



ANIMAL HEALTH IN
AUSTRALIA

Annual Report
2021

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Contact information

If you have any:

- requests or enquiries about publication reproduction or rights
- suggestions or recommendations

please address them to:

General Manager

Emergency Preparedness, Animal Health and Biosecurity

Animal Health Australia

A: PO Box 5116, Braddon ACT 2612

T: 02 6232 5522

E: aha@animalhealthaustralia.com.au

Digital version

Please find a digital copy of the *Animal Health in Australia Annual Report 2021*, as well as previous editions, at www.animalhealthaustralia.com.au/ahia.

About this publication

The *Animal Health in Australia Annual Report* covers animal health and related matters that have occurred during the year, including relevant new policies and projects, disease incidents and status, and research activities.

Chapter 1 outlines key achievements, while Chapter 2 highlights the current status of Australia's terrestrial animal health and Chapter 3 the current status of Australia's aquatic animal health.

The report is produced by Animal Health Australia (AHA) and receives input and review from staff at the Australian Government Department of Agriculture, Water and the Environment through the Animal Health Policy Branch (AHPB), Office of the Chief Veterinary Officer (OCVO) and the Australian Bureau of Agricultural and Resource Economics and Sciences.

AHA would like to acknowledge the following people for their role in producing this publication.

AHA: Ian McDonald, Sarah-Paige O'Donovan, Daniel Hadiwibawa, Emily Sears and Samantha Allan

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The publication was reviewed by Dr Mark Schipp, Australian Chief Veterinary Officer and Kathleen Plowman, AHA Chief Executive Officer.



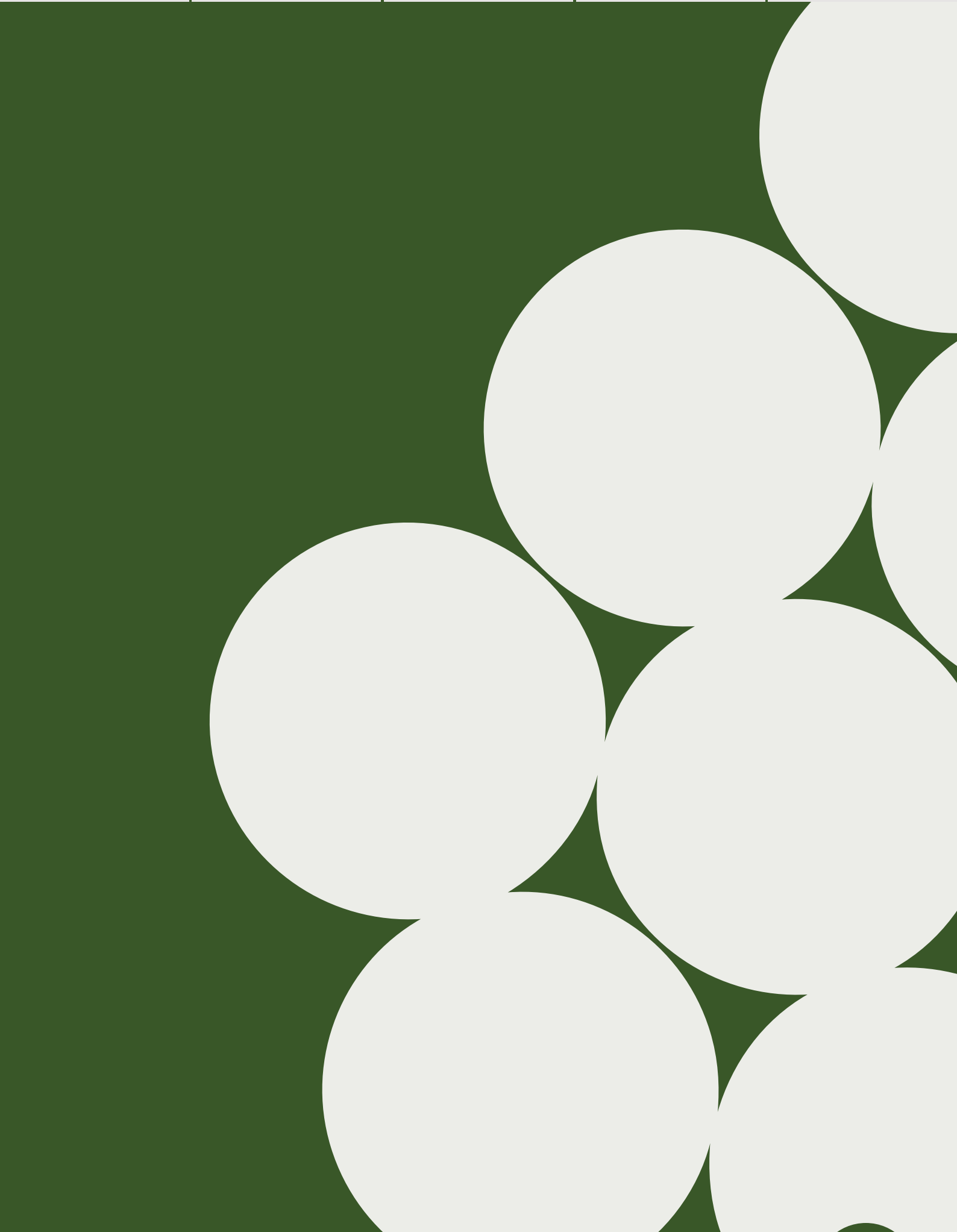
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Foreword

Welcome to the latest edition of the *Animal Health in Australia Annual Report*, which outlines key animal health initiatives and developments over the past year, including relevant new policies and disease incidents.

This report complements the *Animal Health in Australia System Report* which goes into more detail on our animal health systems and the governance, surveillance, emergency management and animal welfare arrangements that support our unique animal health status.

The dedicated work of our animal health communities in 2021 continued to deliver excellent outcomes for our primary producers, export industries and the broader Australian community. This has led to another strong year in biosecurity and disease preparedness which is further outlined in the report.

I would like to make a particular note of Australia's success in regaining freedom from high pathogenicity avian influenza. This outcome, achieved during a period of significant COVID-19 disruption, highlights our excellent biosecurity coordination and response capabilities, and I commend everyone who was involved in the successful eradication of this disease.

I'd also like to highlight the continued implementation of the *Commonwealth Biosecurity 2030* strategy and *Animalplan 2022–2027*, which are both helping to bring together industry and government in a collaborative approach to managing our animal health system.

During 2021, the Australian Government Department of Agriculture, Water and the Environment launched its Pacific Engagement Program to assist Pacific nations improve regional animal health and biosecurity. Australia is committed to working closely with our near neighbours to build capacity and strengthen national and regional engagement with key international bodies.

The Pacific Engagement Program will support better coordination and a multidisciplinary approach to help both Australia and our Pacific neighbours protect their respective agricultural and food systems, enhance regional animal health networks, and strengthen Pacific engagement with the World Organisation for Animal Health. The goal to improve animal health in our region will decrease risks to Australia and provide benefits for all.

It is important that our animal health systems remain resilient and proactive in combating the increased risks of pests and diseases. As you will see in this report, considerable work is being done to strengthen national animal health systems to prevent, prepare and respond to disease outbreaks, uphold animal health and welfare standards, support economic prosperity and maintain food security.

As Australia's Chief Veterinary Officer, I am privileged to witness the many activities and programs that contribute to maintaining our robust animal health system. As reflected in this report, Australia's animal health system is a product of best-practice science, innovation and collaboration and the dedication of many. I sincerely thank all who contributed to the development of this report, and of course the many who work to support animal health in Australia.



Dr Mark Schipp
Australian Chief Veterinary Officer

The dedicated work of our animal health communities in 2021 continued to deliver excellent outcomes for our primary producers, export industries and the broader Australian community.



Australian Chief Veterinary Officer Dr Mark Schipp in Suva with Fiji Ministry of Agriculture staff.



Key achievements

1



Animal health status, emergency preparedness and response



Australia regained disease freedom from high pathogenicity avian influenza

In February 2021, Australia met the requirements of the World Organisation for Animal Health (OIE) for freedom from high pathogenicity avian influenza (HPAI), with Victoria successfully eradicating avian influenza from Australian poultry on all affected properties. Surveillance of both domestic and wild birds was a key part of the response.



Review of avian influenza outbreaks

Following the outbreaks of avian influenza in Victoria during 2020, which involved three different avian species and three different influenza viruses, Animal Health Australia (AHA) coordinated the after-action review for which lessons learned are currently being evaluated and actioned in consultation with federal, state and territory governments and industry.



AUSVETPLAN – contingency planning for emergency animal diseases

During 2021, AHA conducted major reviews of six AUSVETPLAN manuals, developed one new manual, and updated a further 14 manuals into the latest format. There are now 39 AUSVETPLAN manuals in the Edition 5 format, with the remaining manuals under active review.

View the AUSVETPLAN series:
animalhealthaustralia.com.au/ausvetplan



Strengthening emergency animal disease preparedness – training and exercises

During 2021, AHA delivered five national emergency animal disease preparedness workshops to government and industry representatives of the Consultative Committee on Emergency Animal Disease, National Management Group, and Liaison — Livestock Industry. AHA also delivered four workshops aimed at raising awareness of emergency animal disease response arrangements in Australia. For one of these, AHA was funded to deliver a Biosecurity Incident Management System Awareness workshop for Parks ACT, which aimed to improve biosecurity incident response in the ACT Government's Biosecurity and Rural Services team.



Enhancing the preparedness of Australia's horse industries

In a first of its kind, a two-day virtual exercise brought government, animal disease specialists and industry bodies together to better prepare the broader horse industry to respond to a future outbreak of equine influenza. Hosted and coordinated by AHA from 23–24 November 2021, Exercise Gammalite consisted of practical activities to ensure all industry stakeholders understand the role they play in responding to a potential outbreak. Initiated and funded by Harness Racing Australia, the exercise attracted 60 participants, including representatives from Racing Australia, Australian Horse Industry Council and Equestrian Australia, as well as several jurisdictional chief veterinary officers.



African swine fever simulation exercise

The Australian Government continued to run a series of African swine fever (ASF) simulation workshops, known as Exercise Razorback, through 2020 and 2021. The exercises were aimed at improving national ASF preparedness and response arrangements. In 2021, there were two successful workshops with key participants from the Department of Agriculture, Water and the Environment, state and territory biosecurity agencies, AHA and industry.

Find out about ASF preparedness:

www.awe.gov.au/biosecurity-trade/pests-diseases-weeds/animal/asf



Improving outbreak response policies for a foot and mouth disease outbreak in Australia

The impact of different control strategies on various foot and mouth disease (FMD) outbreak scenarios in Australia was investigated through the collaborative FMD Ready project. The simulation exercise revealed, for example, that a decision to use vaccination in an FMD outbreak would increase the time period to regain official disease-free status, and hence delay a return to international trade and market access. The Australian Animal Disease Spread modelling framework (AADIS) was used to simulate the impact of different strategies on outbreak duration and number of farms infected. The economic benefit of implementing trading zones as part of the response was also evaluated, as were various post-outbreak surveillance strategies for proof of disease freedom.

Learn about the modelling framework:

aadis.org.au

View the simulation research paper:

www.frontiersin.org/articles/10.3389/fvets.2021.648003/full



Guidelines to support general surveillance programs

In 2021, the Australian Bureau of Agricultural and Resource Economics and Sciences developed guidelines to support the planning, implementation and monitoring of general (or passive) surveillance programs. The aim of these guidelines is to help program coordinators, policymakers, funders and those who monitor and evaluate general surveillance programs to understand the key considerations for designing, planning and implementing passive surveillance programs. The guidelines are underpinned by systems-thinking research and nine diverse cross-sector case studies of general surveillance programs from across Australia and New Zealand, including two animal disease programs. These guidelines and summary checklists were published in February 2022.

View the guidelines:

www.awe.gov.au/abares/research-topics/social-sciences/making-general-surveillance-work/guidelines



New recruits to the National Biosecurity Response Team

The National Biosecurity Response Team (NBRT) is a group of highly skilled government personnel trained in responding to animal, plant, aquatic and environmental biosecurity incidents. New members of the NBRT for 2021–2024 were appointed, representing all jurisdictions and biosecurity sectors. After completing their induction, they have been gearing up for a busy professional development program in 2022. This will build on the success of the NBRT's virtual Exercise Network in late June 2021, which explored the nuanced differences between a physical and virtual control centre. The exercise provided an opportunity to assess capabilities, develop and test protocols, and discuss the challenges and opportunities in responding virtually.

National animal health initiatives



Animalplan 2022–2027

Animalplan 2022–2027: Australia's National Action Plan for Terrestrial Agricultural Animal Health is expected

to be published in mid-2022. It consists of an agreed list of priorities to strengthen Australia's national terrestrial animal health system by 2027 and support the National Farmers' Federation's vision for the agricultural industry to exceed \$100 billion in farmgate output by 2030. The Animalplan steering committee is working to ensure that its objectives and activities are implemented over the next five years.

Read the Animalplan:

www.awe.gov.au/agriculture-land/animal/health/animal-plan



AQUAPLAN 2022–2027

The fourth national strategic plan for aquatic animal health, *AQUAPLAN 2022–2027*, has been developed

by aquatic animal industries and governments over the past 18 months. AQUAPLAN provides agreed industry-government investment priorities to strengthen Australia's aquatic animal health management system. Ministerial endorsement of the plan is currently underway, which will give all stakeholders confidence that the priorities are supported at the highest level.

Read the AQUAPLAN:

www.awe.gov.au/agriculture-land/animal/aquatic/aquaplan



National Animal Health Diagnostics Business Plan 2021–2026

The new *National Animal Health Diagnostics Business Plan* for 2021–2026 provides updated guidance on actions to revise and maintain Australia's animal

health diagnostic capability. It covers technology, harmonisation, training initiatives and other quality assurance functions which underpin national and international trade and assist in protecting animal and public health.



Antimicrobial prescribing guidelines for dairy cattle

The Australian Veterinary Association (AVA) has published antimicrobial prescribing guidelines for dairy cattle in a project jointly funded by the AVA and Animal Medicines Australia, with support from Dairy Australia.

View the guidelines:

www.ava.com.au/siteassets/policy-and-advocacy/policies/animal-welfare-principles-and-philosophy/ava-ama-antimicrobial-prescribing-guidelines-for-dairy-cattle-4-01-22-final.pdf



Australia's place in the global avian influenza phylogeography

The National Avian Influenza in Wild Birds Surveillance partnership has investigated relationships among available Australian wild bird avian influenza genomic sequence data. Analysis of virus gene flow and infection dynamics within Australia was consistent with Australian wild waterfowl showing nomadic, rainfall-dependent movement patterns, which are different to those observed in the Northern Hemisphere. All sequences have been uploaded to a global sequence-sharing platform emphasising Australia's commitment to international sharing of avian influenza sequence data.

View the research:

www.biorxiv.org/content/10.1101/2021.11.30.470533v1

Animal welfare standards



Management of heat stress in live sheep exports

In 2018, regulatory changes relating to the management of the heat stress risk

among exported sheep were implemented, including a prohibition on sheep exports during the hottest part of the year. These changes have been associated with a significant reduction in sheep mortality rates. In 2022, the Department of Agriculture, Water and the Environment will finalise its current review into sheep exports during the Northern Hemisphere summer.



Australian Standards for the Export of Livestock

The Department of Agriculture, Water and the Environment continually

monitors the operation of the *Australian Standards for the Export of Livestock* (ASEL) to ensure they are fit for purpose and achieving the intended animal welfare outcomes. An updated version (ASEL 3.2) that addressed stakeholder feedback and made the standards clearer and more useable was published in November 2021.

Read the Standards:

www.awe.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/australian-standards-livestock



Australian Standards for the Export of Livestock rejection criteria guidebooks

The Department of Agriculture, Water and the Environment is working to improve the consistent interpretation and application of the ASEL. In December 2021, guidebooks for cattle, buffalo, sheep and goats were published to assist industry and government staff when assessing the suitability of livestock for export. The guidebooks provide clear criteria to ensure that only animals fit for export enter the export supply chain.

Visit the guidebooks:

www.awe.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/australian-standards-livestock/rejection-criteria-guidebooks



Bos taurus review

In early 2022, the Department of Agriculture, Water and the Environment will complete its review

of heat and cold stress in *Bos taurus* cattle from southern Australia during long haul export by sea. The review provides scientifically robust, evidence-based recommendations to improve Australia's export arrangements to support the welfare of *Bos taurus* cattle during preparation and transport.

Read the review:

www.awe.gov.au/biosecurity-trade/export/controlled-goods/live-animals/livestock/history/cattle-and-buffalo-exports-by-sea



Development of new livestock processing standards and guidelines

New *Australian Animal Welfare Standards and Guidelines for Livestock at Processing Facilities* are being developed to replace the 2002 *Model Code of Practice for the Welfare of Animals: Livestock at Slaughtering Establishments*. In 2021 the Animal Welfare Task Group commissioned an independent scientific literature review to inform the standards and guidelines and appointed a stakeholder advisory group and an independent facilitator. Work will continue in 2022, and when complete, the standards and guidelines will provide a nationally consistent approach to regulation and help maintain Australia's strong animal welfare reputation.

Read the guidelines:

www.awe.gov.au/agriculture-land/animal/welfare/awtg



Delivery of a livestock transport awareness campaign

Building on the successful release of the 2019 guide *Is the animal fit to load?*, which was developed by Meat & Livestock Australia, the South Australian Government delivered a transport awareness and education campaign directed at stakeholders involved in the management and transport of livestock. This included signage, extension materials and information sessions, which were attended by approximately 70 stock agents across five venues.



Enhancing horse welfare during land transport

The Animal Welfare Task Group reviewed the *Australian Animal Welfare Standards and Guidelines for Land Transport of Livestock* in 2021, with a view to achieving a more reasonable balance between the welfare of the horses being transported and the interests of the people transporting them. The revised standards and guidelines also reflect recent advances in scientific understanding of horse welfare and physiology and incorporate the practical expertise of those who work with horses on a daily basis.

Read the guidelines:

www.awe.gov.au/agriculture-land/animal/welfare/awtg



Victorian animal welfare legislative reform

The Victorian Government has continued work to develop new animal welfare legislation to replace the *Prevention of Cruelty to Animals Act 1986* (Vic). In April 2021, a report was released, summarising the feedback received, which showed widespread support for key proposals that strengthen animal welfare provisions.

View the reforms:

www.premier.vic.gov.au/victorians-favour-new-animal-welfare-act



The Tasmanian Animal Welfare Advisory Committee

The Tasmanian Animal Welfare Advisory Committee (AWAC) began 2021 by conducting a comprehensive audit on animal welfare concerns for Tasmania to identify the areas of highest priority. The result was a strong focus on dog welfare issues, particularly puppy farms. The AWAC recommended changes to the *Animal Welfare (Dogs) Regulations 2016* (Tas) and the associated guidelines, both of which are currently being amended. The AWAC also suggested changes to the *Animal Welfare Act 1993* (Tas), and an amendment bill will be tabled in 2022. Tasmania continues to implement the nationally agreed *Australian Animal Welfare Standards and Guidelines for Cattle* and *Australian Animal Welfare Standards and Guidelines for Sheep* with regulations currently being developed. Regulations for exhibited animals and livestock at saleyards and depots will follow.

Industry-led projects



Beef sustainability

The release of the Australian Beef Sustainability Framework (ABSF) annual update during Beef Week in

May 2021 revealed marked improvements in the use of pain relief and confirmed that the Australian cattle industry had halved its CO₂ emissions since 2005. The ABSF also noted a four-fold increase in responses to its producer sustainability survey, which indicates an encouraging improvement in producer engagement.

Find out more:

www.sustainableaustralianbeef.com.au/resources/annual-update2



Sheep sustainability

The Red Meat Advisory Council, Sheep Producers Australia and Wool Producers Australia have developed

a sheep sustainability framework. The aim of the framework is to demonstrate sustainable practices, identify areas for improvement and how to better communicate these to consumers and customers. The framework, which was released in April 2021, was developed through extensive consultation with industry stakeholders.

Learn more:

www.sheepsustainabilityframework.com.au



Cattle Council of Australia on the board of Global Roundtable for Sustainable Beef

Cattle Council of Australia (CCA) won an international seat on the board of the Global Roundtable for Sustainable Beef (GRSB) for a two-year term beginning in January 2021. This provides an important opportunity for CCA to influence the development of GRSB's global goals and ensure the

position of Australian cattle producers is understood and considered.

Visit the global roundtable website:

grsbeef.org/sustainability-goals



Updated *National Farm Biosecurity Manual for Pork Production*

AHA and Australian Pork Limited reviewed and updated the *National Farm Biosecurity Manual for Pork Production* in October 2021 to better align with changes to the Australian Pork Industry Quality Assurance Program and current biosecurity best practices. This was the culmination of several years' work. The new manual was well received by industry, with more than 1000 site visits (or 50 visits per month) since its release.

Download the manual:

www.farmbiosecurity.com.au/porkbiosecuritymanual



Integrated parasite management for cattle

ParaBoss for cattle was launched in May 2021 as the industry resource

for parasite management information and a "one-stop shop" that brings together the latest research and development and practical resources. The online resource offers region-specific and seasonal strategies to reduce the impact of flies, ticks, worms and lice in any grassfed beef, feedlot and dairy herd. Information on the biology, treatment and management of parasites, and advice on preventing chemical resistance are cornerstones of the website.

Visit the website:

paraboss.com.au

Trade



Free trade agreements

Free trade agreements (FTAs) are an important mechanism to reaffirm Australia's robust, science-based biosecurity regime and recognise animal welfare and food standards. Australia currently has 16 FTAs in force with its various trading partners. In 2021, Australia recommenced negotiations to finalise the India-Australia Comprehensive Economic Cooperation Agreement, continued negotiations on the Australia-European Union FTA and signed the Australia-United Kingdom FTA.

View the FTAs:

www.awe.gov.au/biosecurity-trade/market-access-trade/fta



Boost to Australia's agricultural traceability systems

The Australian Government committed \$68.4 million to strengthen Australia's agricultural traceability systems and increase access to premium overseas markets. This builds upon the already strong traceability frameworks in place, especially around food safety, animal welfare, provenance and biosecurity. Working with industry and state and territory governments, the Department of Agriculture, Water and the Environment will establish a national agricultural traceability alliance and hub to strengthen engagement and cooperation on a national data-led approach to traceability. There will be funding for research and the development of industry-led proof-of-concept projects. These measures will also support the development and uptake of credentials that verify the quality of Australian agricultural produce. Transparent traceability systems such as these are crucial to show consumers that our products are safe, clean and sustainable from paddock to plate.



Reopening market access following avian influenza in Victoria

During 2021, Australia worked to regain its export trade in live birds and edible and inedible poultry products following the loss of trade due to the detection and subsequent outbreaks of HPAI in Victoria in the last half of 2020. Australia provided comprehensive submissions and successfully negotiated to reinstate trade to almost all of the 44 affected international trading partners.



Export market access

Following the successful eradication of HPAI in 2020, the Department of Agriculture, Water and the Environment continued to regain international market access for poultry and poultry products. New market access was achieved for horses to the Philippines and for day-old chicks and fertile eggs to Papua New Guinea. A new protocol was negotiated for export of breeder alpacas to Chile, and amendments to protocols have resulted in improved access for sheep and goat germplasm exports to Argentina and Brazil. Improved access for breeder cattle to the Philippines has also been negotiated.

Learn more:

www.awe.gov.au/biosecurity-trade/market-access-trade/agricultural-trade-matters

Revised certification for horses was negotiated to ensure their residency in approved countries prior to export to Australia.



Import of animals and animal products

The Department of Agriculture, Water and the Environment

continues to progress biosecurity import risk assessments in response to requests from other countries and proposals from Australian importers. Salmonid products from Estonia, Latvia and Lithuania have been approved for import following competent authority evaluations. New import conditions were implemented for non-salmonid finfish species for human consumption and use as baitfish. A biosecurity risk review was completed for zoo bovids and their semen from approved countries. Progress continues on risk reviews underway, including: prawns and prawn products for human consumption, psittacine birds (household pet and aviary) and natural sausage casings. Risk reviews have commenced for: dairy products for human consumption, fish and fish products for petfood and stockfeed, hatching eggs, glanders and rabies. Revision of import conditions following confirmation of canine ehrlichiosis in northern Australia is progressing pending advice from scientific experts. Revised certification was negotiated for horses to ensure their residency in approved countries prior to export.

Find out more:

www.awe.gov.au/biosecurity-trade/policy/risk-analysis/animal



Animal and animal product revised conditions and certifications

In addition to negotiating revised certification for horses prior to export to Australia, import conditions for dogs are also being revised following the confirmation of canine ehrlichiosis (*Ehrlichia canis*) in northern Australia.

One Health



Antimicrobial Resistance Mission

The Commonwealth, Scientific and Industrial Research Organisation

(CSIRO) is coordinating Australia's antimicrobial resistance (AMR) mission, in conjunction with foundation partners the Department of Health and Department of Agriculture, Water and the Environment. Still in its early stages of development, the aim of the AMR mission is to connect, coordinate and cultivate new antimicrobial and alternative technologies to ensure that new and current antimicrobials remain effective. Taking a One Health approach, the mission will focus on enabling and accelerating research and development, and promoting cross-sector innovation and industry uptake.

Visit the mission website:

www.csiro.au/en/about/challenges-missions/Antimicrobial-resistance



One Health master action plan on antimicrobial resistance

In February 2021, the Australian Government released the *One Health Master Action Plan for Australia's National Antimicrobial Resistance Strategy – 2020 and Beyond*. The action plan provides national focus areas for each of the One Health sectors – agriculture, animal health, the environment, food and human health – to implement the national AMR strategy over the next five years. It also provides guidance for stakeholders to develop their own action plans to combat AMR and ensure that effective antimicrobials and antimicrobial-alternatives continue to be available in the future.

View the action plan:

www.amr.gov.au/resources/one-health-master-action-plan-australias-national-antimicrobial-resistance-strategy-2020



Implementing Australia's national antimicrobial resistance strategy

The Department of Agriculture, Water and the Environment continued to support a range of data collection activities in line with the implementation of *Australia's National Antimicrobial Resistance Strategy – 2022 and Beyond*. Antimicrobial resistance surveys were conducted in the chicken meat, salmon and barramundi industries, and plans were made to survey the pork industry in 2022. A project was completed with the University of Sydney to expand, promote and evaluate an online education package on effective antimicrobial stewardship practices for clinical veterinarians. The animal health sector also contributed to national One Health AMR initiatives, such as the early scoping for a One Health surveillance system that will capture AMR and antimicrobial usage data from all One Health sectors.

Read the strategy:

www.amr.gov.au/resources/australias-national-antimicrobial-resistance-strategy-2020-and-beyond



World Antimicrobial Awareness Week 2021

The Department of Agriculture, Water and the Environment marked World Antimicrobial Awareness Week 2021 with a social media campaign and contributions to AMR and antimicrobial stewardship conferences. CSIRO convened the AMR Summit in November 2021 that aimed to support the implementation of Australia's national AMR strategy. The summit focused on innovation, technology and turning the strategy into impact. Department staff also chaired sessions and presented papers at an online workshop about the future of antimicrobial usage data collection in Australia, as part of the second Australian Veterinary Antimicrobial Stewardship Conference in November 2021.

Find out more:

www.amr.gov.au/about-amr/world-antimicrobial-awareness-week

Terrestrial animal health status

2



Australia has a strong track record of freedom from the major epidemic diseases of livestock. Our geographical isolation provides a natural biosecurity barrier, which is supported by sound biosecurity policies and a history of successful disease eradication campaigns.

The spread of some endemic diseases of animals in Australia is limited by host, pathogen, and environmental factors and the type of animal production enterprises present in an area. Tick fever, for example, occurs only in parts of northern Australia where the climate is suitable for tick vectors. State and territory governments manage the control and eradication of animal diseases, often

with the support of industry accreditation schemes. This chapter provides information about Australia's status for all nationally significant terrestrial animal diseases.

2.1 Status of terrestrial animal health in Australia

Australia reports to the World Organisation for Animal Health (OIE) on OIE-listed diseases^{1,2} every six months.² Table 2.1 shows Australia's status for OIE-listed diseases in 2021.

Table 2.1 Australia's status for OIE-listed diseases of terrestrial animals, 2021

Infection/Disease	Status	Date of last occurrence and notes
Multiple species disease		
Anthrax	Present	Limited distribution (see Figure 2.8)
Aujeszky's disease virus	Free	Never occurred
Bluetongue virus	Present	Restricted to specific zones of Australia (see Section 2.5); sentinel herd and vector-monitoring programs are in place
<i>Brucella abortus</i>	Free	Australia declared freedom from all terrestrial animal species in 1989
<i>Brucella melitensis</i>	Free	Never occurred in animals
<i>Brucella suis</i>	Serological evidence	Maintained in feral pigs in parts of New South Wales and Queensland. Rare occurrence in domestic pigs. Sporadic detections in pig-hunting dogs (not OIE-notifiable occurrences)
Crimean Congo haemorrhagic fever	Free	Never occurred
<i>Echinococcus granulosus</i>	Present	–
<i>Echinococcus multilocularis</i>	Free	Never occurred
Epizootic haemorrhagic disease virus	Virus present	Disease has not been reported
Equine encephalomyelitis (eastern)	Free	Never occurred
Foot and mouth disease virus	Free	1872; Australia is officially recognised by OIE as free without vaccination

Cont'd

1 www.oie.int/en/animal-health-in-the-world/oie-listed-diseases-2021

2 <https://wahis.oie.int/#/home>

Infection/Disease	Status	Date of last occurrence and notes
Heartwater	Free	Never occurred
Japanese encephalitis	Serological evidence	Serological evidence suggestive of Japanese encephalitis detected seasonally in Torres Strait; however, no confirmed clinical cases since 2004; No cases were reported in 2021
<i>Mycobacterium tuberculosis</i> complex	Free	Australia declared freedom from bovine tuberculosis in 1997; the last case in any species was reported in 2002
New World screw-worm fly (<i>Cochliomyia hominivorax</i>)	Free	Never occurred
Old World screw-worm fly (<i>Chrysomya bezziana</i>)	Free	Never occurred
Paratuberculosis	Present	National control and management programs are in place
Q fever	Present	–
Rabies virus	Free	1867
Rift Valley fever virus	Free	Never occurred
Rinderpest virus	Free	1923; with the global eradication of rinderpest in 2011, all countries are free
Surra (<i>Trypanosoma evansi</i>)	Free	Never occurred
<i>Trichinella</i> spp.	Limited species present	<i>Trichinella spiralis</i> is not present; <i>T. pseudospiralis</i> is present in wildlife
Tularaemia	Present	–
West Nile fever	Australian variants present	No cases were reported in 2021
Cattle diseases		
Bovine anaplasmosis	Present	Transmission mainly in areas of northern Australia
Bovine babesiosis	Present	Transmission mainly in areas of northern Australia
Bovine genital campylobacteriosis	Present	–
Bovine spongiform encephalopathy	Free – negligible risk	Never occurred; the Transmissible Spongiform Encephalopathies Freedom Assurance Project includes surveillance (see Section 2.5); Australia has official OIE ‘negligible risk’ status

Cont'd

Infection/Disease	Status	Date of last occurrence and notes
Bovine viral diarrhoea	Present	Bovine viral diarrhoea virus 1 (BVDV-1) is present; BVDV-2 has never occurred
Enzootic bovine leucosis	Free (dairy cattle herd) Very low prevalence (beef cattle)	Australian dairy herd achieved freedom on 31 December 2012
Haemorrhagic septicaemia	Free	Never occurred; strains of <i>Pasteurella multocida</i> are present, but not the 6b or 6e strains that cause haemorrhagic septicaemia
Infectious bovine rhinotracheitis/ infectious pustular vulvovaginitis	Present	Bovine herpesvirus (BHV)-1.2b is present; BHV-1.1 and BHV-1.2a have never occurred
Lumpy skin disease virus	Free	Never occurred
<i>Mycoplasma mycoides</i> subsp. <i>mycoides</i> SC (contagious bovine pleuropneumonia)	Free	1967; Australia declared freedom in 1973 and is officially recognised by OIE as free
Theileriosis	Free	<i>Theileria orientalis</i> is present in Australia but OIE-listed species <i>T. parva</i> and <i>T. annulata</i> are not
Trichomonosis	Present	–
Trypanosomosis (tsetse-transmitted)	Free	Never occurred
Sheep and goat diseases		
Caprine arthritis/encephalitis	Present	Voluntary accreditation schemes exist
Contagious agalactia	Free	<i>Mycoplasma agalactiae</i> has been isolated, but Australian strains do not produce agalactia in sheep
Contagious caprine pleuropneumonia	Free	Never occurred
<i>Chlamydophila abortus</i> (enzootic abortion of ewes, ovine chlamydiosis)	Free	Never occurred
Maedi-visna	Free	Never occurred
Nairobi sheep disease	Free	Never occurred
Ovine epididymitis (<i>Brucella ovis</i>)	Present	Voluntary accreditation schemes exist in all states
Peste des petits ruminants virus	Free	Never occurred; Australia is officially recognised by OIE as free
Salmonellosis (<i>Salmonella Abortusovis</i>)	Free	Never occurred; surveillance has shown no evidence of infection in sheep

Cont'd

Infection/Disease	Status	Date of last occurrence and notes
Scrapie	Free	1952; the Transmissible Spongiform Encephalopathies Freedom Assurance Project includes surveillance (see Section 2.5); atypical scrapie has been detected several times
Sheep pox and goat pox	Free	Never occurred
Equine diseases		
African horse sickness virus	Free	Never occurred; Australia is officially recognised by OIE as free. ³
Contagious equine metritis	Free	1980
Dourine	Free	Never occurred
Equid herpesvirus 1 (EHV-1)	Present	–
Equine arteritis virus	Serological evidence	–
Equine encephalomyelitis (western)	Free	Never occurred
Equine infectious anaemia	Present	Limited distribution and sporadic occurrence
Equine influenza	Free	2007; Australia self-declared freedom according to OIE standards in 2008. ⁴
Equine piroplasmiasis	Free	1976
Venezuelan equine encephalomyelitis	Free	Never occurred
Swine diseases		
African swine fever virus	Free	Never occurred
Classical swine fever virus	Free	1962; Australia is officially recognised by OIE as free
Nipah virus encephalitis	Free	Never occurred
Porcine reproductive and respiratory syndrome virus	Free	Never occurred
<i>Taenia solium</i> (porcine cysticercosis)	Free	Never occurred
Transmissible gastroenteritis	Free	Never occurred
Avian diseases		
Avian chlamydiosis	Present	–
Avian infectious bronchitis	Present	–
Avian infectious laryngotracheitis	Present	–

Cont'd

³ www.oie.int/en/animal-health-in-the-world/oie-listed-diseases-2021

⁴ www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Self-declarations/Archives/ENG_archive_2000_December_2020.pdf

Infection/Disease	Status	Date of last occurrence and notes
Avian influenza viruses	Free	Following an outbreak involving three different strains of avian influenza (H7N7 HPAI, ^a H5N2 LPAI ^b and H7N6 LPAI) at six properties in July–August 2020, Australia officially achieved freedom on 26 February 2021
Avian mycoplasmosis (<i>Mycoplasma gallisepticum</i>)	Present	–
Avian mycoplasmosis (<i>Mycoplasma synoviae</i>)	Present	–
Duck virus hepatitis	Free	Never occurred
Fowl typhoid	Free	1952
Infectious bursal disease (Gumboro disease)	Present	Infectious bursal disease occurs in a mild form and was last reported in 2004; Very virulent strains are not present
Influenza A viruses of high pathogenicity in birds other than poultry, including wild birds	Free	HPAI viruses have not been detected in Australian wild birds, other than a single detection of HPAI H7 virus in one feral Eurasian starling trapped inside an affected poultry shed during the 1985 HPAI H7 virus outbreak
Newcastle disease virus	Lentogenic viruses present	Virulent Newcastle disease last occurred in poultry in 2002; in August 2011, a paramyxovirus not previously reported in Australia was detected in hobby pigeons in Victoria; disease caused by this virus has not spread to poultry
Pullorum disease	Not reported	Last reported in 1992; <i>Salmonella</i> Pullorum has been eradicated from commercial chicken flocks
Turkey rhinotracheitis	Free	Never occurred
Lagomorph diseases and infections		
Myxomatosis	Present	Used as a biological control agent for wild rabbits
Rabbit haemorrhagic disease	Present	Used as a biological control agent for wild rabbits; a new strain was detected in 2015 and another released in 2017
Bee diseases and infections		
Infection of honey bees with <i>Melissococcus plutonius</i> (European foulbrood)	Present	–
Infection of honey bees with <i>Paenibacillus larvae</i> (American foulbrood)	Present	–

Cont'd

a HPAI = high pathogenicity avian influenza

b LPAI = low pathogenicity avian influenza

Infection/Disease	Status	Date of last occurrence and notes
Infestation of honey bees with <i>Acarapis woodi</i>	Free	Never occurred
Infestation of honey bees with <i>Tropilaelaps</i> spp.	Free	Never occurred
Infestation of honey bees with <i>Varroa</i> spp. (varroosis)	Present	<i>Varroa destructor</i> has never been reported in Australia; Incursions of <i>V. jacobsoni</i> were identified and stamped out in June 2016 and April 2020; The response is currently in proof-of-freedom phase
Infestation with <i>Aethina tumida</i> (small hive beetle)	Present	Restricted distribution
Other diseases and infections		
Camel pox	Free	Never occurred
Leishmaniasis	Australian variant, <i>Leishmania macropodum</i> , present	Rare; Australian variant was first isolated in 2000 from macropods and occurs infrequently in a small region near Darwin; in 2017, it was isolated in a new species, captive Nabarlek (pygmy rock wallaby, <i>Petrogale concinna</i>) in the Northern Territory; Occasional imported case of <i>L. infantum</i> with no known local transmission

2.2 National List of Notifiable Animal Diseases of Terrestrial Animals

The National List of Notifiable Animal Diseases of Terrestrial Animals⁵ facilitates disease reporting and control by identifying diseases that must be reported to an agricultural authority upon detection. The list, agreed by the Animal Health Committee (AHC), includes not only all diseases notifiable to OIE but also endemic diseases of national significance. The requirement to report disease occurrences on this list to government authorities is mandated by state and territory legislation.

The list, agreed by the Animal Health Committee (AHC), includes not only all diseases notifiable to OIE but also endemic diseases of national significance.

AHC reviews the list on a regular basis. The most recent review was finalised in 2019. Table 2.2 shows Australia's status for diseases on the National List of Notifiable Diseases of Terrestrial Animals that are not reportable to OIE for 2021.

⁵ www.agriculture.gov.au/pests-diseases-weeds/animal/notifiable

Table 2.2 Australia's status for diseases on the National List of Notifiable Diseases of Terrestrial Animals that are not reportable to OIE, 2021

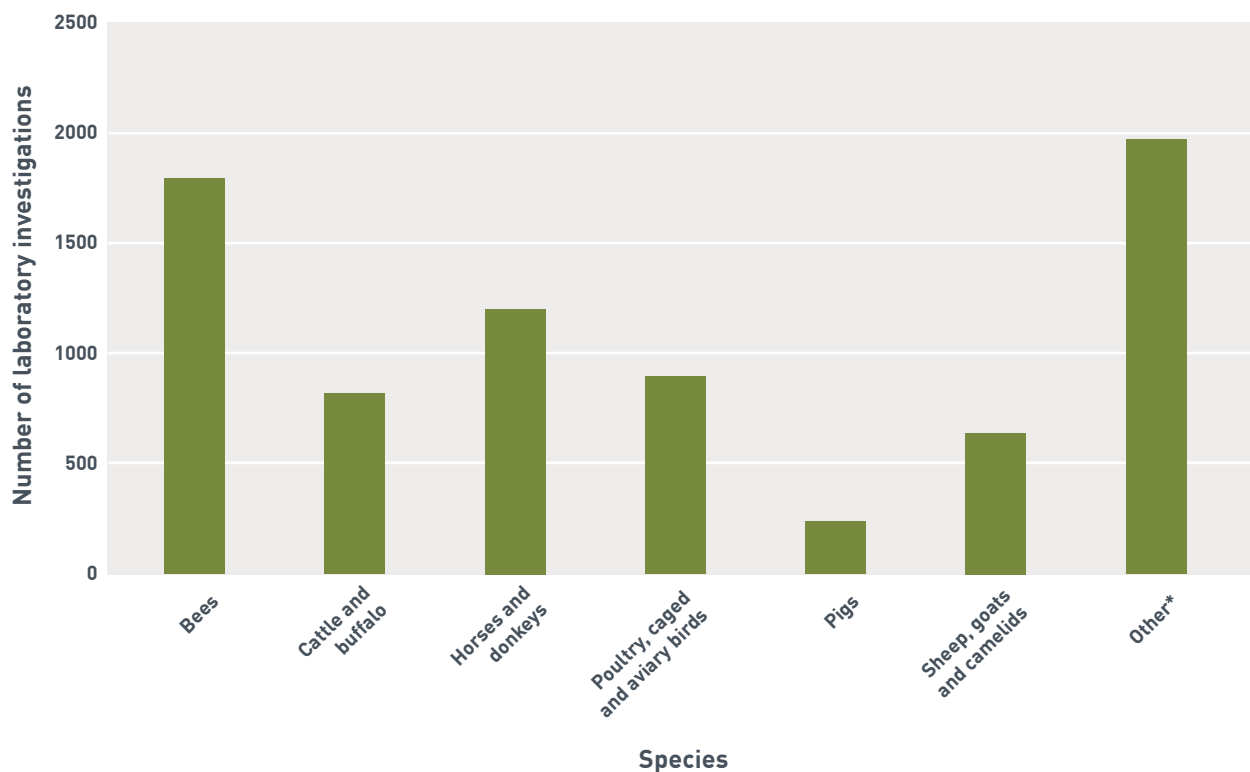
Diseases/infections and infestation	Status	Date of last occurrence and notes
Australian bat lyssavirus	Present	–
Borna disease virus	Free	Never reported
<i>Brucella canis</i>	Free	Never reported
Bungowannah virus (porcine myocarditis)	Present	2003; restricted distribution, one piggery
Devil facial tumour disease	Present	Restricted distribution
Duck herpesvirus 1 (duck viral enteritis / duck plague)	Free	Never reported
<i>Ehrlichia canis</i> (ehrlichiosis)	Present	Detected for the first time in Australian dogs in May 2020; restricted distribution
Encephalitides (tick-borne)	Free	Never reported
Equine encephalosis virus	Free	Sporadic occurrence
Getah virus	Free	Never reported
Hendra virus	Present	Sporadic occurrence; see Figure 2.10
<i>Histoplasma farciminosum</i> (epizootic lymphangitis)	Free	Never reported
Influenza A viruses in swine	Present	–
Jembrana disease virus	Free	Never reported
Louping ill	Free	Never reported
Malignant catarrhal fever (wildebeest-associated)	Free	Never reported
Menangle virus	Present	1997
<i>Mycobacterium avium</i> (avian tuberculosis)	Present	–
<i>Mycoplasma iowae</i>	Free	Never reported
<i>Neorickettsia risticii</i> (Potomac horse fever)	Free	Never reported
Porcine epidemic diarrhoea virus	Free	Never reported; national survey conducted in 2016 with negative results
Post-weaning multi-systemic wasting syndrome	Free	Never reported
Pulmonary adenomatosis (jaagsiekte)	Free	Never reported

Cont'd

Diseases/infections and infestation	Status	Date of last occurrence and notes
<i>Pseudogymnoascus destructans</i> in bats (white nose syndrome)	Free	Never reported
<i>Psoroptes ovis</i> (sheep scab)	Free	1896
<i>Salmonella</i> Abortusequi	Free	Never reported
<i>Salmonella</i> Enteritidis in poultry	Present	National <i>Salmonella</i> Enteritidis Monitoring and Accreditation Program available for commercial egg producers. Five serological positive flocks reported in poultry in 2021
Seneca Valley virus (Senecavirus A)	Free	Never reported
Swine vesicular disease virus	Free	Never reported
<i>Taenia saginata</i> (cysticercus bovis)	Present	–
<i>Teschovirus A</i> (porcine enteroviral encephalomyelitis)	Present	–
Transmissible spongiform encephalopathies (chronic wasting disease of deer, feline spongiform encephalopathy)	Free	Two cases of feline spongiform encephalopathy have been diagnosed in imported animals in Australian zoos in 1992 (cheetah) and 2002 (Asiatic golden cat), where exposure before importation to feeds derived from bovine spongiform encephalopathy-affected cattle are thought to have caused the disease
<i>Trypanosoma cruzi</i> (Chagas disease)	Free	Never reported
Vesicular exanthema	Free	Never reported
Vesicular stomatitis virus	Free	Never reported
Warble fly infestation	Free	Never reported
Wesselsbron virus	Free	Never reported

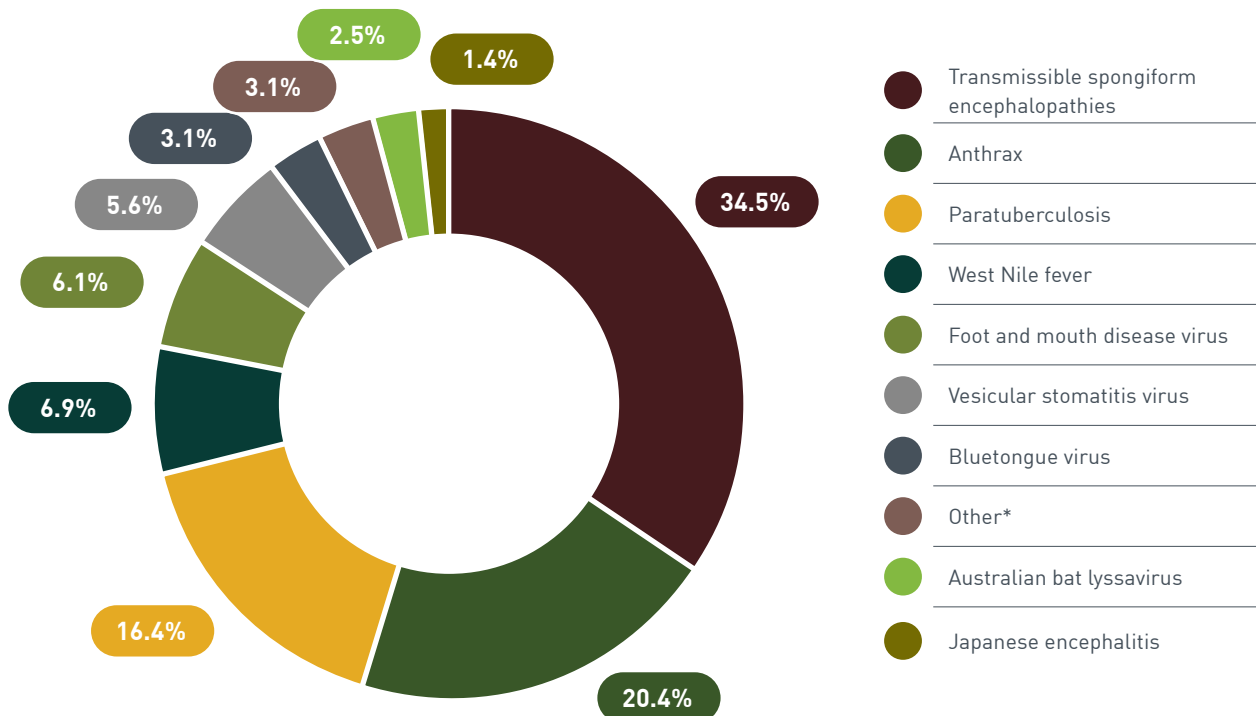
In 2021, 7580 disease investigations (Figures 2.1 to 2.9) were conducted to detect or exclude nationally notifiable diseases in clinically consistent animals (excluding wildlife and feral animals). Investigations reported here are those that included testing at a government veterinary laboratory and may have involved a single animal

or multiple animals from the same property. The number of investigations in 2021 was lower than previous years, due predominantly to the impact of COVID-19 on the operation of national animal health services.



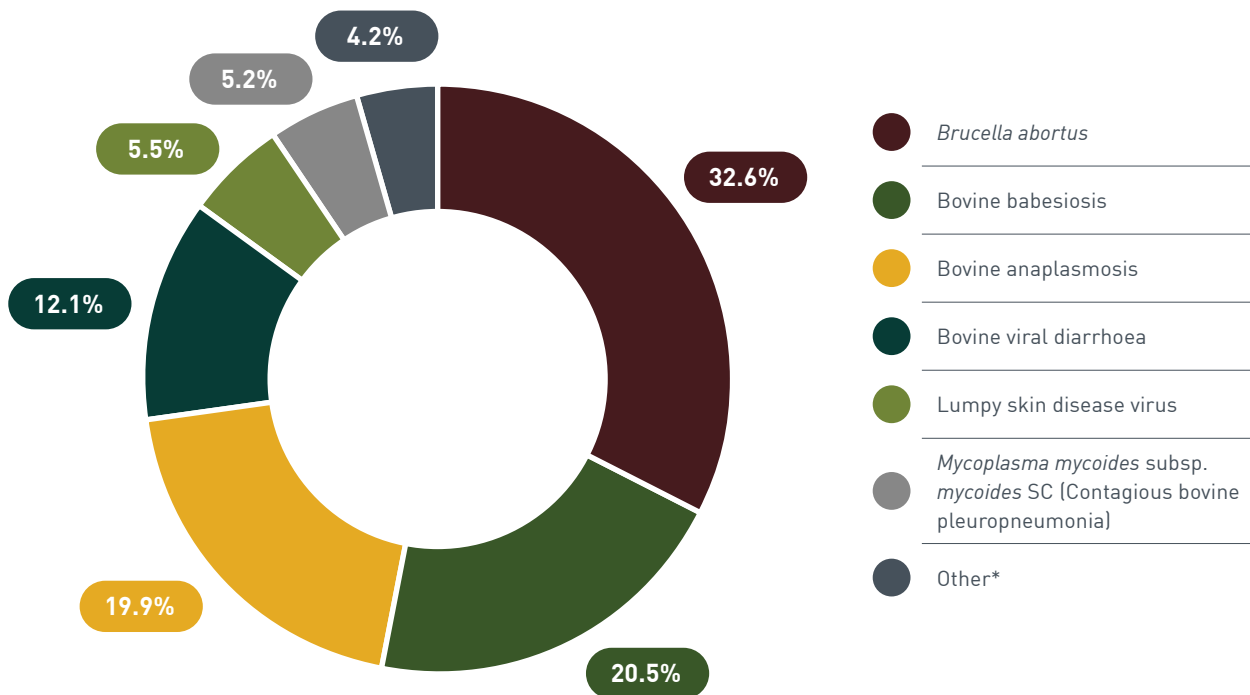
*Other includes: Domestic cats, dogs and rabbits.

Figure 2.1 Number of investigations for national notifiable diseases in Australia in 2021



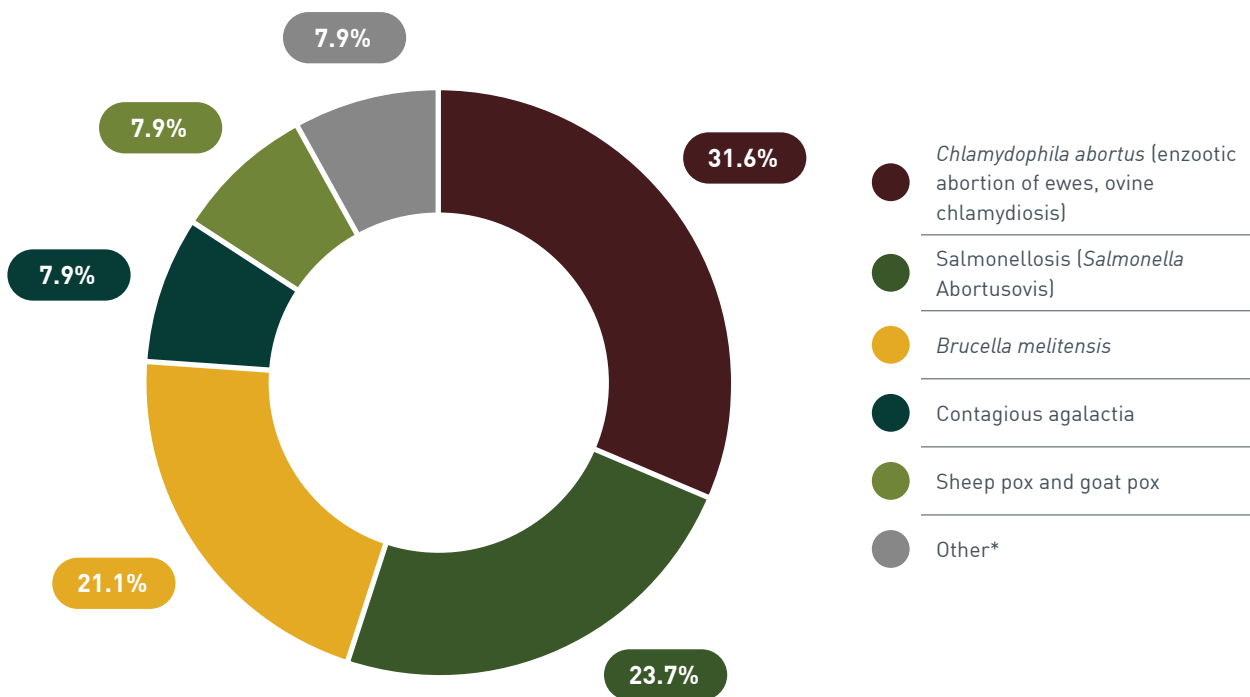
*Other includes: Heartwater, malignant catarrhal fever (wildebeest-associated), New World screw-worm fly [*Cochliomyia hominivorax*], Old World screw-worm fly [*Chrysomya bezziana*], rabies virus, Rift Valley fever virus, Surra [*Trypanosoma evansi*], *Trichinella* spp., tularaemia and warble fly infestation.

Figure 2.2 Investigations of multiple specific national notifiable diseases, infections and infestations in Australia in 2021



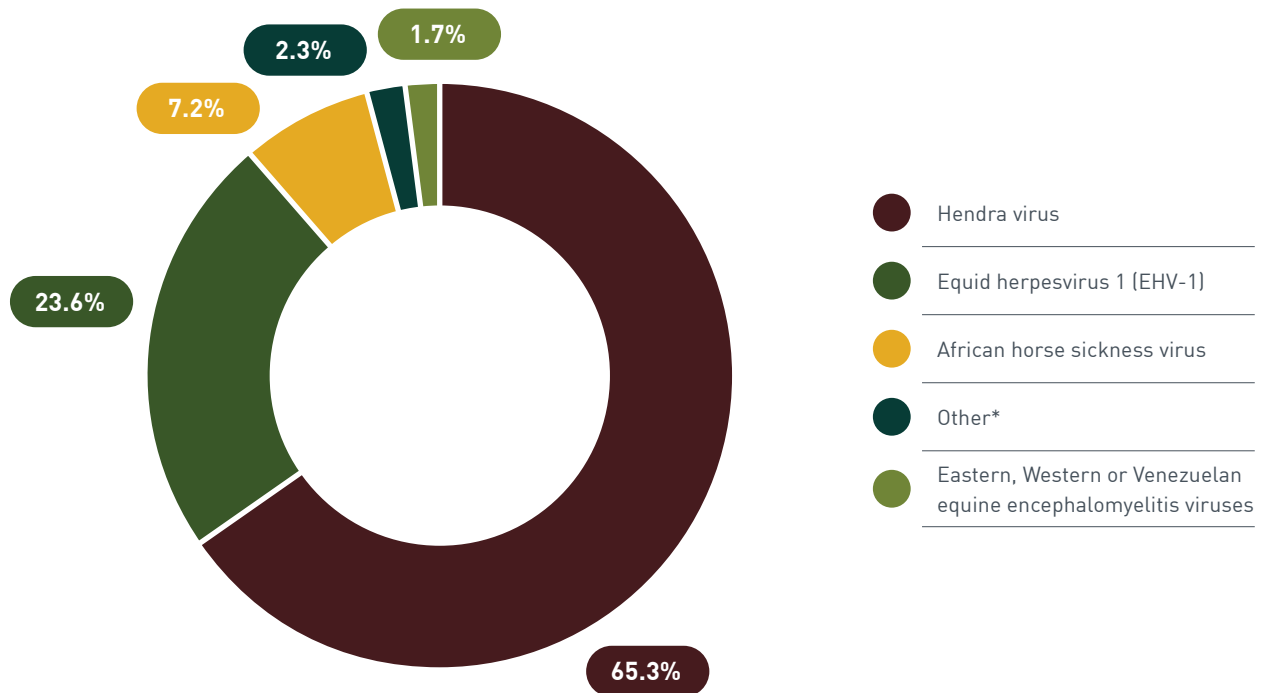
*Other includes: Haemorrhagic septicaemia (infection with *Pasteurella multocida* serotypes 6:B and 6:E), Infection with bovine leukaemia virus (enzootic bovine leucosis) and infection with *Theileria parva* (East Coast fever) or *T.annulata* (Mediterranean theileriosis)

Figure 2.3 Investigations of cattle-specific national notifiable diseases, infections and infestations in Australia in 2021



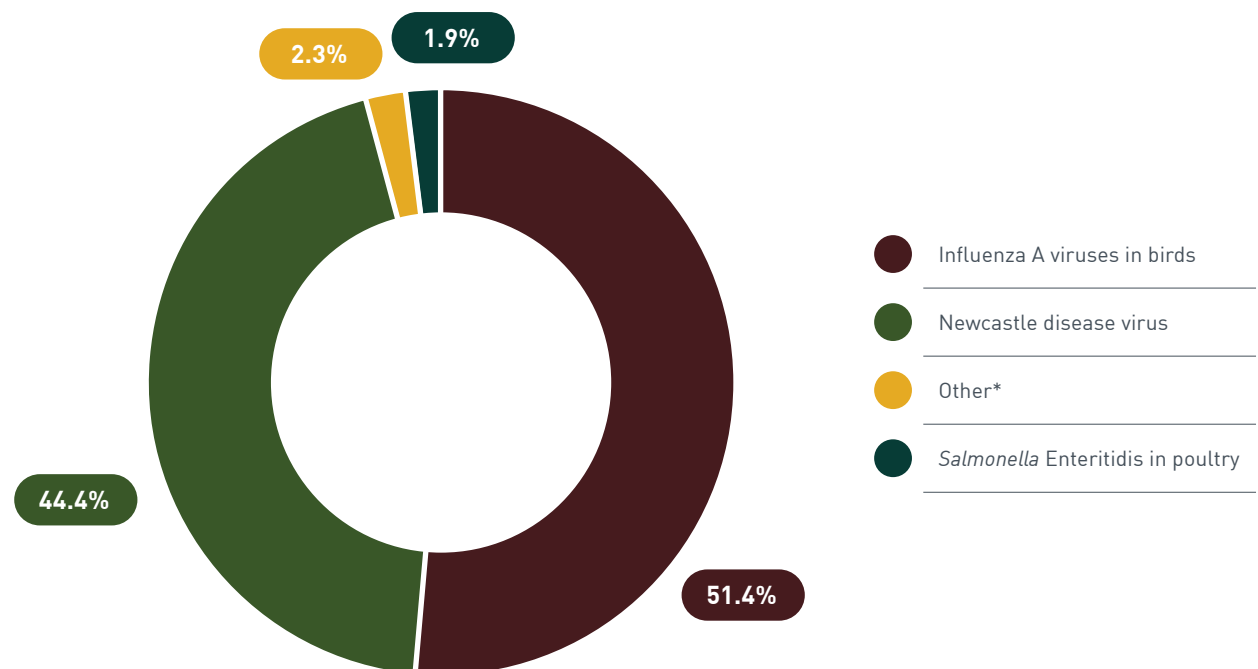
*Other includes: Contagious caprine pleuropneumonia, peste des petits ruminants virus, *Psoroptes ovis* (sheep scab) and Maedi-visna.

Figure 2.4 Investigations of sheep and goat specific national notifiable diseases, infections and infestations in Australia in 2021



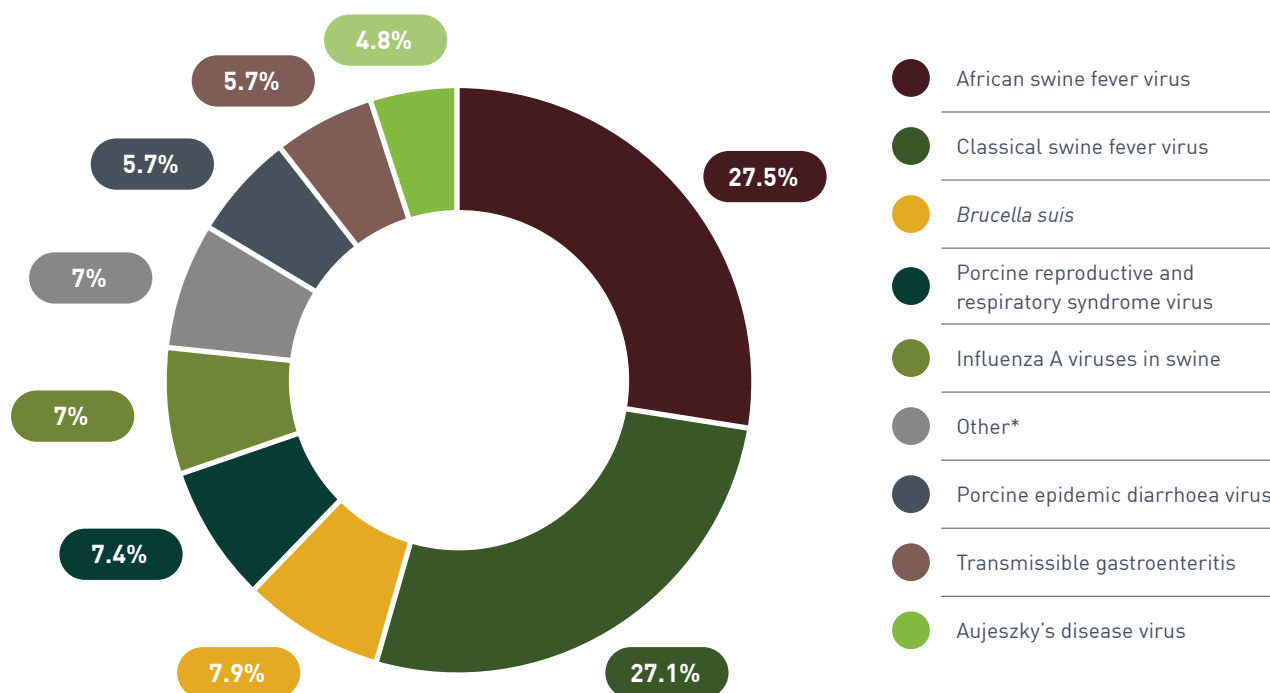
*Other includes: *Burkholderia mallei* (glanders), dourine, equine arteritis virus, equine infectious anaemia, equine influenza, *Histoplasma farciminosum* (epizootic lymphangitis) and *Salmonella Abortusequi*.

Figure 2.5 Investigations of equine-specific national notifiable diseases and infections in Australia in 2021



*Other includes: Duck herpesvirus 1 (duck viral enteritis/duck plague), duck virus hepatitis, fowl typhoid, infectious bursal disease (Gumboro disease), *Mycobacterium avium* (avian tuberculosis) and pullorum disease.

Figure 2.6 Investigations of avian-specific national notifiable diseases and infections in Australia in 2021 in poultry, cage and aviary birds



*Other includes: Bungowannah virus (porcine myocarditis), Menangle virus, Nipah virus encephalitis, post-weaning multi-systemic wasting syndrome and teschovirus A (porcine enteroviral encephalomyelitis).

Figure 2.7 Investigations of swine-specific national notifiable diseases and infections in Australia in 2021

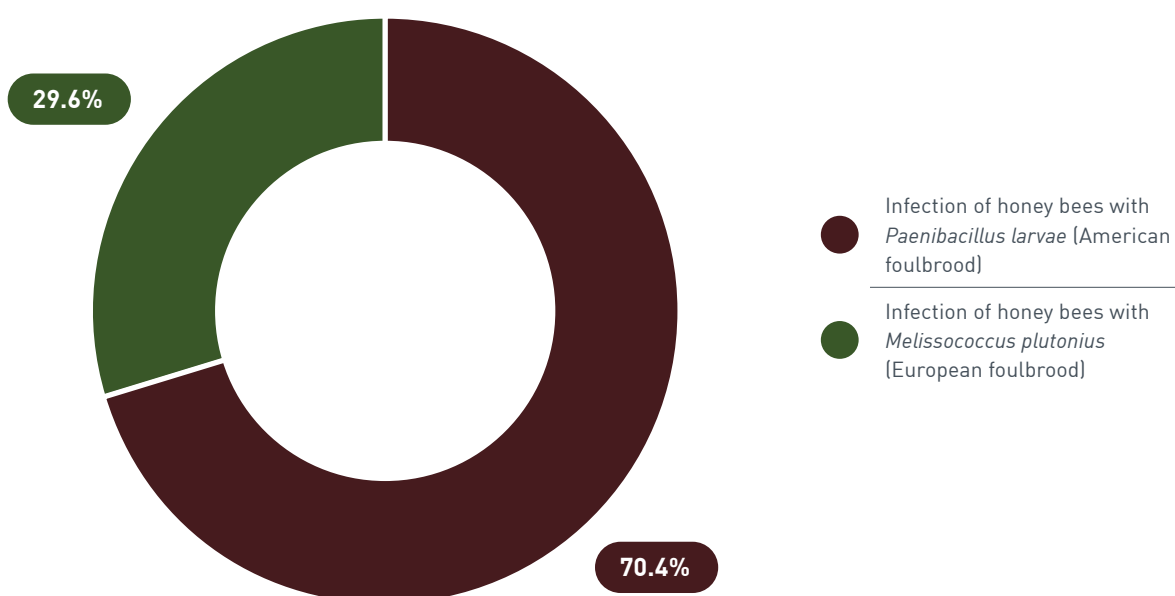


Figure 2.8 Investigations of bee-specific national notifiable diseases and infestations in Australia in 2021

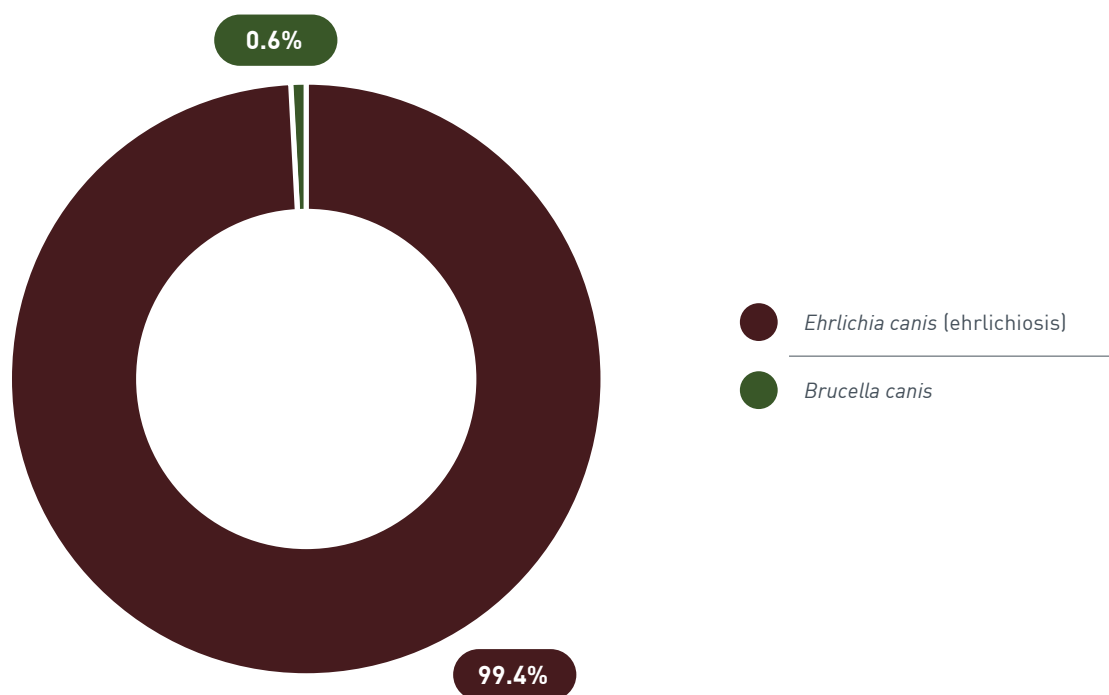


Figure 2.9 Investigations of other national notifiable diseases and infections in domestic animals in Australia in 2021

2.3 Significant disease incidents and status changes of nationally notifiable terrestrial animal diseases in 2021

This section provides further information about investigations of nationally notifiable terrestrial animal diseases in 2021, to support Australia's disease status for OIE-listed diseases presented in Table 2.2. In particular, it outlines Australia's response to significant disease incidents important to international trade and market access, which has helped safeguard Australia's national animal health status through 2021. Supplementary information about specific disease incidents can be found in the *Animal Health Surveillance Quarterly* editions for 2021.⁶

⁶ animalhealthaustralia.com.au/supporting-market-access

Anthrax

Anthrax is a nationally notifiable animal disease that affects a wide variety of domestic and wild animals. The disease usually occurs very suddenly in cattle and sheep and is subject to government controls – including quarantine, disposal of carcasses, vaccination and tracing of at-risk animals and their products. Areas at risk of anthrax occurrence are well defined, and include central New South Wales and the northern and north-eastern districts of Victoria. In these areas, anthrax occurs only sporadically.

One anthrax incident was detected in January 2021 in sheep in the Tottenham district of New South Wales. Of approximately 4000 head, 224 ewes and lambs died. Cattle on the property were not affected. Control measures were implemented in accordance with the AUSVETPLAN case response manual for Anthrax⁷ – including quarantine, stock and livestock product movement control,

⁷ animalhealthaustralia.com.au/ausvetplan

vaccination, decontamination and appropriate carcass disposal. Human health authorities were also notified, and public health precautions were implemented. For all exported animals and animal products, Australia ensured that all health requirements were met and certified appropriately.

Avian influenza

On 26 February 2021, Australia regained its previous disease-free animal health status for high pathogenicity avian influenza (HPAI) in accordance with the OIE *Terrestrial Animal Health Code*, following three incursions in July–August of 2020 across six poultry farms in Victoria.

Ehrlichia canis

Canine monocytic ehrlichiosis is a disease of dogs that is transmitted by brown dog ticks (*Rhipicephalus sanguineus*) infected with the bacteria *Ehrlichia canis*.

Infection with *E. canis* was confirmed for the first time in Australian dogs in May 2020 in the Kimberley region of Western Australia and in June 2020 in the Northern Territory. Subsequent national surveillance found *E. canis* was well established in the Northern Territory and northern Western Australia and based on these findings, eradication was deemed not feasible.

In February 2021, ticks infected with *E. canis* were found in northern South Australia and in March 2021, a clinical case of ehrlichiosis was confirmed in a dog living in the far north of South Australia. In addition, several dogs with ehrlichiosis were identified in New South Wales, Queensland, and Victoria in mid-2021, after travelling from the Northern Territory into these three states.

Disease management is now focused on tick prevention and control, the testing of dogs before movement to areas where *E. canis* is not known to be active, and through community awareness campaigns.

2.4 Public health-related animal disease investigations

This section outlines animal disease investigations that are closely related to public (human) health. Supplementary information about these zoonotic events can be found in the *Animal Health Surveillance Quarterly* editions for 2021.

Hendra virus

Hendra virus (HeV) is a zoonosis that causes natural infection and disease in horses and humans and is a nationally notifiable animal disease. Numerous HeV incidents have occurred in New South Wales and Queensland since 1994, involving more than 100 horses, most of which have either been euthanased or died as a result of the disease.

Flying foxes are the natural host for HeV. Appropriate risk management for horse owners includes minimising the potential for contact between flying foxes and horses and vaccinating horses against HeV.

The New South Wales and Queensland governments continue to implement well-established biosecurity and public health responses to all HeV incidents, including tracing and control of people and horse movements.

Research based on past routine surveillance identified a novel lineage of HeV (HeV-g2) that caused severe disease in a horse in south-east Queensland.⁸ It was not identified during routine polymerase chain reaction (PCR)-based testing due to its genomic divergence compared to all previously identified HeVs. Further testing indicated that currently available vaccine and monoclonal antibodies would still be effective for this new lineage. Guidelines for suspected HeV biosecurity and disease investigation have been updated due to these findings.

In October 2021, a fatal horse case of HeV-g2 near Newcastle in New South Wales was detected via routine biosecurity testing using an updated PCR-based test.

8 Annand, EJ Horsburgh BA, Xu K, Reid PA, Poole B, de Kantzow MC et al. 2022. Novel Hendra virus variant detected by sentinel surveillance of horses in Australia. *Emerging Infectious Diseases*, 28(3): 693–704.

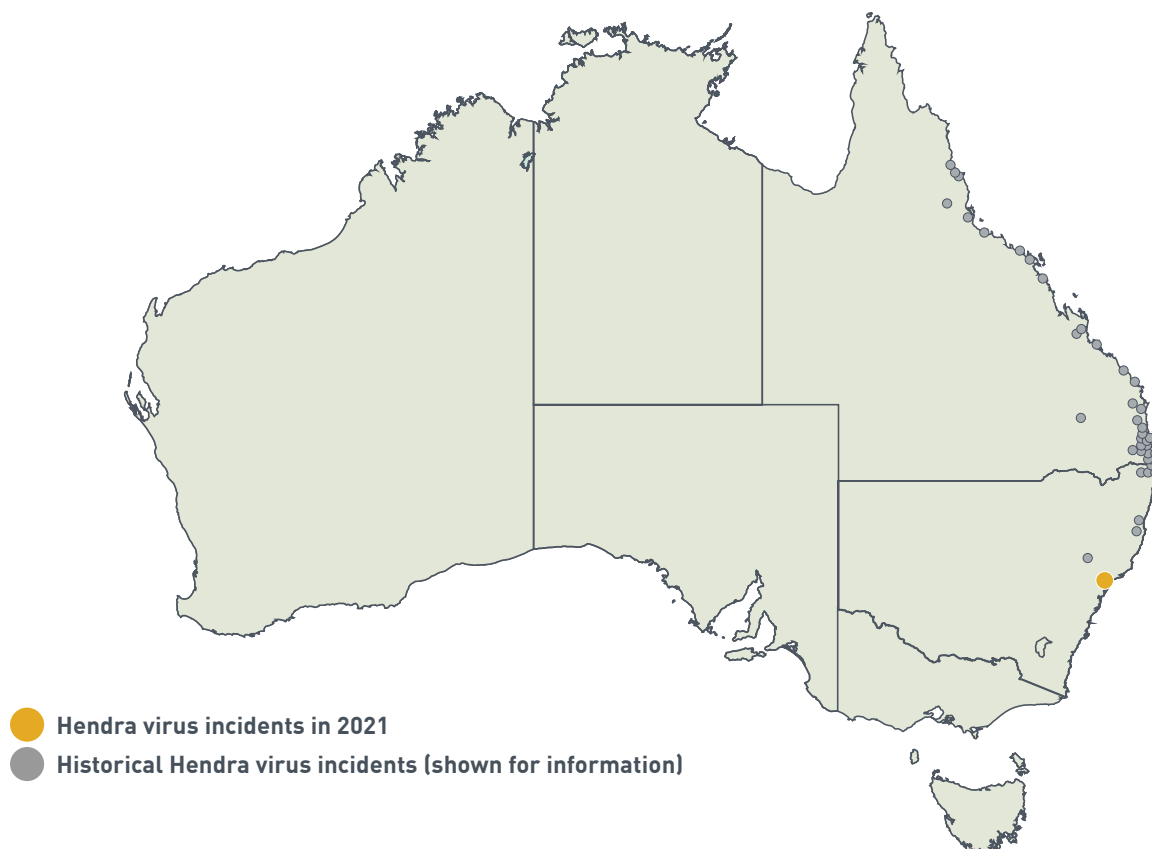


Figure 2.10 Locations of Hendra virus incidents in Australia, January–December 2021

Mycobacterium ulcerans

Mycobacterium ulcerans causes a disease known as Buruli ulcer. In Australia, the disease is also known as Bairnsdale ulcer and Daintree ulcer. Although primarily considered a human disease, *M. ulcerans* has also been detected in domestic species and native animals. There are several established endemic areas in Australia for Buruli ulcer in humans, including East Gippsland in Victoria, parts of Far North Queensland and the Queensland Capricorn Coast. More recently, endemic areas have emerged on the Bellarine and Mornington peninsulas of Victoria, with cases also reported in inner Melbourne.⁹ *M. ulcerans* has been identified in a number of domestic and wildlife species in Victoria.^{10,11} As in humans, infection with *M. ulcerans*

in wildlife causes skin ulcers, and these mostly occur on the animal's nose, ear, paw or tail.

M. ulcerans is considered an environmental pathogen. The mode of transmission is not well understood, although contaminated water, soil or vegetation, as well as biting insects, are hypothesised to play a role.¹² Small mammals, particularly possums, have been suggested as environmental reservoirs for *M. ulcerans* in Victoria. Possums from endemic areas in Victoria have been shown to shed *M. ulcerans* in their faeces.^{10,13} There is no evidence of direct transmission from animals to humans, and vice versa.

In 2021, two ringtail possums (*Pseudocheirus peregrinus*) were reported with *M. ulcerans* infection in Victoria. One case involved an adult male possum found in a suburban garden in south-east Melbourne. The possum had multiple deep skin ulcers and

9 Vic Health 2021. 'Buruli ulcer bacteria identified in inner west Melbourne.' Available at www2.health.vic.gov.au/about/news-and-events/healthalerts/buruli-ulcer-bacteria [Accessed 7 February 2022]

10 Wildlife Health Australia 2022. *Mycobacterium ulcerans* [Buruli ulcer] disease, fact sheet. wildlifehealthaustralia.com.au/Portals/0/Documents/FactSheets/Mammals/Mycobacterium_ulcerans_disease.pdf

11 Ban S,7 Cox-Witton K, Grillo T 2020. *Mycobacterium ulcerans* in a ringtail possum in a new location. *Animal Health Surveillance Quarterly* 25(3): 13–17.

12 Blasdell KR, McNamara B, O'Brien DP, Tachedjian M, Boyd V et al. 2022. Environmental risk factors associated with the presence of *Mycobacterium ulcerans* in Victoria, Australia. medRxiv

13 Fyfe JA, Lavender CJ, Handasyde KA, Legione AR, O'Brien CR et al. 2010. A major role for mammals in the ecology of *Mycobacterium ulcerans*. *PLoS Neglected Tropical Diseases* 4: e791

was euthanased. The second case was a possum from Essendon – the same location as a previous case reported in 2020. In both cases, a swab of the skin ulcers was submitted to the Mycobacterium Reference Laboratory at the Victorian Infectious Diseases Reference Laboratory, and *M. ulcerans* infection was confirmed by PCR.

M. ulcerans surveillance in wildlife may support public health preventative measures by helping to identify potential new areas for human infection.

2.5 Terrestrial animal surveillance programs

Australia's national surveillance system draws upon partnerships and networks involving government agencies, livestock industries, wildlife and commercial organisations, and individuals. These networks support a range of national programs and initiatives to investigate significant disease incidents and monitor their distribution and status. An outline of the activities of key national terrestrial animal monitoring and surveillance programs during 2021 is provided below. Further information on each of these programs is available in the 2021 *Animal Health in Australia System Report*.¹⁴

National Arbovirus Monitoring Program

The National Arbovirus Monitoring Program (NAMP) monitors the distribution of economically important arboviruses (insect-borne viruses) of livestock (cattle, sheep, goats and camelids) and associated insect vectors in Australia (*Culicoides* species biting midges). Arboviruses monitored by NAMP include bluetongue, Akabane and bovine ephemeral fever viruses. NAMP data are gathered throughout Australia by serological monitoring of cattle in sentinel herds, strategic serological surveys of other cattle herds and trapping of insect vectors.

The bluetongue virus (BTV) transmission zone map¹⁵ was maintained throughout 2021 and was made publicly available to inform livestock producers on the distribution of arboviruses and facilitate

management decisions. The BTV transmission zone boundary is updated promptly following confirmation of changes in the distribution of BTV transmission. During 2021, a retraction of the BTV transmission zone boundary was made in the North West Slopes of New South Wales following the absence of BTV transmission in the region over the past two years.

BTV typing occurred to determine serotypes circulating in Australia. BTV serotypes detected during the 2020–2021 arbovirus season were 1, 7, 15, 16 and 21. In north-east South Australia, a single *Culicoides brevitarsis* specimen was detected in a collection in February 2021. Follow-up entomology sampling and a serosurvey bleed did not detect further *C. brevitarsis* specimens or BTV. An additional sentinel herd and entomology site have been added in the region for ongoing monitoring in the 2021–2022 season. Enhanced BTV surveillance and vector trapping in northern Victoria (initiated in 2017–2018) continued during this season, with no evidence of virus transmission and no known vectors being detected.

During 2021, a discussion exercise was undertaken to test the NAMP arrangements based on fictitious scenarios of bluetongue detection in the BTV transmission-free zone of Australia. The exercise was held in two parts and involved participants from key government and industry organisations.

The results of NAMP's arbovirus transmission monitoring activities are published annually.¹⁶

National Significant Disease Investigation Program

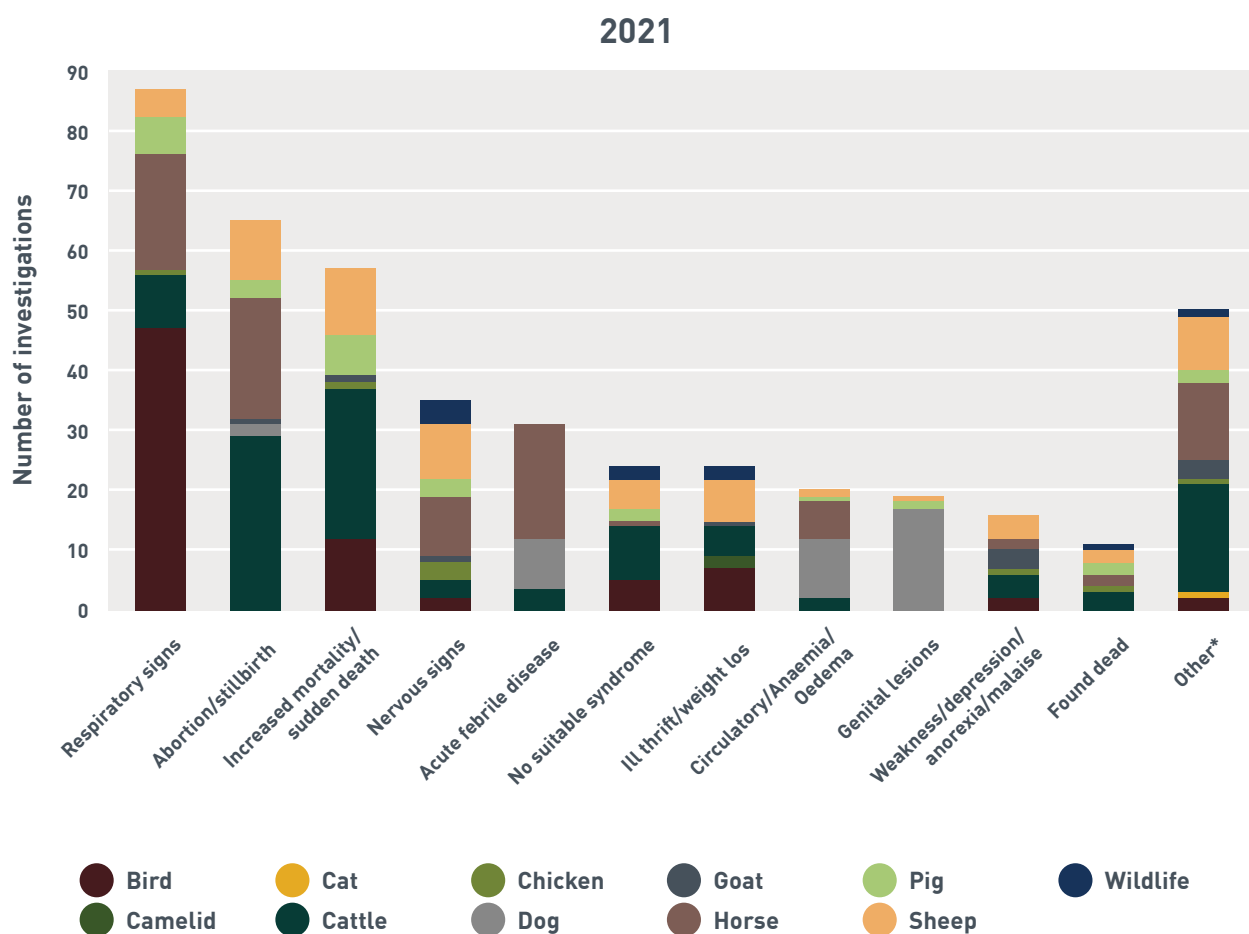
Private veterinary practitioners play a key role in general surveillance in Australia, providing expertise in evaluating, clinically investigating and reporting outbreaks of significant disease in animals. The National Significant Disease Investigation (NSDI) Program supports veterinary practitioners to investigate and report on significant disease events in livestock and wildlife.

During 2021, 436 disease investigations arising through general surveillance activities were

¹⁴ animalhealthaustralia.com.au/industry-publications

¹⁵ namp.animalhealthaustralia.com.au

¹⁶ animalhealthaustralia.com.au/maintaining-access-to-arbovirus-sensitive-markets



*Other syndromes included oral lesions or salivation, lameness, nasal discharge, diarrhoea, skin lesions, alimentary signs other than diarrhoea, congenital defect, generalised oedema, lymphadenopathy, production drop, infertility and jaundice.

Figure 2.11 Number of National Significant Disease Investigation Program subsidised investigations, by syndrome and animal group, January–December 2021

subsidised as part of the program (Figure 2.11). Key syndromes investigated were respiratory signs, abortion and stillbirth, and increased mortality. Training initiatives to enhance the quality of disease investigations by private veterinarians were conducted in New South Wales and the Northern Territory in 2021. Further information on the NSDI Program is available on the AHA website.¹⁷

National Sheep Health Monitoring Project

The National Sheep Health Monitoring Project (NSHMP) is managed by AHA and monitors lines of sheep in abattoirs for several important animal

health conditions.¹⁸ The NSHMP generates a comprehensive, contemporary dataset that provides a snapshot of the animal health status of the Australian flock. Sheep carcasses are monitored for a range of diseases and conditions which impact productivity, meat processing wastage and farm profitability. These data are important in highlighting regional variation and trends in the monitored conditions over time.

During the 2021 calendar year, 8 531 739 sheep from 37 188 lines and 8741 property identification codes across 10 domestic and export abattoirs were inspected. This was just slightly fewer than in 2020.

¹⁷ animalhealthaustralia.com.au/collaborative-disease-investigations

¹⁸ animalhealthaustralia.com.au/national-sheep-health-monitoring-project



In 2021, Australia maintained freedom from classical scrapie and continued to be recognised by OIE as a country of negligible risk for BSE.

Transmissible Spongiform Encephalopathy Freedom Assurance Project

The Transmissible Spongiform Encephalopathies Freedom Assurance Project (TSEFAP), which is funded by nine industry stakeholders and all federal, state and territory governments, aims to increase market confidence that Australian animals and animal products are free from transmissible spongiform encephalopathies (TSEs). This is achieved through the structured and nationally integrated management of animal-related TSE activities by AHA.¹⁹

¹⁹ animalhealthaustralia.com.au/maintaining-australias-freedom-from-tses

Projects that operate under TSEFAP are:

- the National Transmissible Spongiform Encephalopathies Surveillance Project (NTSESP)
- the Australian ruminant feed ban scheme, including inspections and stockfeed testing
- imported animal surveillance for cattle from countries that subsequently reported bovine spongiform encephalopathy (BSE) and
- communications.

The NTSESP provides early detection of BSE and classical scrapie (should they occur) and demonstrates Australia's ability to meet the requirements for negligible risk status for BSE and free status for classical scrapie. The program involves testing samples from cattle, sheep and goats with clinical signs consistent with BSE or classical scrapie. Opportunistic sampling of fallen and casualty slaughter cattle, sheep and goats is also undertaken.

In 2021, Australia maintained freedom from classical scrapie and continued to be recognised by OIE as a country of negligible risk for BSE. Australia's targeted surveillance program is consistent with OIE requirements, and data are submitted to OIE each year to reconfirm Australia's disease-free status.

During 2021, 368 cattle, 323 sheep and 8 goats were examined as part of the program. All samples tested negative for BSE and classical scrapie. One case of atypical scrapie was found during 2021, demonstrating the effectiveness of the NTSESP.

Screw-Worm Fly Surveillance and Preparedness Program

The Screw-Worm Fly Surveillance and Preparedness Program (SWFSPP) is a national program managed by AHA that focuses on early detection and preparedness in the event of an incursion of screw-worm fly.²⁰

During 2021, surveillance was undertaken for both Old World screw-worm fly (*Chrysomya bezziana*) and New World screw-worm fly (*Cochliomyia*

²⁰ animalhealthaustralia.com.au/monitoring-for-swf

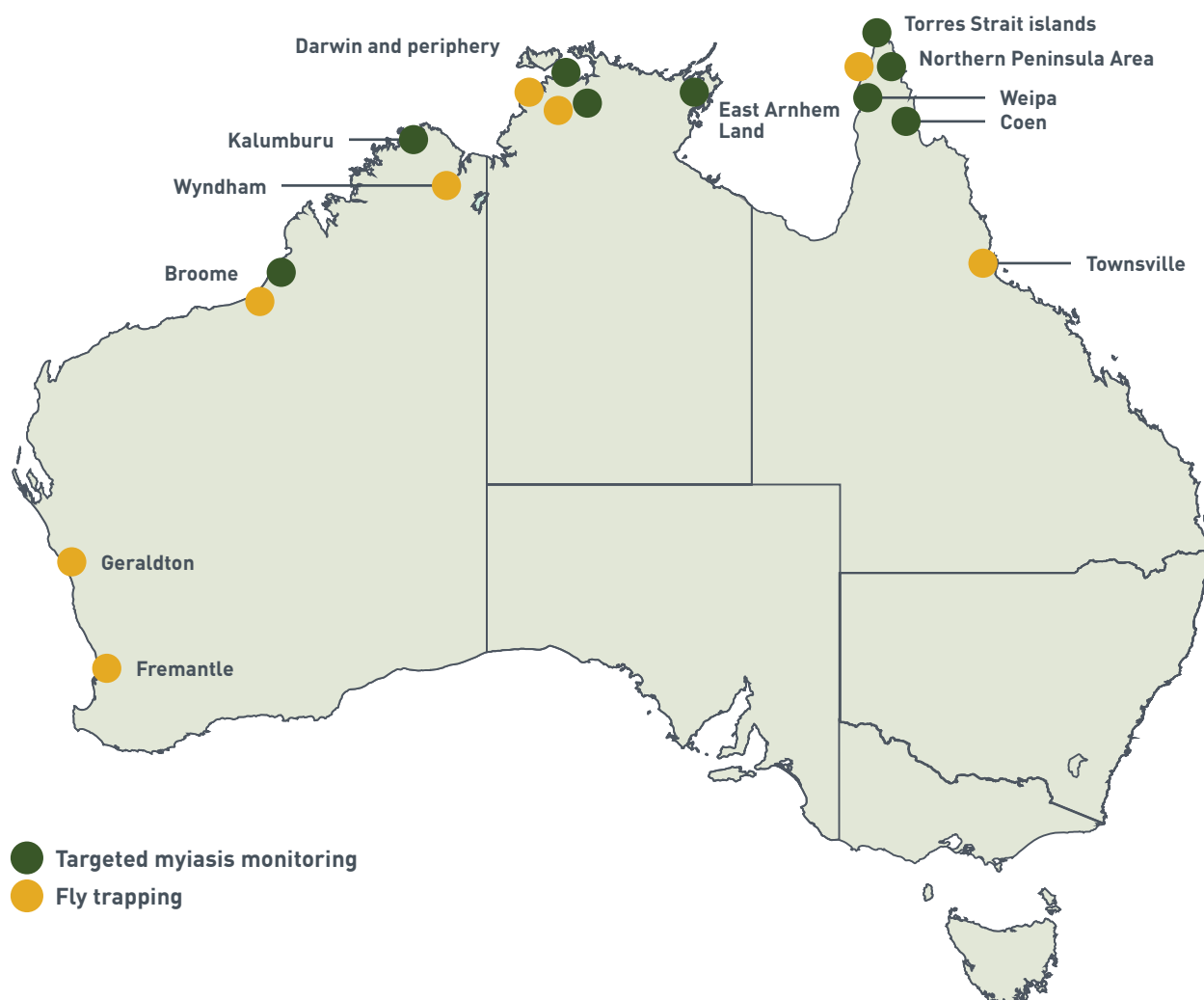


Figure 2.12 Locations of targeted myiasis monitoring and fly trapping in the Screw-Worm Fly Surveillance and Preparedness Program, Australia, 2021

hominivorax). Surveillance comprised fly trapping and targeted livestock wound surveys for myiasis, in addition to general surveillance for myiasis through veterinarians and other key animal health stakeholders.

During 2021, fly trapping was undertaken at 19 sites within eight locations, comprising a total of 266 trapping events. Targeted myiasis monitoring was conducted at 18 sites within eight locations, comprising 8945 cattle or domestic animal surveys (Figure 2.12).

During 2021, a key achievement of the program was increasing Australia's preparedness through ensuring that appropriate permits were in place to prevent any delays in the use of prophylactic and

therapeutic chemical treatments in the event of an incursion.

Australian Pork Limited Evidence of Absence Surveillance Project

In 2021, the Australian Pork Limited Evidence of Absence Surveillance Project was renewed for an additional three-year period. The project seeks to increase surveillance for specified exotic pig diseases and was developed in consultation with specialist pig veterinarians. The exotic diseases targeted through the project include African swine fever, classical swine fever, porcine reproductive and respiratory syndrome, transmissible gastroenteritis, porcine epidemic diarrhoea, Aujeszky's disease and porcine teschovirus encephalomyelitis.

The surveillance project is delivered by AHA and draws on a series of guidelines²¹ describing the clinical syndromes associated with exotic pig diseases of high priority for Australia. A government contact point has been established within each state for veterinarians to liaise on the project. Since the project's inception, there has been a steady increase in exclusion testing for relevant diseases, with summary records of investigations collated as part of Australia's National Animal Health Information Program.

Cattle tick and tick fever

The cattle tick *Rhipicephalus* (formerly *Boophilus*) *microplus* or *R. australis* mainly infests cattle, but may occasionally affect other species such as horses, sheep, goats, camelids, deer and water buffalo. Ticks also transmit tick fever (bovine babesiosis or anaplasmosis), caused by *Babesia bigemina*, *B. bovis* or *Anaplasma marginale*. Babesiosis and anaplasmosis are nationally notifiable animal diseases in tick-free areas. Cattle tick is managed by individual state and territory programs. The tick fever zones are shown in Figure 2.13, with regions of the Northern Territory, Queensland and Western Australia defined as cattle tick areas.

Northern Australia Quarantine Strategy

The Department of Agriculture, Water and the Environment's Northern Australia Quarantine Strategy (NAQS) is a multidisciplinary program that has conducted surveillance for exotic plant and animal pests and diseases for over 30 years. Operating across northern Australia, an area recognised as having unique biosecurity risks, NAQS employs almost 30 specialist scientists, including six veterinarians and an aquatic scientist, to lead the delivery of the surveillance program.

In 2021, NAQS continued to conduct targeted and general surveillance across northern Australia to support the early detection of pests and diseases that may be introduced through natural or human-mediated pathways. One surveillance activity unique to NAQS is the active targeted survey of feral animal populations across northern Australia. These surveys involve low-altitude aerial observation of feral animals by veterinarians. A subset of individual animals is humanely euthanased for post-mortem examination and sampled to test for a number of diseases exotic to Australia. Abnormal clinical signs or pathology detected during these surveys undergoes further diagnostic work-up and exotic

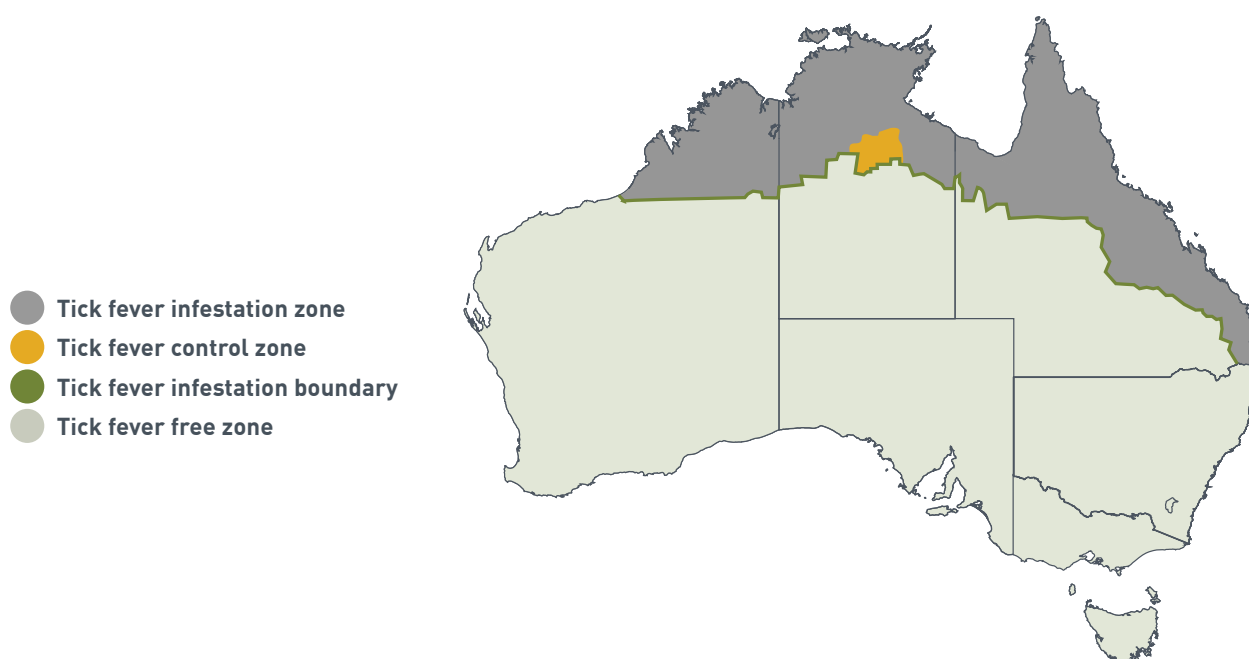


Figure 2.13 Tick fever zones in Australia as at 31 December 2021

²¹ animalhealthaustralia.com.au/enhanced-surveillance-for-significant-exotic-diseases-of-pigs

disease exclusion testing (Table 2.3). In 2021, 12 surveys of feral animals were conducted across 17 regions of northern Australia (Figure 2.14). The vast majority of animals sampled were feral pigs. Not only are they relatively abundant compared to other feral animal species found in northern Australia, they are also known to host a wide range of exotic animal pests and diseases.

In addition to targeted feral animal health surveillance, NAQS also delivers the following animal health surveillance activities:

- Targeted surveys of domestic animals in the Torres Strait–Northern Peninsula Area (NPA) of Queensland, including routine sample collection and testing for a number of diseases exotic to Australia (Figure 2.15). As for feral animal surveys, any abnormal clinical signs or pathology detected during these surveys undergoes further diagnostic work-up and exotic disease exclusion testing (Table 2.3).
- Targeted environmental sampling of wild waterfowl to monitor for avian influenza (AI), as part of the National Avian Influenza Wild Bird (NAIWB) Surveillance Program.
- Monitoring for exotic serotypes and vectors of BTV and other arboviruses, through sentinel and serosurveillance of cattle herds and light trapping, contributing to the NAMP.
- Targeted monitoring for screw-worm fly in the NPA, adjacent to the Torres Strait, contributing to the SWFSPP.
- Targeted monitoring for zoonotic flaviviruses, including Japanese encephalitis (JE) in the NPA and Tiwi Islands, Northern Territory.
- Targeted and general surveillance for marine pests and aquatic diseases, including deployment of marine pest settlement arrays and inspection of marine debris that washes up in coastal regions of northern Australia.
- Targeted and general biosecurity public awareness.
- Ad hoc disease investigations in response to biosecurity or animal health concerns reported by third parties, such as Indigenous rangers, pastoralists or members of the public.

NAQS also delivers monitoring for exotic serotypes and vectors of BTV and other arboviruses, through sentinel and serosurveillance of cattle herds and light trapping, contributing to the NAMP.



CASE STUDY

Japanese encephalitis virus surveillance and response in Northern Australia

In March 2021, a resident of Tiwi Islands, Northern Territory sadly passed away after a short encephalitic illness that was originally attributed to either Murray Valley encephalitis virus or Kunjin virus²² – both mosquito-borne flaviviruses that are endemic in some parts of Australia, including the Northern Territory.

When further testing of samples instead confirmed a diagnosis of JE, a related flavivirus that was not known to be present in Northern Territory, an investigation was launched by NT Health. This investigation determined that the infection had been acquired locally, most likely in January 2021 on Tiwi Islands.

Given JE is a zoonotic disease, the Northern Territory Department of Industry, Tourism and Trade, as the agency responsible for animal health and biosecurity, was invited to assist with the ongoing investigation. The NAQS animal health surveillance program was also invited to assist, given its knowledge and operational surveillance capacity in Tiwi Islands and other coastal regions of the Northern Territory.

The agencies involved in the response continue to work together to support the local community in understanding and managing risk factors for JE (as

well as other endemic mosquito-borne diseases), and to conduct further surveillance of mosquitoes and local animal populations (principally pigs), to determine if there is evidence of local reservoirs of JE virus (JEV) that would present an ongoing risk to both human and animal health.

Besides technical input into the inter-agency working group, NAQS's contributions to the ongoing investigation in 2021 included:

- Working with the Medical Entomology Unit of NT Health and Tiwi Land Rangers to commence mosquito trapping on Tiwi Islands. This new surveillance activity commenced in late 2021 and will continue to operate throughout the monsoon season. Samples collected through the traps will be used to identify species of mosquitoes and to test for presence of JEV.
- Working with local Indigenous enterprises to set up sentinel chicken flocks on Tiwi Islands. Also established in late 2021, blood samples from these flocks will continue to be collected regularly throughout the monsoon season and tested for evidence of active or past infection with JEV.
- Conducting surveillance of feral animal populations on Tiwi Islands in mid-2021, involving low altitude aerial observations, post-mortems and sample collection. Samples from these animals were tested for evidence of active or past infection with JEV. Samples collected by NAQS from feral animals in other coastal regions of the Northern Territory throughout the 2020–21 monsoon season (when the human case was acquired) were also tested for JEV. This feral animal surveillance is a long-established activity for NAQS throughout northern Australia and will continue to be used for targeted surveillance of JEV and other significant animal pests and diseases.

Surveillance for JEV continued in the Northern Territory throughout the 2021–22 monsoon season.

22 Health authorities issue mosquito warning after person dies on Tiwi Islands. ABC News, www.abc.net.au/news/2021-03-20/nt-mosquito-borne-virus-warning-following-tiwi-islands-death/100019152 (Accessed 7 February 2022)

In addition to its own animal health surveillance activities, NAQS works collaboratively with a broad range of stakeholders to conduct surveillance, including:

- Indigenous ranger groups delivering surveillance activities on a fee-for-service basis via the NAQS Indigenous Ranger program.

- Private veterinarians working in northern Australia, via the Northern Australia Biosecurity Surveillance Network (NABSnet), a program overseen by a multi-agency working group led by NAQS.

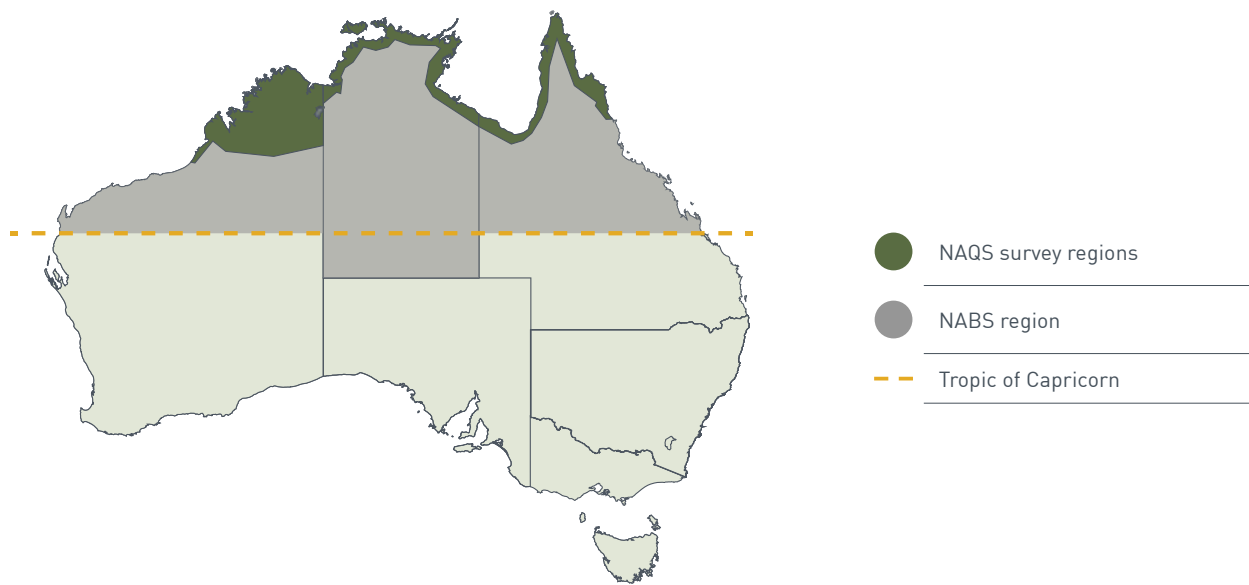


Figure 2.14 Northern Australia Biosecurity Surveillance (NABS) region with key Northern Australia Quarantine Strategy survey areas shown

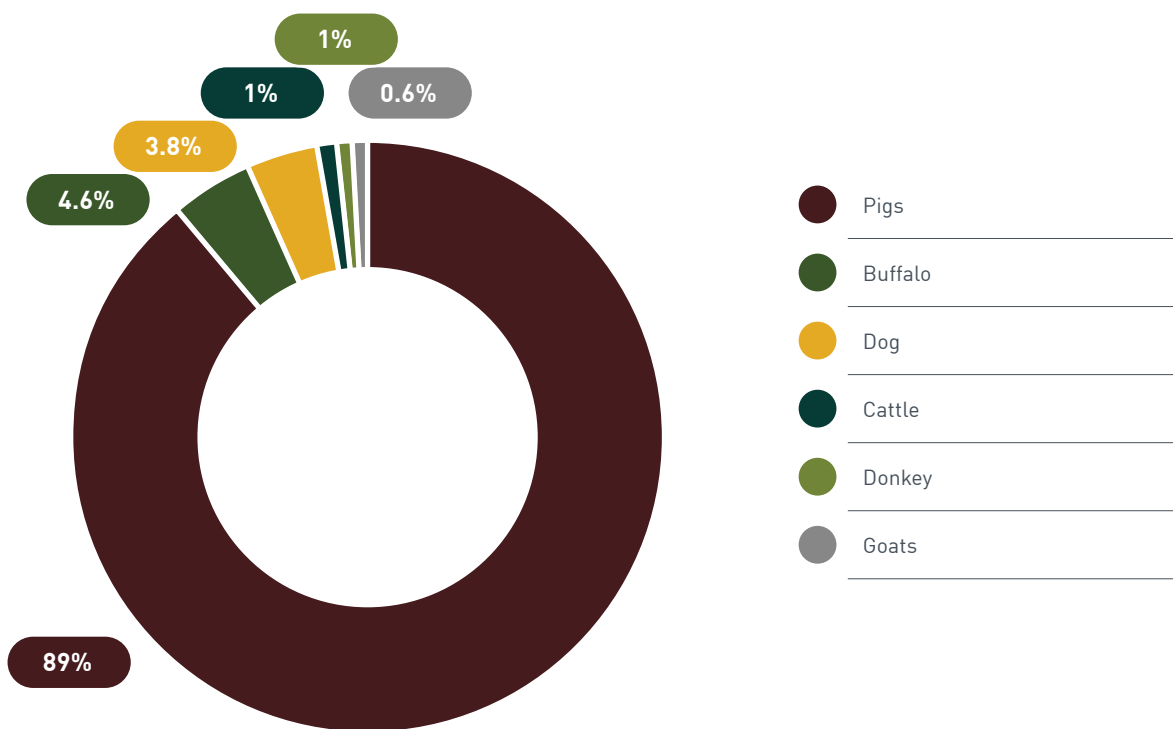


Figure 2.15 Percentage of each species sampled across northern Australia in 2021 by NAQS feral and domestic animal surveys

Table 2.3 Pathogen tests for disease investigations by NAQS in 2021 in northern Australia^a

Pathogen tested	Negative results	Positive results
African swine fever virus	33	0
Suid alphaherpesvirus 1 (Aujeszky's disease)	31	0
<i>Brucella</i> sp.	18	0
<i>Burkholderia pseudomallei</i>	8	0
Classical swine fever virus	33	0
Foot and mouth disease virus	2	0
Japanese encephalitis virus ^b	5	
West Nile virus – Kunjin ^b	5	0
Murray Valley encephalitis virus ^b	5	0
<i>Leptospira</i>	1	0
Menangle virus	2	0
Newcastle disease virus	5	0
Old World screw-worm fly	1	0
Porcine reproductive and respiratory syndrome virus	2	0
Pox virus	0	1 ^c
<i>Trypanosoma evansi</i>	34	0
Type A Influenza virus	5	0
Vesicular stomatitis vesiculoviruses	1	0

a Animals were often tested for multiple pathogens. In total, 40 animals had a disease investigation performed from the 12 feral animal surveys, 1 domestic animal survey and 2 ad hoc disease investigations in 2021.

b At the time of publication, there were 19 pending tests for Japanese encephalitis, West Nile virus – Kunjin and Murray Valley encephalitis virus.

c Confirmed as suipoxvirus.

Wildlife health surveillance

Wildlife Health Australia (WHA) administers Australia's general wildlife health surveillance system, in partnership with government agencies and non-government organisations. During 2021, 852 wildlife disease investigation events were added to the national database (Table 2.4). Approximately 41% of these wildlife investigation events related to bats, 29% related to birds, and 16% related to marsupials.

Wild bird disease investigations include both single animal and multiple animal morbidity and mortality events. In 2021, WHA received 247 reports of wild

bird mortality or morbidity investigations from around Australia, ranging from single animal to multiple animal (mass mortality) events.

Diagnostic testing in wild bird mortality events includes exclusion of diseases caused by avian influenza virus (AIV), avian orthoavulavirus 1 (AOAV-1; including Newcastle disease [ND] virus and pigeon paramyxovirus 1 [PPMV-1]) and West Nile virus (WNV). No wild bird mortality events were attributed to AIV or WNV over this period. AIV was specifically excluded by PCR testing for influenza A in 99 of the events in 2021. In addition, AOAV-1 was excluded in 85 events by PCR testing specific for

Table 2.4 Wildlife disease investigation events in Australia in 2021

Animals	Number of investigations ^a
Bats	348
Birds	247
Marsupials	134
Feral mammals	58
Snakes and lizards	24
Marine mammals	16
Amphibians	16
Freshwater turtles	5
Monotremes	3
Other mammals ^b	2

^a One event involved both birds and feral mammals, so total number of events does not equal 852.

^b Dingo (*Canis familiaris dingo*).

ND virus and/or PPMV-1. AIV and AOAV-1 exclusion testing was not warranted in the remaining events on the basis of clinical signs, history, prevailing environmental conditions or other pathogens or diagnoses.

Findings in wild birds included: angiostrongylosis, aspergillosis, avian chlamydiosis, avian pox, botulism, coccidiosis, *Escherichia coli* infection, haemoproteus, *Macrorhabdus ornithogaster* infection, mycobacteriosis, non-pestis yersiniosis, *Salmonella* species infections, sarcocystosis, parasitism, PPMV-1, poisoning, psittacine and non-psittacine beak and feather disease, toxoplasmosis, trichomoniasis and trauma.

The majority of bat investigations involved individual bats being submitted for testing for Australian bat lyssavirus (ABLV), a nationally notifiable disease. Bats are tested for ABLV for a variety of reasons, most commonly following potentially infectious contact with a human – for example from a bite or scratch – or with a pet dog or cat. A total of 376 bats were tested for ABLV in 2021. Of these, 35 flying foxes from Queensland, New South Wales, South Australia, Northern Territory and Victoria were found to be infected with ABLV. There were no

detections of ABLV infection in 2021 in species other than bats. Regular reports on the status of ABLV in Australia are published by the Bat Health Focus Group.²³ This group, coordinated by WHA, works to improve national coordination of issues associated with bat health, within the broader context of biosecurity, public health, livestock health and environmental impacts.

Significant wildlife health incidents

A summary of significant wildlife health incidents in 2021 is provided below.

- From June 2021, an unusually large number of sick and dead frogs were reported in eastern Australia, predominantly from locations across New South Wales, with reports also received from Queensland and eastern Victoria. The suspected cause is the amphibian chytrid fungus *Batrachochytrium dendrobatidis* in combination with cold temperatures. However, other factors may be involved.²⁴ This event is referred to in more detail in Section 3.3.

²³ www.wildlifehealthaustralia.com.au/ProgramsProjects/BatHealthFocusGroup.aspx

²⁴ Ban S, Grillo T, Death C, Cox-Witton K 2021. Wildlife Health Australia. *Animal Health Surveillance Quarterly*, 26(3): 16–19.



Hundreds of flying foxes (*Pteropus* spp.) with neurological signs were reported from a range of locations in northern New South Wales and South East Queensland.

- Hundreds of flying foxes (*Pteropus* spp.) with neurological signs were reported from a range of locations in northern New South Wales and South East Queensland. An investigation ruled out a number of diseases as the potential cause of the event, including ABLV, and no evidence of an infectious cause was found. A toxic or metabolic cause is considered most likely, and investigation is continuing.²⁵
- Reports of rodenticide toxicity in native wildlife increased in 2021,²⁶ when high mouse numbers

occurred in Australia's eastern grain belt. Rodent population numbers responded to abundant crops, which resulted from higher rainfall after previous drought conditions.

- An unusually high number of ABLV infections was detected in little red flying foxes (*Pteropus scapulatus*) from December 2020 to April 2021 in South East Queensland. This may have been due to an outbreak in the little red flying fox population, or the result of increased detection of sick flying foxes when a large camp moved into a densely populated area.²⁷

25 n.a. 2021. State and territory reports. *Animal Health Surveillance Quarterly*, 26(1): 23–30.

26 Death C, Ban S, Cox-Witton K. 2021. Wildlife Health Australia. *Animal Health Surveillance Quarterly*, 26(2): 5–8.

27 Barrett J 2021. Atypical cluster of lyssavirus (ABLV) infections in little red flying foxes in South East Queensland. *Animal Health Surveillance Quarterly*, 26(1): 7–8.

CASE STUDY

Silver gull mortality events, Tasmania

Investigation of mass mortalities in wild birds is important, not only to detect or exclude nationally notifiable diseases (e.g. Influenza A), but also to conduct further investigation and diagnostic testing to identify the cause. Thorough investigation allows a better understanding of the drivers of mortality events in wild birds. In addition, some of the more common causes of avian mass mortalities (e.g. botulism, pesticide or other toxicities, or infections such as *Chlamydia* and *Salmonella* DT160),²⁸ may have implications for potential transmission to humans or domestic animals, or as sentinels for environmental exposures.

Mass mortality events in silver gulls (*Larus novaehollandiae*) occurred at two closely located sites in Launceston, Tasmania in the first quarter of 2021.²⁹ In the first event, approximately 80 sick and dead silver gulls were reported by members of the public. Four birds were collected for investigation. Histopathology findings by the Tasmanian Animal Health Laboratory included mild myositis, hepatitis and enteritis. No pathogens suggestive of an infectious disease process were identified. AOA-1 was excluded by PCR. A sample from a juvenile gull returned a relatively weak AIV positive result at CSIRO's Australian Centre of Disease Preparedness. PCR tests for H5, H7 and H9 AIV subtypes were negative. Fenthion, an organophosphate pesticide, was detected in gizzard samples from two birds at the Analytical Services Tasmania laboratory and deemed the cause of the mortality event.

In the second event, approximately 130 silver gull carcasses were found on a vacant block. Six birds were submitted for investigation. Necropsy findings included evidence of diarrhoea in five

birds, and haemorrhagic ventriculitis of the gizzard in one bird. One bird also had conjunctivitis and a focal mass on the beak, with histopathology suggestive of incidental pox infection. AIV, AOA-1 and *Chlamydia psittaci* were excluded by PCR. Organophosphate pesticide screening at AST was negative. Samples tested by enzyme-linked immunosorbent assay (ELISA) at Biosecurity Sciences Queensland Laboratory were positive for botulinum toxin types C and D, with botulism considered the likely cause of this event.³⁰

To further investigate the AIV status of the gulls in these events, 57 faecal environmental swabs were collected from the two locations. One sample of three pooled swabs was AIV positive, but negative for H5 and H7 subtypes. AI was not considered the cause of these mortality events, as clinical examination and pathology findings were not consistent with AI. These incidental findings are not unusual given that shorebirds (charadriiformes) are an AIV reservoir species. Nevertheless, investigation of significant mortality events should always include AIV exclusion.³¹



28 wildlifehealthaustralia.com.au/Portals/0/Documents/FactSheets/Avian/Mass_mortalities_in_wild_birds.pdf

29 Ban S et al. 2021. Wildlife Health Australia. *Animal Health Surveillance Quarterly*, 26(1): 18–21.

30 wildlifehealthaustralia.com.au/Portals/0/Documents/FactSheets/Avian/Botulism_in_Australian_Wild_Birds.pdf

31 www.wildlifehealthaustralia.com.au/Portals/0/Documents/FactSheets/Avian/Avian_Influenza_in_Wild_Birds_in_Australia.pdf

National Avian Influenza Wild Bird Surveillance Program

The NAIWB Surveillance Program undertakes targeted surveillance of apparently healthy and hunter-shot wild birds and general surveillance of significant unexplained morbidity and mortality events in wild birds. This is in addition to the general wild bird surveillance reported earlier in the wildlife health surveillance section. Since July 2005, over 121 840 wild birds have been tested for AIVs, with a subset of samples also tested for AOAIV-1 (which includes ND virus).

In 2021, targeted (pathogen-specific, risk-based) surveillance was conducted by sampling apparently healthy, live and hunter-shot wild birds at sites in New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria and Western Australia (Figure 2.16). A total of 5543 faecal environmental, cloacal and oropharyngeal swabs collected from waterbirds were tested for AIVs.

AIV was specifically excluded by PCR testing for influenza A in 99 of the events in 2021. In addition, AOAIV-1 was excluded in 85 events by PCR testing specific for ND virus and/or PPMV-1. AIV and AOAIV-1 exclusion testing was not warranted in the remaining events on the basis of clinical signs, history, prevailing environmental conditions and other pathogens or diagnoses.

No HPAI viruses were identified. However, surveillance activities continue to result in evidence of a wide range of subtypes of AI viruses of low pathogenicity. Low pathogenicity subtypes detected included H1, H2, H3, H5, H6, H7, H8, H9, H10 and H11.

Further information on the NAIWB Surveillance Program is available on WHA's Avian Influenza Wild Bird Surveillance webpage, and in the Avian Influenza in Wild Birds fact sheet and Wild Bird Newsletter.³²

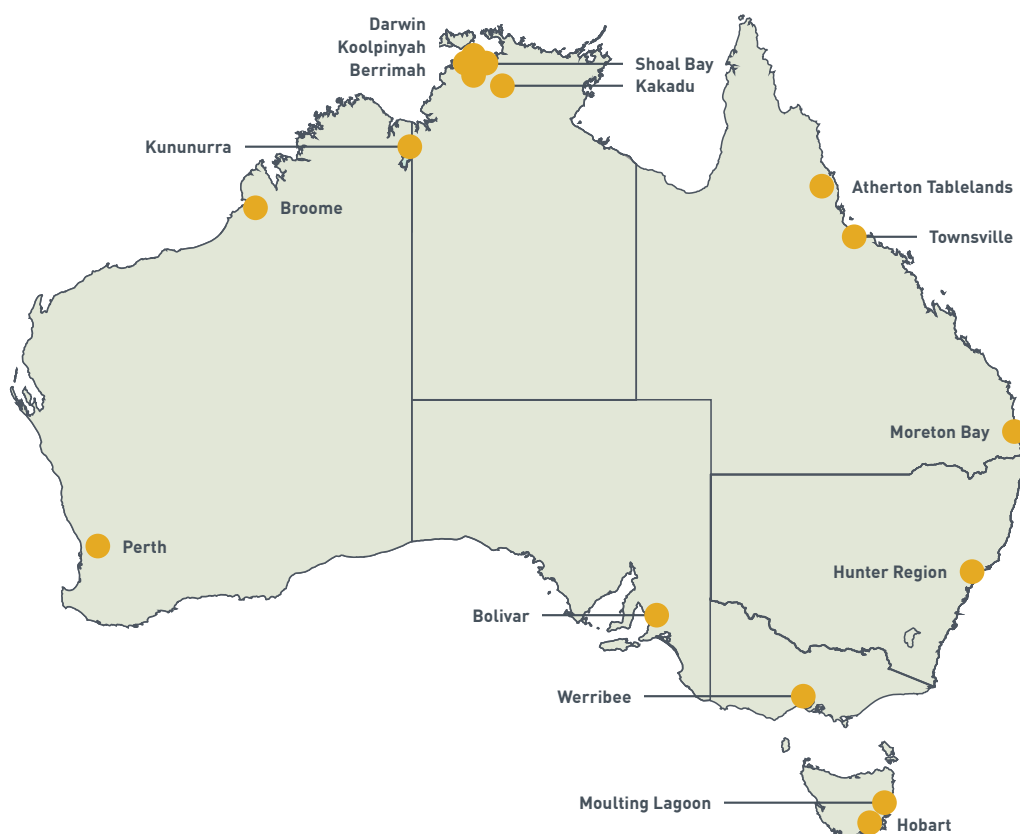


Figure 2.16 Key sampling locations* of targeted surveillance of live and hunter-shot wild birds through Australia, 2021

*Locations shown are where the majority of wild bird samples are collected on a regular basis. Locations sampled irregularly or where small numbers of samples are collected are not shown.

32 www.wildlifehealthaustralia.com.au/ProgramsProjects/WildBirdSurveillance.aspx

Since July 2005, over 121 840 wild birds have been tested for AIVs, with a subset of samples also tested for AOA V-1 (which includes ND virus).



Aquatic animal health status

3



Image credit: South Australian Oyster Growers Association

3.1 Status of aquatic animal health in Australia

This chapter provides details on the status of aquatic animal health in Australia including disease events in 2021. Australia has a robust reporting system for aquatic animal diseases of national significance. Australia's National List of Reportable Diseases of Aquatic Animals³³ includes all the aquatic animal diseases currently listed by the World Organisation for Animal Health (OIE) and other aquatic animal diseases of national significance.

Consistent and accurate reporting is important to demonstrate Australia's claims to freedom from diseases of international significance – to support trade of seafood products and to support

our biosecurity measures. Our disease reporting demonstrates transparency to trading partners and a commitment to disease management and biosecurity.

In 2021, the OIE listed 10 fish diseases, seven mollusc diseases, 10 crustacean diseases and three amphibian diseases. Australia is free from most of these diseases. Australia's status for each OIE-listed aquatic animal disease in 2021 is shown in Table 3.1. For OIE-listed diseases that are present, the maps in Figure 3.1 indicate states and territories from which those diseases are reported.

Australia reviews its national list annually taking into account new scientific information on listed diseases and new and emerging diseases. Table 3.2 shows Australia's status for aquatic animal diseases of national significance that are not reportable to the OIE for 2021.

Table 3.1 Australia's status for OIE-listed diseases of aquatic animals, 2021

Agent	Status
Fish	
<i>Aphanomyces invadans</i> (epizootic ulcerative syndrome)	Last reported 2021
Epizootic haematopoietic necrosis virus	Last reported 2012
<i>Gyrodactylus salaris</i>	Never reported
Haemorrhagic septicaemia virus	Never reported
HPR-deleted or HPR0 infectious salmon anaemia virus	Never reported
Infectious haematopoietic necrosis virus	Never reported
Koi herpes virus	Never reported
Red sea bream iridovirus	Never reported
Salmonid alphavirus	Never reported
Spring viraemia of carp virus	Never reported
Mollusc	
Abalone herpesvirus	Last reported 2021
<i>Bonamia ostreae</i>	Never reported

Cont'd

³³ www.awe.gov.au/agriculture-land/animal/aquatic/reporting/reportable-diseases

Agent	Status
<i>Bonamia exitiosa</i>	Last reported 2019
<i>Marteilia refringens</i>	Never reported
<i>Perkinsus marinus</i>	Never reported
<i>Perkinsus olseni</i>	Last reported 2021
<i>Xenohalictis californiensis</i>	Never reported
Crustacean	
Acute hepatopancreatic necrosis disease	Never reported
<i>Aphanomyces astaci</i> (crayfish plague)	Never reported
Decapod iridescent virus 1	Never reported
<i>Hepatobacter penaei</i> (necrotising hepatopancreatitis)	Never reported
Infectious hypodermal and haematopoietic necrosis virus	Last reported 2020
Infectious myonecrosis virus	Never reported
<i>Macrobrachium rosenbergii</i> nodavirus (white tail disease)	Last reported 2008
Taura syndrome virus	Never reported
White spot syndrome virus	Last reported 2020
Yellow head virus genotype 1	Never reported
Amphibian	
<i>Batrachochytrium dendrobatidis</i>	Last reported 2021
<i>Batrachochytrium salamandrivorans</i>	Never reported
Ranavirus species	Last reported 2008

Notes: Aquatic animal diseases that were reportable to the OIE in 2021 are those listed in the 2021 OIE *Aquatic Animal Health Code*.

Table 3.2 Australia's status for other significant diseases of aquatic animals in 2021

Infection	Status
Finfish diseases	
<i>Aeromonas salmonicida</i> – atypical strains	2021
<i>Aeromonas salmonicida</i> subsp. <i>salmonicida</i> (furunculosis)	Never
Bacterial kidney disease (<i>Renibacterium salmoninarum</i>)	Never
<i>Edwardsiella ictaluri</i> (enteric septicaemia of catfish)	2014
Infectious spleen and kidney necrosis virus	2020 ^a
<i>Myxobolus cerebralis</i> (whirling disease)	Never
<i>Piscirickettsia salmonis</i> (Piscirickettsiosis)	Never
Scale drop disease virus	Never
Singapore grouper iridovirus (ranavirus)	Never
Turbot reddish body iridovirus	Never
Viral encephalopathy and retinopathy	2021
<i>Yersinia ruckeri</i> – Hagerman strain (enteric redmouth disease)	Never
Mollusc diseases	
<i>Marteilia sydneyi</i>	2021
<i>Marteilioides chungmuensis</i>	Never
<i>Mikrocytos mackini</i>	Never
Ostreid herpesvirus-1	2021
Crustacean diseases	
<i>Enterocytozoon hepatopenaei</i>	Never
Gill-associated virus	2020
Monodon slow growth syndrome	Never

a The detection was limited to a fish population at a hobbyist breeder home aquarium.

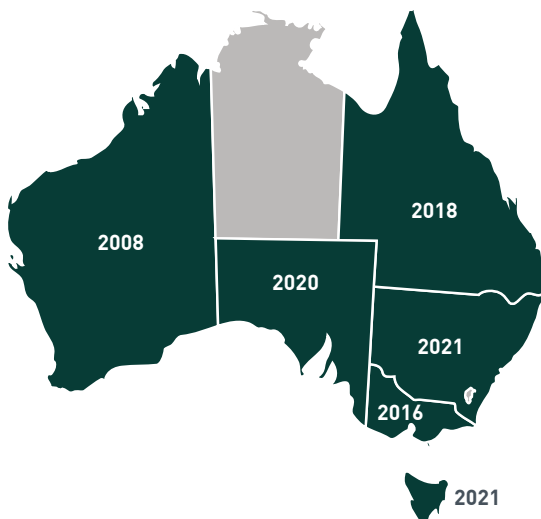
Abalone herpesvirus



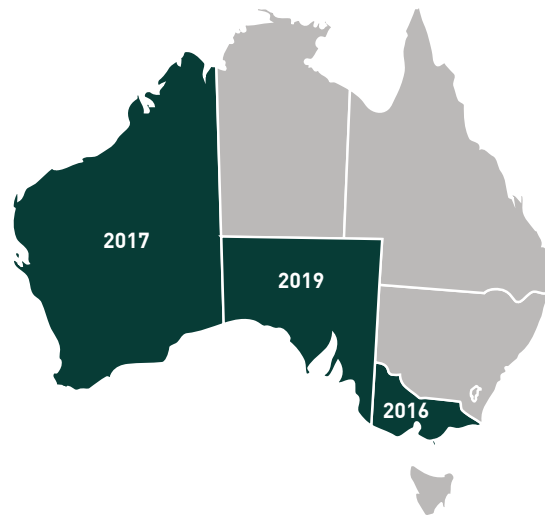
***Aphanomyces invadans*
(epizootic ulcerative syndrome)**



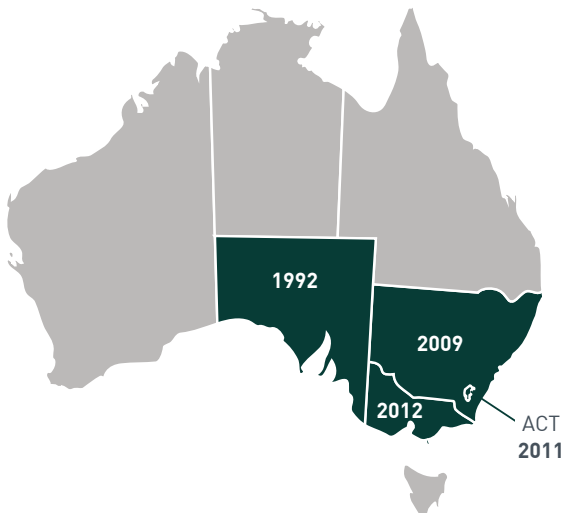
Batrachochytrium dendrobatidis



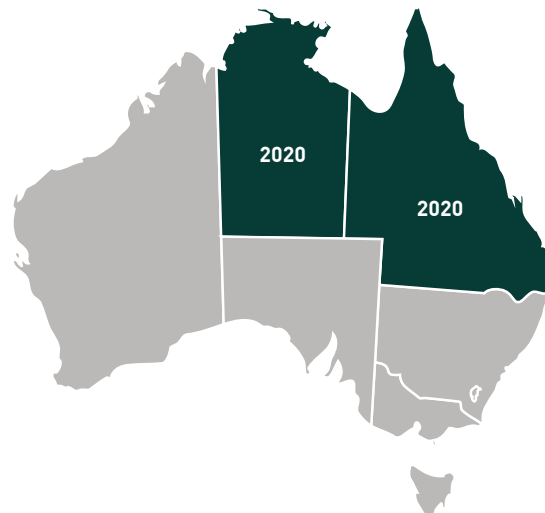
Bonamia exitiosa



**Epizootic
haematopoietic necrosis**



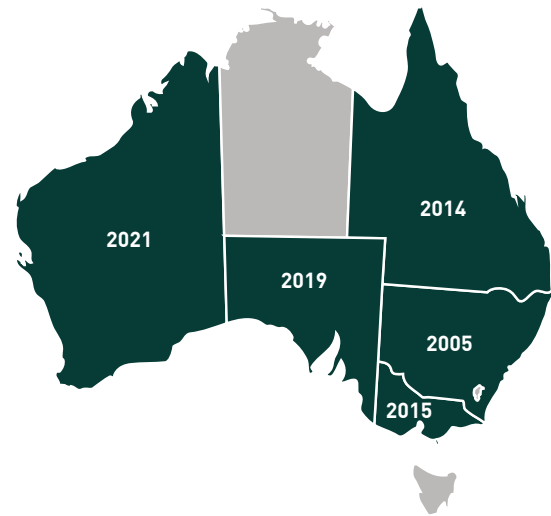
**Infectious hypodermal and
haematopoietic necrosis virus**



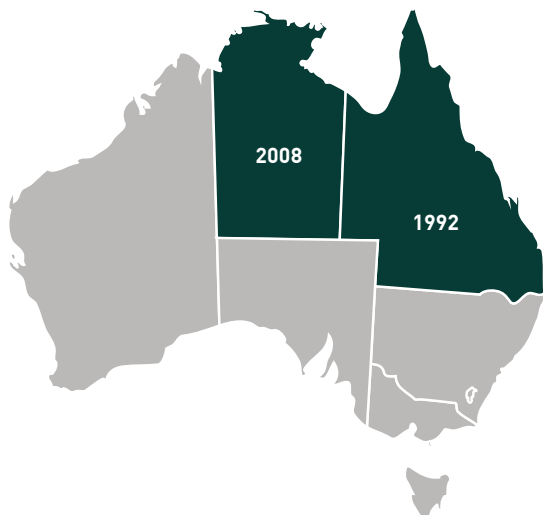
Macrobrachium rosenbergii nodavirus
(white tail disease)



Perkinsus olseni



Ranavirus species



White spot syndrome virus



- States and territories have reported the specific disease within their jurisdictional boundaries in the past but the disease has been eradicated (date of last occurrence indicated).
- States and territories have never reported the specific disease.

Figure 3.1 Distribution of OIE-listed aquatic animal diseases in Australia

3.2 National exotic disease exclusion testing for aquatic animal species in 2021

During 2021, national exotic disease exclusion testing for aquatic animal species was conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australian Centre for Disease Preparedness (ACDP) to detect or exclude nationally reportable diseases (Figures 3.2 to 3.4). Each investigation involved either a single aquatic animal or multiple aquatic animals.

3.3 Aquatic animal disease events in 2021

Abalone viral ganglioneuritis in Victoria

In May 2021, wild black lip abalone (*Haliotis rubra*) in Cape Nelson, Victoria tested positive to the virus causing abalone viral ganglioneuritis (AVG). A commercial diver observed significant abalone mortalities on a reef and collected several affected

abalone. The samples were sent to the state veterinary diagnostic laboratory, AgriBio, where the causative agent, haliotid herpesvirus-1 (HaHV-1), was detected. As the national reference animal health laboratory, the ACDP confirmed the presence of HaHV-1 in the abalone samples.

The last detection of AVG in wild abalone populations in Victoria was in 2010. The 2021 detection was made in samples collected from an area previously affected by AVG. The genome of the virus detected in this outbreak matched exactly with the viruses detected in Victoria during the 2005–2010 outbreak.

Victoria's Chief Veterinary Officer declared a control area from the middle of Bridgewater Bay to Narrawong Coastal Reserve under the *Livestock Disease Control Act 1994* (Vic) to assist in limiting the spread of disease via human activities. Prohibited activities included commercial and recreational fishing and diving from shore or boat and use of commercial fishing equipment (including hoop nets, bait traps, hauling nets and abalone levers). No abalone, rock lobsters, sea urchins and other aquatic invertebrates could be collected, whether live or dead. A Fisheries Notice designated a 500m aquaculture protection zone around an aquaculture

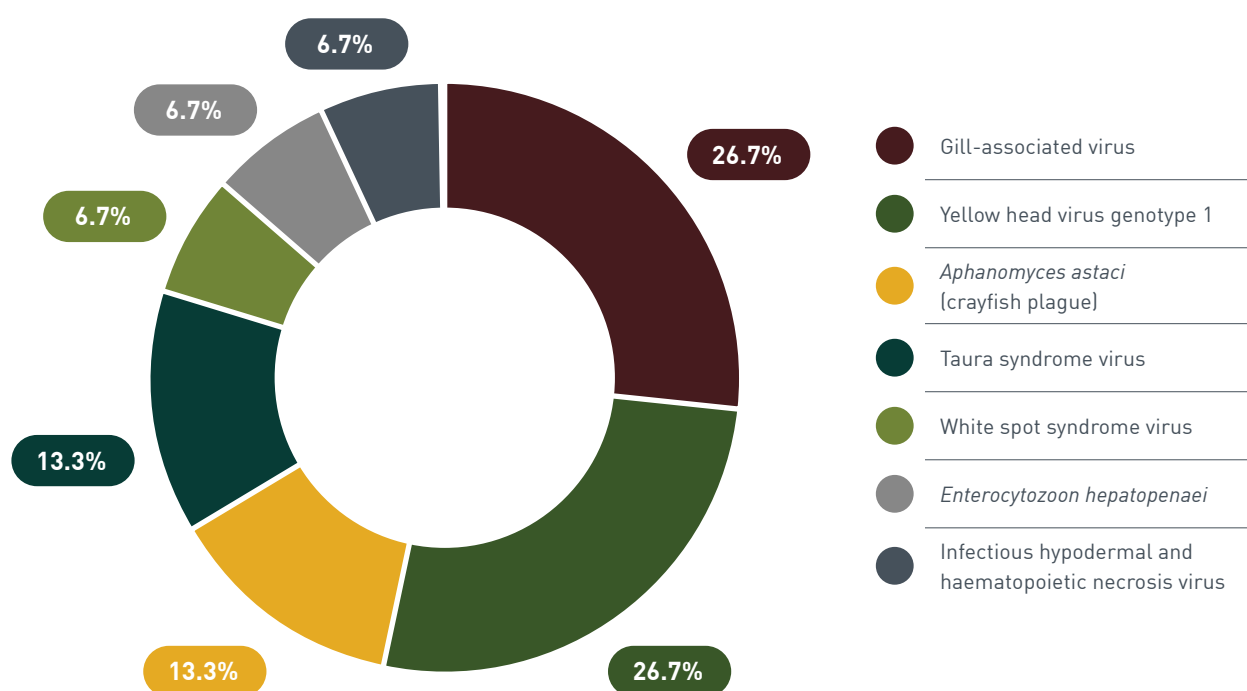


Figure 3.2 National reportable disease investigations of crustaceans in 2021

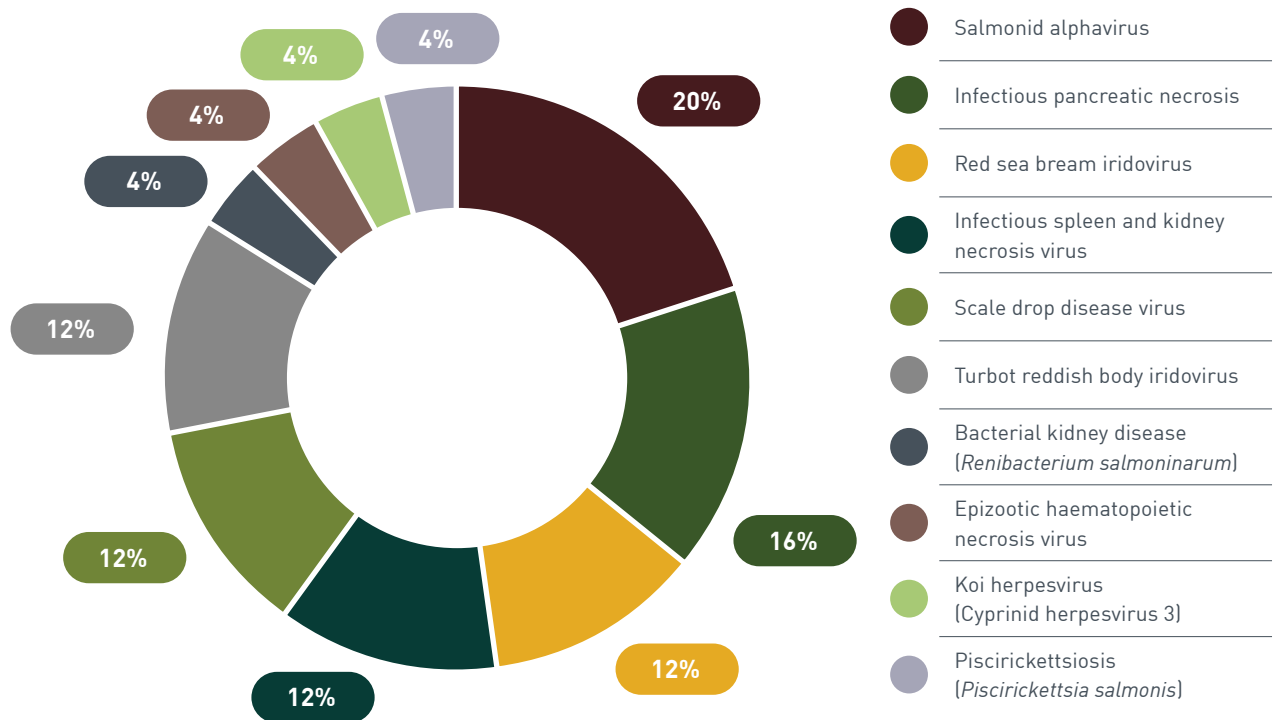


Figure 3.3 National reportable disease investigations of fish in 2021

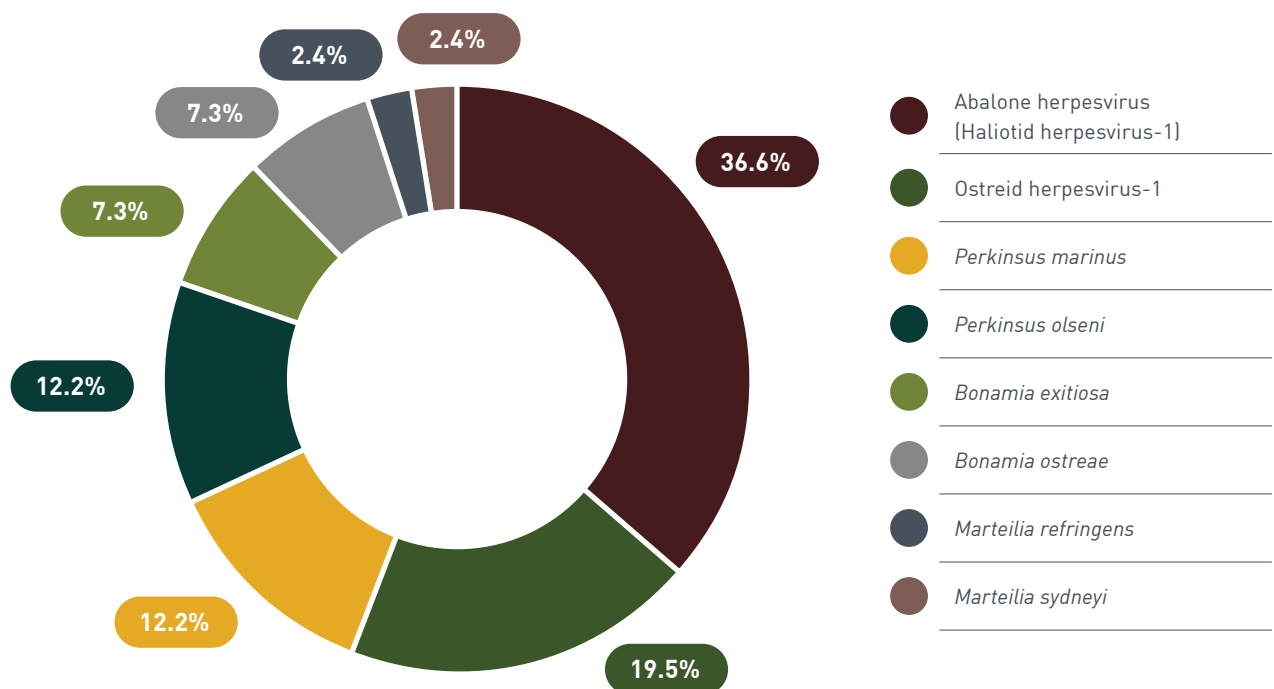


Figure 3.4 National reportable disease investigations of molluscs in 2021

farm, located near infected zones. Fishing, boating or diving was not permitted within this area. The Victorian Fisheries Authority (VFA) also placed a state-wide prohibition under a Fisheries Notice that banned the use of abalone as bait and the discarding of abalone contents into the marine environment.

Delimiting surveillance was activated that focused on reefs in proximity to the affected wild abalone populations to determine the extent of spread and informed further actions. Farming enterprises in the region were also subjected to heightened surveillance. Wild abalone samples were taken across 21 reefs and seven of these were declared infected with AVG as of 8 July 2021. A total of 101 sites were dived with 2887 abalone tested using detachment tests by divers. Of the 533 abalone samples that were sent for laboratory testing, 96 tested positive. All farmed abalone tested negative.

Based on the surveillance results, eradication of the virus in wild abalone was considered not achievable. Following a joint VFA/Agriculture Victoria project, AVG will be managed by the VFA and key abalone industries, with ongoing support from Agriculture Victoria. As part of the long-term AVG management policies, there are plans to encourage increased passive surveillance with industry and the community. Strong community engagement and education activities have been put in place to support this goal. Passive surveillance during this outbreak has been sensitive in detecting AVG, and reports of suspected AVG from fishers have correlated strongly with positive PCR tests.

In response to AVG detection in Victoria, New South Wales put in place movement restrictions into New South Wales of live wild caught abalone from all parts of western Victoria through the Biosecurity (abalone viral ganglioneuritis) Control Order 2021. The order was later extended to prevent the movement of live abalone into or within New South Wales, as well as the transport or sale of live abalone for commercial purposes within the state. New South Wales initiated visits to all live seafood holding facilities. Officers visited 286 premises across the state and found 30 premises that were infected. All of these premises were managed under the biosecurity control order. All live

holding facilities that tested positive for AVG were decontaminated and fallowed before restocking. Interstate trading of live abalone has resumed with a permit to allow movement of abalone sourced from farms in Tasmania and Victoria. The permit process involves a risk assessment, consultation with industry, the Abalone Health Accreditation Program (AHAP) membership and completion of the facility's summer audits (as part of the AHAP). AVG is not known to occur in wild abalone in New South Wales, and there are no abalone farms in the state.

Epidemiological investigations found that the spread of the disease from Victoria to live holding facilities in New South Wales was from infected stock that were not showing clinical signs when collected. This incident highlighted the need for better advice to the processing industry on biosecurity practices and equipment decontamination and disinfection. In response to this, national guidelines for decontamination of abalone transport equipment are being developed including a list of approved disinfectants that are effective for inactivating HaHV-1.

Throughout the May 2021 outbreak in Victoria and the detection in live holding facilities in New South Wales, the Aquatic Consultative Committee on Emergency Animal Disease provided national coordination for the response activities.

Frog mortality event

Since June 2021, more than 1600 reports of sick or dying frogs have been provided through the national citizen science project, FrogID.³⁴ The majority of reports are from New South Wales, followed by Queensland and some from eastern Victoria. Both native frogs and the invasive cane toad have been affected. Green tree frog was the most commonly reported species, followed by cane toads and Peron's tree frog. Typical clinical signs were skin discolouration (darker or lighter skin), lethargy, emaciation and excessive sloughed skin.

A small number of localised frog mortalities are common following a sudden drop of temperature during winter. However, this event affected a large

³⁴ www.frogid.net.au

number of animals across a large geographic area of eastern states. Due to the scale of this event and potential significance to Australia's endangered amphibian species, the Australian Registry of Wildlife Health, the Australian Museum, other museums, Wildlife Health Australia, universities, state government environment and biosecurity agencies, and the Department of Agriculture, Water and the Environment worked together to investigate the event and determine the likely cause.

The group contributed to newspaper articles, social media postings, newsletters and information sheets to inform members of the public, citizen scientists, veterinarians and other wildlife health professionals of the event and encourage appropriate reporting and collection of samples.

Due to COVID-19 lockdowns in New South Wales, Queensland and Victoria, the organisation of field sample collection, transportation and diagnosis was

delayed significantly. To date, all samples tested for ranavirus have been negative, and the amphibian chytrid fungus *Batrachochytrium dendrobatidis* has been detected in some affected frogs.

The amphibian chytrid fungus is known to occur in many species in Australia. Globally, the extinction of several amphibian species and the decline of many other populations has been attributed to chytrid fungus. It is a significant infectious disease of amphibians and as such, *B. dendrobatidis* is listed in the OIE *Aquatic Animal Health Code* and Australia's National List of Reportable Diseases of Aquatic Animals.

Some frogs investigated did not have any evidence of chytrid fungus and it is possible that the cause of this mortality event is multifactorial, potentially including ecological conditions, chytrid and another pathogen. Investigations remain ongoing.

Australia has a robust reporting system for aquatic animal diseases of national and international significance.



Image credit: Max de Kantzow

Appendix

4



Image credit: Shutterstock

Appendix A – Livestock and aquatic industries in Australia

Table A1 Sheep and cattle numbers by state, 2019–20

	Unit	Qld	NSW	Vic.	SA	WA	Tas.	NT	ACT	National
Sheep	'000 head	1973	20 372	15 152	10 190	13 650	2161	0	31	63 529
Beef cattle	'000 head	10 381	3603	2045	908	1923	480	1799	2	21 142
Dairy cattle	'000 head	118	254	1469	116	109	295	-	-	2361

Source: Australian Bureau of Statistics.

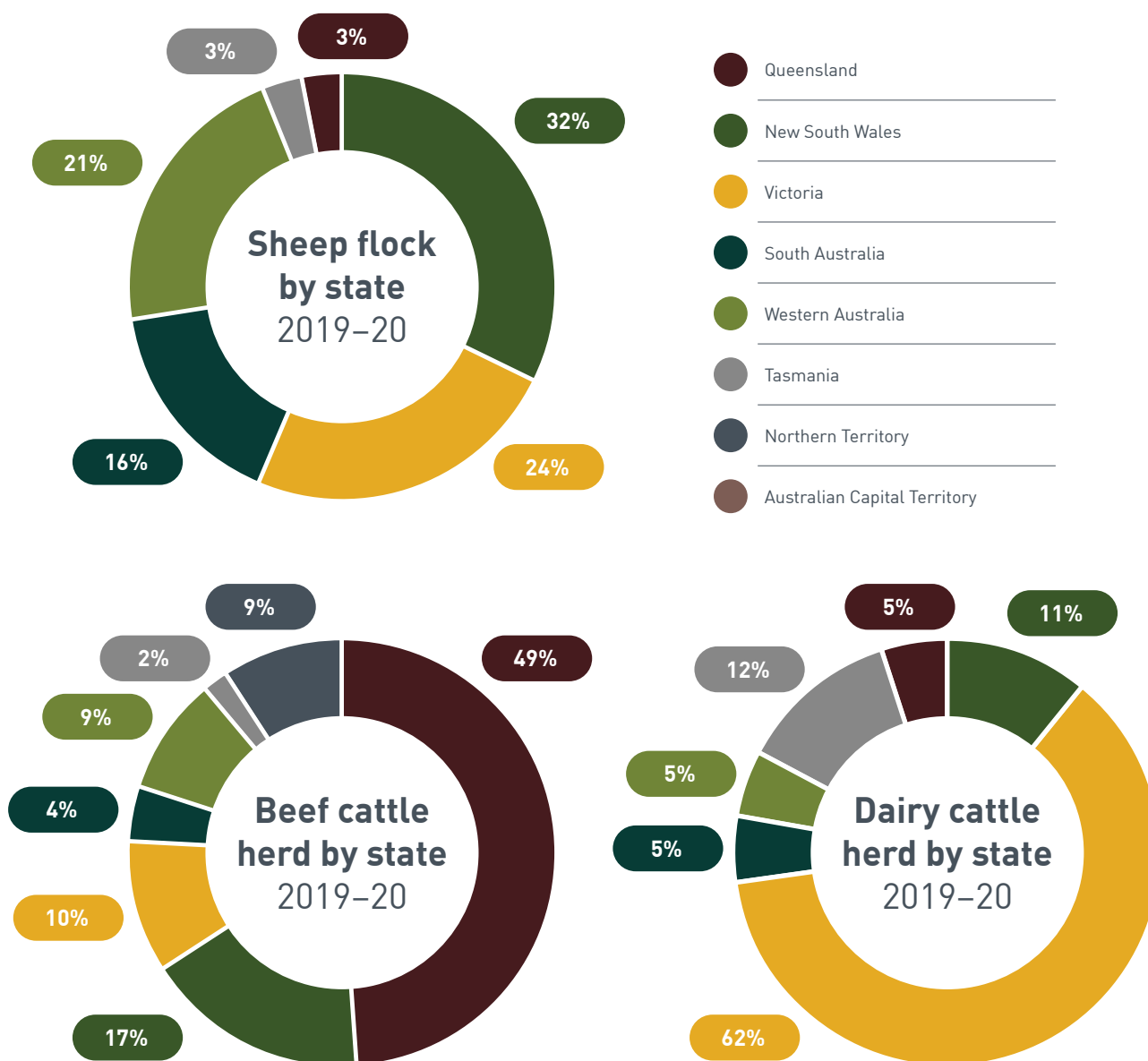


Figure A1 Sheep and cattle numbers by state, 2019–20

Table A2 Australian livestock statistics

	Unit	2018–19	2019–20	2020–21 ^a
Livestock numbers				
Sheep	'000 head	65 755	63 529	66 200
Beef cattle	'000 head	22 382	21 142	21 507
Dairy cattle	'000 head	2341	2361	2330
Total Cattle	'000 head	24 723	23 503	23 837
Pigs	'000 head	2319	2258	2389
Livestock slaughtering				
Sheep	'000 head	9730	8268	5403
Lamb	'000 head	22 087	20 272	20 747
Cattle and calves	'000 head	8704	8699	6621
Pigs	'000 head	5316	5167	5490
Chickens	million	653	658	675
Goats	'000 head	1456	1248	993
Meat produced^b				
Mutton	kt (cw)	230	208	142
Lamb	kt (cw)	501	482	515
Beef and veal	kt (cw)	2352	2372	1931
Pork	kt (cw)	414	403	432
Poultry	kt (cw)	1240	1247	1285
Goat meat	kt (cw)	20	19	17
Livestock products				
Wool ^c	kt (gr. eq.)	379	355	355
Milk ^d	ML	8793	8797	8858
Eggs	million dozen	355	366	376
Meat exports				
Mutton	kt (sw)	197	182	146
Lamb	kt (sw)	292	280	279
Beef and veal	kt (sw)	1222	1290	981
Pig meat	kt (sw)	33	29	32

Cont'd

	Unit	2018–19	2019–20	2020–21 ^a
Chicken meat	kt (sw)	41	43	32
Goat meat	kt (sw)	18	17	15
Kangaroo meat	kt (sw)	3	2	1
Camel meat	kt (sw)	1	2	0
Live animal exports				
Live sheep ^e	'000 head	925	1089	602
Live feeder/slaughter cattle ^f	'000 head	1129	1239	780
Live breeder cattle ^g	'000 head	139	139	125
Live goats	'000 head	19	16	14
Live camels	head	1811	352	696
Live buffalo	head	11 240	4285	0
Gross value of livestock production				
Sheep ^h	\$m	905	1044	724
Lamb ^h	\$m	3151	3636	3652
Cattle and calves ^{h,i}	\$m	11 184	12 693	12 778
Pigs ^j	\$m	1222	1519	1478
Poultry	\$m	2775	2827	2918
Goats	\$m	127	168	138
Cattle exported live ^k	\$m	1644	1878	1507
Sheep exported live ^e	\$m	121	157	93
Goats exported live	\$m	7	6	7
Wool ^c	\$m	4390	3065	2495
Milk ^k	\$m	4374	4829	4668
Eggs	\$m	833	881	911

a ABARES and ABS estimate.

b Includes carcase equivalent of canned meats.

c Includes shorn wool (includes crutching), dead and fellmongered wool, and wool exported on skins.

d Includes the whole milk equivalent of farm cream intake.

e includes breeding stock.

f includes buffalo.

g includes dairy cattle and buffalo.

h Excludes skin and hide values.

i Includes dairy cattle slaughtered.

j Includes all bovine for feeder/slaughter, breeding and dairy purposes.

k Milk intake by factories and valued at the farm gate.

Source: Australian Bureau of Statistics.

Table A3 Australian fisheries production

	Unit	2017–18	2018–19	2019–20
Volume of fisheries production				
Tuna	kt	12	12	12
Salmonids ^a	kt	61	58	67
Other fish	kt	121	116	125
Prawns	kt	23	25	24
Rock lobster	kt	11	10	8
Crab	kt	5	4	4
Other crustaceans	kt	1	1	1
Abalone	kt	4	3	3
Scallop	kt	8	7	7
Oyster	kt	9	9	9
Squid	kt	3	2	1
Other molluscs	kt	6	7	6
Other nei*	kt	3	16	13
Total	kt	266	269	281
Value of fisheries production				
Tuna	\$m	160	161	178
Salmonids ^a	\$m	855	839	904
Other fish	\$m	539	568	638
Prawns	\$m	361	374	368
Production not included elsewhere ^b	\$m	713	701	522
Crab	\$m	60	57	50
Other crustaceans	\$m	28	27	26
Abalone	\$m	195	170	140
Scallop	\$m	25	16	18
Oyster	\$m	102	111	114
Squid	\$m	16	14	13
Other molluscs	\$m	85	134	124
Other nei*	\$m	38	37	52
Total	\$m	3178	3210	3147

Cont'd

	Unit	2017-18	2018-19	2019-20
Exports of fisheries production				
Seafood products - volume ^c	kt	51	46	56
Seafood products - value ^c	\$m	1495	1444	1331
Other marine products - value	\$m	81	85	80

a Includes salmon and trout production.

b Includes aquaculture production not elsewhere specified because of confidentiality restrictions. In Victoria, this includes warmwater finfish, ornamental fish, other shellfish, shrimps and aquatic worms.

c Excludes live tonnage but includes live value.

Sources: ABARES; Australian Fisheries Management Authority; Australian Bureau of Statistics; Department of Fisheries, Western Australia; Department of Primary Industries, New South Wales; Department of Primary Industries, Parks, Water and Environment, Tasmania; Fisheries Queensland, Department of Agriculture, Fisheries and Forestry; Fisheries Victoria, Department of Environment and Primary Industries; Northern Territory Department of Primary Industry and Fisheries; Primary Industries and Regions, South Australia; South Australian Research and Development Institute.

Table A4 Australian aquaculture production^a

	Unit	2017-18	2018-19	2019-20
Volume				
Fish				
Salmonids ^b	kt	61	57	66
Tuna	kt	8	8	8
Silver perch	kt	0	0	0
Barramundi	kt	6	3	3
Other ^c	kt	3	5	5
Total	kt	79	74	83
Crustaceans				
Prawns	t	4205	4794	6740
Yabby	t	51	28	14
Marron	t	66	63	57
Redclaw	t	49	45	62
Total	t	4371	4933	6876
Molluscs				
Edible oyster	kt	9	9	9
Pearl oyster	kt	-	-	-
Abalone	kt	1	1	1
Blue mussel	kt	4	3	2
Total	kt	14	14	13
Production not included elsewhere ^d	kt	1	3	3
Total (all categories)	kt	98	96	106
Value				
Fish				
Salmonids ^b	\$m	855	827	890
Tuna	\$m	126	129	137
Silver perch	\$m	4	3	2
Barramundi	\$m	54	66	91
Other ^c	\$m	48	67	71
Total	\$m	1087	1092	1192

Cont'd

	Unit	2017-18	2018-19	2019-20
Crustaceans				
Prawns	t	81	84	134
Yabby	t	1	1	1
Marron	t	3	2	2
Redclaw	t	1	1	2
Total	t	86	88	139
Molluscs				
Edible oyster	kt	102	111	114
Pearl oyster	kt	53	72	71
Abalone	kt	44	21	22
Blue mussel	kt	12	7	6
Total	kt	209	239	234
Production not included elsewhere ^d	kt	35	31	33
Total (all categories)	kt	1417	1450	1598

a Excludes hatchery production, crocodiles, microalgae and aquarium worms.

b Includes salmon and trout production.

c Includes eel, other native fish and aquarium fish.

d Includes aquaculture production not elsewhere specified because of confidentiality restrictions. In Victoria, this includes warmwater finfish, ornamental fish, other shellfish, shrimps and aquatic worms.

Sources: ABARES; Australian Fisheries Management Authority; Department of Fisheries, Western Australia; Department of Primary Industries, New South Wales; Department of Primary Industries, Parks, Water and Environment, Tasmania; Fisheries Queensland, Department of Agriculture, Fisheries and Forestry; Fisheries Victoria, Department of Environment and Primary Industries; Northern Territory Department of Primary Industry and Fisheries; Primary Industries and Regions, South Australia; South Australian Research and Development Institute.

Acronyms and Abbreviations

AADIS	Australian Animal Disease Spread
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ABLV	Australian bat lyssavirus
ABSF	Australian Beef Sustainability Framework
ACDP	Australian Centre for Disease Preparedness
ACT	Australian Capital Territory
AHA	Animal Health Australia
AHAP	Abalone Health Accreditation Program
AHC	Animal Health Committee
AHPB	Animal Health Policy Branch
AI	avian influenza
AIV	avian influenza virus
AMR	antimicrobial resistance
AOAV	avian orthoavulavirus
ASEL	<i>Australian Standards for the Export of Livestock</i>
ASF	African swine fever
AVA	Australian Veterinary Association
AVG	abalone viral ganglioneuritis
AWAC	Animal Welfare Advisory Committee
BHV	Bovine herpesvirus
BSE	bovine spongiform encephalopathy
BTV	bluetongue virus
BVDV	Bovine viral diarrhoea virus
CCA	Cattle Council of Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation

EHV	Equid herpesvirus
ELISA	enzyme-linked immunosorbent assay
FMD	foot and mouth disease
FTA	free trade agreement
GRSB	Global Roundtable for Sustainable Beef
HaHV	haliotid herpesvirus
HeV	Hendra virus
JE	Japanese encephalitis
JEV	Japanese encephalitis virus
NABS	Northern Australia Biosecurity Surveillance
NABSnet	Northern Australia Biosecurity Surveillance Network
NAIWB	National Avian Influenza Wild Bird
NAMP	National Arbovirus Monitoring Program
NAQS	Northern Australia Quarantine Strategy
NBRT	National Biosecurity Response Team
ND	Newcastle disease
NPA	Northern Peninsula Area
NSDI	National Significant Disease Investigation
NSHMP	National Sheep Health Monitoring Project
NSW	New South Wales
NTSEP	National Transmissible Spongiform Encephalopathies Surveillance Project
OCVO	Office of the Chief Veterinary Officer
OIE	World Organisation for Animal Health
PCR	polymerase chain reaction
PPMV	pigeon paramyxovirus
SA	South Australia
SWFSPP	Screw-Worm Fly Surveillance and Preparedness Program
TSE	transmissible spongiform encephalopathy
TSEFAP	Transmissible Spongiform Encephalopathies Freedom Assurance Project
VFA	Victorian Fisheries Authority
WNV	West Nile virus
WHA	Wildlife Health Australia

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