro* fermentation facility. The facility is used for research work around on-farm efficiency and also covers farm specific enteric emission measurements supporting carbon foot-printing of individual farms.

Sheep
- 22 lambs from a trial evaluating feeding of fodder beet to ewes in late pregnancy - the D grading was applied to lambs that died during the trial (abandoned by ewes).

Deer
- Four deer were electively euthanased during a trial due to progressive weight loss and low body condition scoring. At necropsy these animals exhibited enlarged mesenteric lymph nodes consistent with clinical Johne's disease and were categorised as Grade D (moderate impact of long duration).

Birds
- A bird that was given a D classification was part of a study to assess cognitive ability and reproductive success in wild North Island robins. As part of the study, wild robins in the Karori wildlife sanctuary were fitted with transmitters. In the final report for the project, the principal investigator reported that a juvenile robin that had been fitted with a transmitter had been found

dead in its territory. A pathology report noted ulcerative dermatitis associated with a possible transmitter harness injury, as well as the respiratory system severely compromised by aspergillosis (a naturally occurring fungal infection in the population). In response to the death and report findings, no further transmitters were deployed as part of the study. Given the likely pain of the abrasion from the harness injury the manipulation was reported as a D in the final animal use numbers.

Fish
- Sixty-six fish classified E were used in a trial to determine how flood pumps in waterways affect fish.
- 45 fish kept under high CO_2 conditions for a longer duration showed reduced growth, indicating the impact was higher than with lower duration CO_2 exposure fish – the fish were therefore graded as D.
- Aquatic ecotoxicity testing relies on exposing groups of fish or other aquatic organisms to a range of concentrations of test compounds and observing the outcomes. A high impact score is assigned to fish in the high concentration groups as these groups may experience mortalities related to the previously untested compounds and the effect of the compound is allowed to run its course during testing.

Cephalopod/crustacea
- Crayfish that die during a test period are graded as high impact because they are not monitored more than once a day and are not treated if they become stressed during the test time period.

Guinea pigs
- Ninety-one per cent of the guinea pigs were used in batch release testing for animal vaccines. This is a regulatory requirement to demonstrate potency.
- The remainder were used in veterinary research, and production and evaluation of biological reagents.

Mice
- Sixteen mice that were given a D classification were used in a project to characterise the anti-pain effects of lipids with the long-term goal of developing better, more effective, non-addictive pain therapies with fewer undesirable side effects.   Mice graded as high impact either received reduced analgesia as part of the experiments to characterise the mode of pain relief or were used to determine the duration of effect of the test compounds.
- 92 mice were used in risk assessment of food contaminants, specifically Gambierdiscus which produce toxins in the marine environment.
- Two mice were used in a study of a bovine blood extract on intestinal barrier integrity were euthanased due to deteriorating health.
- Four mice from of a study looking at the effect of bovine blood extract on intestinal barrier integrity were graded E (3 euthanased, 1 died). Post-mortem results showed that the oral gavage was the likely cause of illness/death.
- The project with the mice were from ongoing work on potential methane inhibitors for use in New Zealand farm animals. Mice were used in a programme to identify novel compounds that reduce methane production in New Zealand ruminant farm animals. The compounds are chemically synthesised and selected using knowledge of their chemical structures and potential safety and toxicity. This is followed by in vitro testing with rumen fluid to determine if methane production is reduced. Before giving these to farm animals, their safety and toxicity is tested in a mammalian model animal using mice as the model and OECD acute toxicity methodology. The death of mice means the compounds do not go on to be used in sheep or cattle. Mouse survival results in a further safety test in sheep before efficacy testing is undertaken in cattle or sheep.
- Mice were used in the testing of antigens and animal vaccines mandated by regulation. 18% of mice were used in veterinary research, production and evaluation of biological reagents.
- Mice were used in veterinary research, and production and evaluation of biological reagents.
- In a study sourcing stem cells, 37 mice became morbid and lost weight (more than 20%). With the advice from the University veterinarian, the analgesic treatment regime was modified and the animals were more closely monitored.
- A mouse was culled due to a misplaced injection, which resulted in the development of ascites. The animal was culled and the injection technique of the researcher was reviewed.

Rats

- A study using the 12 rats at the higher impact grade of D were involved in an experiment examining the blood pressure variability following stroke. The model involved the occlusion of the middle cerebral artery in the brain of the rats. Telemeters were implanted in the brain and the animals were monitored by radio telemetry to assess the blood pressure changes postoperatively. The researchers considered that as well as inducing the model, the implanting of the telemeters meant that the degree of invasiveness warranted the severity grade of D.
- In a study on regulation of learning and memory, five rats were euthanased prematurely, due to infections post-surgery that did not respond to antibiotics. The researcher's surgical technique was reviewed by the vet and refinements instigated. Four rats had an unexplained adverse reaction to the anaesthesia, which was then changed, after consultation with the vet. The project was terminated early as a result of these unexpected adverse effects.
- A pilot study to improve the survival rates of rats used in a stroke model.

Pest Control

- Leghold trapping of possums was used in three studies aimed at improving possum control and eradication of Tb. Overall, 674 possums were trapped and 18 showed significant injuries: 16 with broken legs and 2 with lacerations. The rate of injury (2.6%) was a little higher than what is normally expected (<2.5%) if good practice is followed. Staff are trained in the use of a trapping protocol. Most of the injuries (13/18 possums) were traced to one contractor who consequently was no longer employed. The incident led to likely changes in practice including the inclusion of a welfare compliance clause in contracts, and increased supervision and training.
- Two rats died, after anaesthesia and transmitter-fitting, before release on an unusually cold night. Researchers responded successfully by thereafter moving procedures into the back of a vehicle, and using a recovery box containing a hot water bottle for fitting transmitters. Subsequently no rats died.
- 54 rats received a toxin purported to be more humane in other species than conventional toxins used in vertebrate pest management. However, the formulation used was not able to deliver a high enough dose for rapid onset of death and the proposed study (566 animals) was swiftly curtailed, but not before 9 cases graded as D and 46 graded as E had occurred, requiring immediate euthanasia.
- Another study involving rats was a field trial evaluating a re-setting device using sodium fluoroacetate (1080) as the toxin. The traps had 'fired' 101 times so the researchers have interpreted this to represent probably 101 rats dying from 1080 poisoning, which they classified as causing grade E of suffering. Their only evidence was a notable decline in the local rat population.
- A project was conducted for the Rabbit Coordination Group to investigate use of combinations of existing toxins for this pest. This was unsuccessful because so few rabbits (only 3) consumed the bait. However, these toxins, which are in current use, do cause grade E level of suffering.
- "Other species" (20 stoats and three ferrets) were used in studies evaluating use of re-setting devices for delivering toxins in current use, for which the investigators classify the degree of suffering caused as D. The low number of ferrets is because very few of them actually ingested the bait.

12 The Three Rs

No animals were recorded as being used in the development of alternatives in 2017.

13 Erratum

Massey University has reported a changes to its 2016 statistics:
- 390 fewer cattle were used bringing the university's total to 3612.

This changes the total number of animals used to 254 063, and accounts for some minor differences in 2016 numbers quoted in this 2017 report.

Appendix 1

ANIMAL USAGE REPORT: FIVE-YEAR SUMMARY OF THE NUMBER OF ANIMALS USED AND THE PERCENTAGE THAT DIED OR WERE EUTHANASED (BY SPECIES)

	2017		2016		2015		2014		2013	
	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	66	38	593	3	1368	13	771	51	238	3
Birds	33 355	55	9716	17	15 627	13	31 588	42	25 685	13
Cats	1099	<1	926	<1	519	3	728	<1	676	3
Cattle	44 007	<1	104 338	<1	59 330	1	75 496	<1	52 193	2
Cephalopods/ crustaceans	4028	20	4815	28	2200	27	4756	28	5485	24
Deer	1537	11	7688	2	8497	<1	25 058	<1	2316	6
Dogs	888	2	1304	7	812	3	1006	3	1437	8
Fish	101 167	82	19 632	56	40 764	49	40 555	30	24 354	53
Goats	3297	3	4400	5	2052	9	3176	6	581	24
Guinea pigs	1952	94	1900	96	1967	95	1864	95	2209	97
Horses/ donkeys	756	<1	924	1	283	0	237	2	272	2
Marine mammals	698	0	2974	0	403	0	843	0	927	<1
Mice	52 196	99	34 013	98	48 341	99	58 379	97	45 018	98
Pigs	455	91	533	89	738	54	724	42	236	83
Possums	983	89	1169	75	2977	84	3983	94	2626	84
Rabbits	1208	85	1225	90	1494	90	1445	91	1386	92
Rats	7592	84	8770	87	9387	87	11 807	92	10 806	94
Reptiles	1096	<1	1235	8	4473	<1	325	<1	991	5
Sheep	57 436	6	47 548	4	23 474	11	44 745	8	46 218	3
Other species	755	13	360	18	604	7	2801	5	394	20
Total	**314571**		**254063**		**225310**		**310 287**		**224 048**	
Yearly %		54%		25%		39%		34%		36%

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	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
	2015	22,737	9682	2003	5801	22,554	6393	69,170
	2016	20,403	10,981	1554	2505	9862	5106	50,411
	2017	**22,303**	**16,098**	**2283**	**30 321**	**81 692**	**1818**	**154 515**
Commercial organisations	2013	28,087	63,468	225	10,120	341	32	102,273
	2014	20,436	82,185	218	24	2984	12	105,859
	2015	22,195	60,708	714	7474	4811	319	96,221
	2016	15,726	98,908	960	12	-	48	115,654
	2017	**22,777**	**54,923**	**172**	**1**	**10**	**10**	**77,893**
Crown Research Institutes	2013	3818	25,446	2001	6183	10,972	2677	51,097
	2014	1866	22,975	7108	6103	11,174	1431	50,657
	2015	1818	13,828	7422	-	8537	2980	34,585
	2016	4681	43,039	7788	4791	2284	1265	63,848
	2017	**2442**	**18,023**	**1444**	**191**	**9327**	**2909**	**34,336**
Polytechnics	2013	174	729	614	73	2707	67	4364
	2014	206	1312	641	77	3418	146	5800
	2015	208	491	652	75	3455	75	4956
	2016	207	2342	910	57	5602	34	9152
	2017	**299**	**509**	**707**	**78**	**8294**	**38**	**9925**
Government departments	2013	-	-	43	4815	-	841	5656
	2014	2920	-	47	2081	2	3053	8103
	2015	-	-	17	2212	5	613	2,847
	2016	501	-	7	2243	245	977	3973
	2017	**-**	**-**	**-**	**2620**		**629**	**3249**
Other	2013	6025	52	24	62	16	3	6182
	2014	16,705	-	-	4	50	216	16,975
	2015	14,231	73	37	65	1398	563	16,367
	2016	4367	947	78	79	1628	584	7683
	2017	**15,124**	**35**	**110**	**102**	**1834**	**497**	**17,702**
Schools	2013	29	-	9	39	17	1122	1216
	2014	16	123	58	41	50	2160	2448
	2015	-	74	4	-	4	1082	1164
	2016	23	69	78	29	11	3132	3342
	2017	**3**	**15,152**	**19**	**42**	**10**	**1725**	**16,951**
TOTAL	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
	2015	61,189	84,856	10,849	15,627	40,764	12,025	225,310
	2016	45,908	156,676	11,375	9,716	19,632	11,146	254,453
	2017	**62,948**	**104,740**	**4735**	**33,355**	**101,167**	**7626**	**314,571**

Appendix 3

ANIMAL USAGE REPORT: '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

ANIMAL USAGE REPORT: SUMMARY OF THE IMPACT GRADE ALLOCATED BY SPECIES IN 2017

Species	No impact	Little impact	Moderate impact	High impact	Very High impact	Total
Amphibia	1	42	23	-	-	66
Birds	9042	20 353	3959	1	-	33 355
Cats	344	733	22	-	-	1099
Cattle	3676	38 359	1958	14	-	44 007
Cephalopods/ crustacea	3437	266	244	81	-	4028
Deer	30	1358	145	4	-	1537
Dogs	291	539	58	-	-	888
Fish	33 067	62 055	4510	1469	66	101 167
Goats	2533	605	159	-	-	3297
Guinea pigs	58	543	16	803	532	1952
Horses	119	637	-	-	-	756
Marine mammals	-	593	105	-	-	698
Mice	2601	19 214	23 572	205	6604	52 196
Pigs	31	419	5	-	-	455
Possums	26	468	471	-	18	983
Rabbits	129	1065	11	-	3	1208
Rats	215	3711	3487	32	147	7592
Reptiles	10	539	547	-	-	1096
Sheep	20 150	29 576	7688	22	-	57 436
Other species	132	196	404	23	-	755
TOTAL	75 892	181 271	47 384	2654	7370	314 571
Percentage	24.1%	57.6%	15.1%	0.8%	2.3%	

Appendix 5

LIST OF CODE HOLDERS REQUIRED TO SUBMIT A STATISTICS RETURN FOR 2017

Aakland Chemicals (1997) Ltd
Abacus Biotech Ltd
Advanced Genetics 2015 Ltd
Advanced Regenerative Therapies Ltd
Ag Challenge Ltd
AgResearch Ltd
AgriHealth NZ Ltd
Agvet NZ Ltd
Airway Ltd
Alleva Animal Health Ltd
Alltech (NZ) Ltd
Aloe Vera N Z Ltd
Animal Breeding Services (2007) Ltd
Ara Institute of Canterbury
Argenta Manufacturing Ltd
Aroa Biosurgery Ltd
Arotec Diagnostics Ltd
AsureQuality Ltd
Auckland University of Technology
Auckland Zoological Park
Bayer New Zealand Ltd
BioCell Corporation Ltd
Boffa Miskell Ltd
Caledonian Holdings Ltd
Carne Technologies Ltd
Cawthron Institute
Cognosco, Anexa Animal Health
Connovation Ltd
Cropmark Seeds Ltd
CRV Limited
CuroNZ Ltd
Dairy Production Systems Limited
DairyNZ Ltd
Damar Industries Ltd
DCS Animal Health Studies Ltd
Department of Conservation
Dermvetonline
Disease Research Ltd
Eastern Institute of Technology
Elanco Animal Health
EquiBreed NZ Ltd
ES Plastics Ltd
Estendart Ltd
Eurofins AgroScience Services NZ Ltd
Eurofins SCEC Pty Ltd
FIL (New Zealand) Ltd
Franklin Vets
Goldenberg, Silvan
Grace, Neville
Halter Ltd
Haywood, Dr Ursula
Herdwash Ltd
Hillcrest High School
Innovative Medical Solutions Ltd
Institute of Environmental Science and Research Ltd
InterAg

Intuit Regulatory & Marketing Ltd
Invetus NZ Ltd
Jurox Pty Ltd
Karori Sanctuary Trust
Keane, Susan
Knowles, Garry
Landcare Research New Zealand Ltd - Manaaki Whenua
Lawrence, Dr David W
Levin and Horowhenua Veterinary Centre
LIC Deer Ltd
Life Technologies New Zealand Ltd
Lincoln University
Livestock Improvement Corporation Limited
Living Cell Technologies New Zealand Limited
Malaghan Institute of Medical Research
ManukaMed Limited Partnership
Mason Consulting
Massey University
Matamata Veterinary Services Ltd
McLeod, Graeme & Janelle
Medical Plus New Zealand
Merial New Zealand Limited
MetriKlenz Ltd
MPI Investigation and Diagnostic Centre
National Institute of Water and Atmospheric Research Ltd
National Trade Academy
Nelson Marlborough Institute of Technology
NZ Association of Science Educators
NZ Companion Animal Council
NZ Institute for Plant and Food Research Ltd
NZ Leather and Shoe Research Association
NZ National Fieldays Society Inc
Oamaru Veterinary Centre
On-Farm Research Ltd
Oritain Global Ltd
Otago Polytechnic
Otakaro Pathways Ltd
Ottmann, Garry
Parnell Technologies Pty Ltd
PGG Wrightson Seeds Ltd
Pharmfirst Ltd
PharmVet Solutions
PJM Scientific Pty Ltd
Practical CPD Ltd
Quantec Ltd
Rich Technology Solutions Ltd
SBScibus Ltd
Schering-Plough Animal Health Limited
SciLactis Ltd
Seacrest Farms Ltd
Sirona Animal Health Ltd
South Pacific Sera Limited
Southern Institute of Technology
SPCA College
Spring Sheep Dairy LP
Starboard Bio Ltd
Stemvet New Zealand Ltd
Synlait Milk Ltd
Synthase Biotech Ltd
Te Whare Wananga o Awanuiarangi
Techion Group Ltd
The New Zealand King Salmon Co Ltd
Toi Ohomai Institute of Technology

Totally Vets Ltd
Towers Consulting
Trinity Bioactives Ltd
Unitec Institute of Technology
Universal College of Learning
University of Auckland
University of Canterbury
University of Otago
University of Waikato
Vet Nurse Plus
Vet Resource Ltd
Veterinary Enterprises Group
VetLearn
Vetlife Ltd
Vetora
VETPlus Solutions Ltd
VetSouth Ltd
Victoria University of Wellington
Virbac New Zealand Ltd
Waikato Institute of Technology
Waikato Regional Council
Wellington Institute of Technology
Wellington Zoo Trust
West Coast Vets Ltd
Wildland Consultants Ltd
Zoetis New Zealand Ltd