Algal bloom wildlife post-mortem report

Government of South Australia
Department for Environment and Water

Species – Western Grey Kangaroos

Date collected – 24 and 26 March 2025

Location – Tunkalilla Beach

History relating to the animals

Approximately 70 western grey kangaroos (*Macropus fuliginosus*) were affected on a private property at Tunkalilla Beach from a mob of approximately 200 animals. Seven animals in total were necropsied (post-mortem examination of the whole body) across two days, 24 March 2025 (5 animals) and 26 March 2025 (2 animals).

Clinical examination

Affected animals were all close to the beach. Initial reports from National Parks and Wildlife Services reported Phalaris toxicity as being common in kangaroos in this area. There were more females and joeys affected than males. However, there were also more females and joeys present in the mob than males.

Clinical signs of the affected kangaroos included ataxia (wobbliness), progressing through to recumbency (laying down) with paresis (weakness and not full range of movement) of the forelimbs (arms) and complete paralysis (unable to move) of the hindlimbs (legs). The animals were in lean body condition, appeared distressed and were licking forearms. On 24 March 2025, approximately 15 animals were euthanised on welfare grounds (the recumbent animals) and 5 were necropsied at the site.

Further investigation on 26 March 2025 found a further 30 recumbent animals that were unable to stand, which were euthanised on welfare grounds. Two animals were anaesthetised, had blood collected and then were euthanised, with the whole bodies brought back to the laboratory for investigation.

It was confirmed that there was some dried Phalaris grass present in the area but very little new shooting grass and this did not show any indication of being heavily grazed.

Water samples were collected for analysis from the creek, lagoon and ocean at this site. There were dead fish on the beach. People in the area were experiencing symptoms consistent with the irritant effects of *Karenia* spp.

Necropsy

The necropsy (looking at the whole body) of the five animals euthanised on the 24 March 2025, conducted at the site, showed that the animals were in lean body condition with parasites present in the stomach. Blood and tissue samples including brain were collected.

The necropsies of the two animals euthanised on the 26 March 2025, conducted at the laboratory, showed the animals were in good body condition with low numbers of parasites

Algal bloom wildlife post-mortem report

present in the stomach. Plant material was present in the stomachs of both animals, but the type of plant could not be determined. Stomach worms (nematodes) were found in both animals. These worms were normal findings in wild kangaroos. In one of the kangaroos (kangaroo 1) there was a small volume of fluid (approximately 100 ml) in the abdominal cavity. In the other kangaroo (kangaroo 2), the lungs were mottled red. Tissues were collected to test for botulism and for histopathology (looking at tissues under the microscope for more detailed information). Testing for brevetoxins and other algal biotoxins, a possibility due to the algal bloom, was requested.

Histopathology

Histopathological findings from the 5 kangaroos euthanised on 24 March 2025 revealed no abnormalities in any of the tissue examined. There were a limited number of tissues collected and for this reason disease processes/diseases could not be excluded.

Histopathological findings for the kangaroos euthanised on 26 March 2025 were as follows:

There was hyperaemia in the lungs (increased red colouring due to increased blood flow) and oedema (accumulation of fluid between cells). There were stomach worms. In the kidney there was very mild chronic (long-term) inflammation.

Each section of the spinal cord was examined and moderate numbers of nerve cells had dark brown-black granules in the perikaryon (the cell body). This microscopic finding was consistent with Phalaris toxicity. In the brain, similar black granules were found in nerve cell bodies (sites included midbrain and medulla). There were no other remarkable microscopic (histological) findings.

In addition, in kangaroo 1, the muscle cells showed atrophy (decrease in cell size) and degeneration with very mild inflammation.

Blood results

For the animals euthanised on 24 March 2025, the blood samples collected after euthanasia were haemolysed (red blood cells ruptured), meaning the white and red blood cell counts could not be completed.

On 26 March 2025, the two anaesthetised kangaroos had bloods collected prior to euthanasia. The blood count and parameters appeared normal, but the biochemistry showed elevated creatinine kinase (CK – a muscle enzyme) and aspartate aminotransferase (AST – an enzyme found in the muscle but also the liver and heart and some other tissues). This indicated some muscle damage in the kangaroos, likely due to recumbency (laying down).

Botulinum toxins

The bacteria *Clostridium botulinum* produces toxins (botulinum toxins B and C) that, if ingested, can cause botulism. The stomach contents of the two kangaroos examined on

Algal bloom wildlife post-mortem report

26 March 2025 were tested for botulism using a polymerase chain reaction test (PCR – molecular biology test) that detects the nucleic acid (genes) found in *Cl. botulinum* that produces these toxins. The tests were negative, which does not rule out botulism, as these toxins are often hard to detect.

Algology; Algal counts in water samples

- Creek: *Karenia mikimotoi* 20,460 cells/L (not consistent with death in marine life)
- Lagoon: no toxic species present
- Ocean: *Karenia mikimotoi* 608,000 cells/L (consistent with death in marine life)

Microalgae biotoxin (including brevetoxin) testing

Brevetoxins

Kangaroo 1 - Brevetoxin 3 was found in heart (0.03 mg/kg), kidney (0.01 mg/kg), spleen (0.01 mg/kg) and liver (0.03 mg/kg) samples.

Kangaroo 2 - Brevetoxin 3 was found in the liver at 0.04 mg/kg.

Other algal biotoxins

Kangaroo 1 - Results were below reporting limits.

Kangaroo 2 - Paralytic shellfish toxin (PST, dcGTX4) was found in liver (0.07 mg/kg) and brain (0.05 mg/kg) sample.

Summary

Large numbers (approximately 70 out of 200) of western grey kangaroos were found with difficulty standing at Tunkalilla Beach. The sick kangaroos were all found close to the beach, which was affected by the algal bloom at the time. This was confirmed by detections of *Karenia spp*. in the ocean and adjacent creek.

Several kangaroos were euthanised on welfare grounds, and 7 underwent further examination (necropsy and histopathology). Findings in 5 of the kangaroos were inconclusive, and findings in the other 2 kangaroos were consistent with Phalaris toxicity, which is considered to be the most likely cause of the symptoms. Phalaris toxicity is a well-known disease that affects livestock and wild animals (including kangaroos) and is caused by eating a type of pasture grass (*Phalaris aquatica*) that contains neurotoxins. The risk of Phalaris toxicity is highest with new grass growth, but it can occur at any time of year. Phalaris grass grows throughout South Australia.

Brevetoxin was detected in both kangaroos tested and another algal biotoxin (PST) was also detected in one of the kangaroos. The low levels of brevetoxin and PST detected in this case are considered unlikely to have materially impacted on the health of the kangaroos.

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id:
Owner:

Lab No. - Test: [redacted]
Submitter:

PIC:
Species: Kangaroo or Wallaby
Age:

Submitter Id: [redacted]
Clinic Phone:
Submitted: 25/03/2025

Test: NEC - NECROPSY
Reported: 29/03/2025 15:56

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

MACROSCOPY
K1
A-E: Liver, kidney, heart, stomach, brain (cerebrum, thalamus, hippocampus, basal ganglia), spleen

K2
F-H: Brain (cerebrum, thalamus, hippocampus), liver, stomach

K3
I-K brain (cerebrum, thalamus, hippocampus, basal ganglia), liver, kidney

K4
L-N brain (cerebrum, thalamus, hippocampus, basal ganglia and medulla) liver, heart, stomach

MICROSCOPY
K1
The liver, kidney, heart, stomach, and brain appear normal.

K2
The brain, liver, and stomach appear normal.

K3
The brain, liver, and kidney appear normal.

K4
The brain liver, heart, and stomach appear normal.

DIAGNOSIS
K1-4
All the tissues appear histologically normal

COMMENTS
There are no histological findings to explain morbidity for these kangaroos.

Toxicity from the dinoflagellate Karenia mikitomoi blooms is a possible cause for their morbidity.

Water samples (both fresh and seawater) from the affected site have been sent to SASQAP for algal count testing. Karenia mikimotoi blooms have been reported to cause morbidity in a range of animal but predominantly marine animals. The causative toxin is not known.

Li X, Yan T, Yu R, Zhou M. A review of Karenia mikimotoi: Bloom events, physiology, toxicity and toxic mechanism. Harmful Algae. 2019 Dec 1;90:101702.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: NEC - NECROPSY Reported: 29/03/2025 15:56

Validated by [redacted].

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K2
F-H: Brain (cerebrum, thalamus, hippocampus), liver, stomach

K3
I-K brain (cerebrum, thalamus, hippocampus, basal ganglia), liver, kidney

[redacted]

K4
L-N brain (cerebrum, thalamus, hippocampus, basal ganglia and medulla)
liver, heart, stomach

MICROSCOPY
K1
The liver, kidney, heart, stomach, and brain appear normal.

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The brain, liver, and stomach appear normal.

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Validated by [redacted].

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Validated by [redacted].

[redacted]

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id:
Owner:

Lab No. - Test: [redacted]
Submitter:

PIC:
Species: Kangaroo or Wallaby
Age:

Submitter Id: [redacted]
Clinic Phone:
Submitted: 25/03/2025

Test: VBM - VETERINARY BIOCHEM MASTER Reported: 25/03/2025 17:27

GENERAL BIOCHEMISTRY			SPECIMEN : SERUM		
Sodium	137	mmol/L	Protein	64	g/L
Potassium	16.5	mmol/L	Albumin	41	g/L
Na/K	8.3				
Chloride	86	mmol/L	Globulin	23	g/L
Bicarb.	53	mmol/L	T. Bil.	< 1	umol/L
Anion Gap	14	mmol/L	Alk Phos	306	U/L
Urea	17.5	mmol/L	ALT	243	U/L
			GGT	17	U/L
Creat.	216	umol/L	AST	750	U/L
Calcium	2.29	mmol/L			
Phosphate	3.44	mmol/L	CK	27310	U/L
Magnesium	1.0	mmol/L	Chol.	1.9	mmol/L

SERUM INDICES (Clear/+/++/+++/++++)

Icterus index	Clear
Lipaemia index	Clear
Haemolysis index	++++

The sample is severely haemolysed and biochemistry results may be significantly affected.

INTERIM REPORT- Further results and pathologist interpretation to follow.

This request has other tests in progress at the time of reporting

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PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id:
Owner:

Lab No. - Test: [redacted]
Submitter:

PIC:
Species: Kangaroo or Wallaby
Age:

Submitter Id: [redacted]
Clinic Phone:
Submitted: 25/03/2025

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 26/03/2025 08:21

STANDARD PROFILE ZOO **SPECIMEN : BLOOD**

Date: **24/03/25**
Coll. Time: NS
Lab Number: [redacted]

HAEMATOLOGY

GENERAL BIOCHEMISTRY **SPECIMEN : SERUM**

Alk.Phosph.	1638	U/L
Inorg.Phosph.	4.18	mmol/L
Calcium	2.61	mmol/L
Magnesium	1.2	mmol/L
Total Bili.	< 1	umol/L
ALT	167	U/L
AST (SGOT)	578	U/L
GGT	18	U/L
CK	34554	U/L
Total Protein	70	g/L
Albumin	35	g/L
Globulins	35	g/L
Sodium	139	mmol/L
Potassium	17.3	mmol/L
Chloride	98	mmol/L
Bicarbonate	43	mmol/L
Anion Gap	15	mmol/L
Urea	19.7	mmol/L
Creatinine	158	umol/L
Cholesterol	1.7	mmol/L
Glucose	1	mmol/L

SERUM INDICES (Clear/+/++/+++/++++)

Icterus index	Clear
Lipaemia index	Clear
Haemolysis index	+

Laboratory note: Glucose will decrease over time in non-preserved samples and may result in false low values

Validated by [redacted], Veterinary Pathology Resident.

[redacted]

All tests on this request have now been completed

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 26/03/2025 08:21

Validated by [redacted], Veterinary Pathology Resident.

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ALT	167	U/L
AST (SGOT)	578	U/L
GGT	18	U/L
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Urea	19.7	mmol/L
Creatinine	158	umol/L
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Glucose	1	mmol/L

SERUM INDICES (Clear/+/++/+++/++++)

Icterus index	Clear
Lipaemia index	Clear
Haemolysis index	+

Laboratory note: Glucose will decrease over time in non-preserved samples and may result in false low values

Validated by [redacted], Veterinary Pathology Resident.

All tests on this request have now been completed

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 26/03/2025 08:21

Validated by [redacted], Veterinary Pathology Resident.

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id:
Owner:

Lab No. - Test: [redacted]
Submitter:

PIC:
Species: Kangaroo or Wallaby
Age:

Submitter Id: [redacted]
Clinic Phone:
Submitted: 25/03/2025

Test: VFA - VET. FAECES STUDIES Reported: 27/03/2025 12:14

FAECAL ENDOPARASITES

MICROSCOPY

Leucocytes not detected. Erythrocytes detected.
Giardia Antigen Test: NEGATIVE

Cryptosporidium Antigen Test: NEGATIVE

Modified ZN stain for Cryptosporidium: NEGATIVE

Strongyle eggs seen in floatation.

_____Final Report_____
27/03/25
Validated by [redacted], Laboratory Scientist.

This request has other tests in progress at the time of reporting

Test: VFA - VET. FAECES STUDIES Reported: 27/03/2025 12:14

_____Final Report_____
27/03/25
Validated by [redacted], Laboratory Scientist.

Test: VFA - VET. FAECES STUDIES Reported: 27/03/2025 12:14

FAECAL ENDOPARASITES

MICROSCOPY

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Giardia Antigen Test: NEGATIVE

Cryptosporidium Antigen Test: NEGATIVE

Modified ZN stain for Cryptosporidium: NEGATIVE

Strongyle eggs seen in floatation.

[redacted]

_____Final Report_____
27/03/25
Validated by [redacted], Laboratory Scientist.

This request has other tests in progress at the time of reporting

Test: VFA - VET. FAECES STUDIES Reported: 27/03/2025 12:14

_____Final Report_____
27/03/25
Validated by [redacted], Laboratory Scientist.

Test: VFA - VET. FAECES STUDIES Reported: 26/03/2025 13:20

FAECAL ENDOPARASITES

MICROSCOPY
Leucocytes not detected. Erythrocytes detected.
Giardia Antigen Test: NEGATIVE

Cryptosporidium Antigen Test: NEGATIVE

Modified ZN stain for Cryptosporidium: to follow

Strongyle eggs seen in floatation.

Validated by [redacted], Laboratory Scientist.

This request has other tests in progress at the time of reporting

Test: VFA - VET. FAECES STUDIES Reported: 26/03/2025 13:20

FAECAL ENDOPARASITES

MICROSCOPY
Leucocytes not detected. Erythrocytes detected.
Giardia Antigen Test: NEGATIVE

Cryptosporidium Antigen Test: NEGATIVE

Modified ZN stain for Cryptosporidium: to follow

Strongyle eggs seen in floatation.

Validated by [redacted], Laboratory Scientist.

This request has other tests in progress at the time of reporting

Test: VFA - VET. FAECES STUDIES Reported: 26/03/2025 13:20

Validated by [redacted], Laboratory Scientist.

Test: VFA - VET. FAECES STUDIES Reported: 26/03/2025 13:20

Validated by [redacted], Laboratory Scientist.

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id: KANGAROO MORTALITY

Lab No. - Test: [redacted]

Owner:

Submitter:

PIC:

Submitter Id: [redacted]

Species: Kangaroo or Wallaby

Clinic Phone:

Age:

Submitted: 26/03/2025

Test: GP - GROSS PATHOLOGY

Reported: 29/03/2025 18:08

NECROPSY REPORT

FINAL REPORT

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].
SAMPLES SUBMITTED
Two adult female eastern grey kangaroos (Macropus giganteus)

NECROPSY FINDINGS
The animals are allocated numbers 1 and 2 at the laboratory. The descriptions refer to both animals except where noted.

There animals are in good body condition. There are minimal post mortem autolytic changes. There are low numbers of strongyle-like nematodes (10 to 35mm long, pale white) in the stomach. The stomach contains abundant moist green ingesta. No particular leaf type can be determined.

Kangaroo 1
The animal weighs 24.3kg. There is 100ml of translucent red tinged fluid in the abdomen. The total protein of the fluid is 20g/L.

Kangaroo 2
The animal weighs 33kg. The lungs are widespread mottled red.

The spinal cords will be removed from each animal tomorrow.

GROSS SUMMARY
Kangaroo 1
Mild ascites
Gastric nematodiasis

Kangaroo 2
Gastric nematodiasis

SAMPLES COLLECTED & TESTING
Formalin fixed tissues are being processed for histopathology.

Freshwater (labelled creek) will be sent for blue-green algae testing.

We are in the progress of identifying the laboratory in South Australia which can test algal counts and identify algal species in Seawater (for the samples labelled ocean and lagoon).

As requested liver, kidney, spleen, heart, lung, brain, stomach contents and faeces are stored in case additional testing is required.

COMMENTS
There are no remarkable gross findings to explain the weakness and recumbency for the kangaroos. The mottled red pattern in the lungs of kangaroo 2 may be mild vascular hyperaemia / congestion, which may be agonal processes. The spinal cords will be removed tomorrow and a further report will be issued.

We will prioritized algal testing of the water and complete histopathology. Haematology and biochemistry are also underway.

NECROPSY FINDINGS 29/3/2025
The vertebral canals and spinal cords from both animals appear grossly normal.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: GP - GROSS PATHOLOGY Reported: 29/03/2025 18:08

Validated by [redacted].

Test: GP - GROSS PATHOLOGY Reported: 29/03/2025 18:08

NECROPSY REPORT

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heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].
SAMPLES SUBMITTED
Two adult female eastern grey kangaroos (Macropus giganteus)

NECROPSY FINDINGS
The animals are allocated numbers 1 and 2 at the laboratory. The descriptions refer to both animals except where noted.

There animals are in good body condition. There are minimal post mortem autolytic changes. There are low numbers of strongyle-like nematodes (10 to 35mm long, pale white) in the stomach. The stomach contains abundant moist green ingesta. No particular leaf type can be determined.

Kangaroo 1
The animal weighs 24.3kg. There is 100ml of translucent red tinged fluid in the abdomen. The total protein of the fluid is 20g/L.

Kangaroo 2
The animal weighs 33kg. The lungs are widespread mottled red.

The spinal cords will be removed from each animal tomorrow.

GROSS SUMMARY
Kangaroo 1
Mild ascites
Gastric nematodiasis

Kangaroo 2
Gastric nematodiasis

SAMPLES COLLECTED & TESTING
Formalin fixed tissues are being processed for histopathology.

Freshwater (labelled creek) will be sent for blue-green algae testing.

We are in the progress of identifying the laboratory in South Australia which can test algal counts and identify algal species in Seawater (for the samples labelled ocean and lagoon).

As requested liver, kidney, spleen, heart, lung, brain, stomach contents and faeces are stored in case additional testing is required.

COMMENTS
There are no remarkable gross findings to explain the weakness and recumbency for the kangaroos. The mottled red pattern in the lungs of kangaroo 2 may be mild vascular hyperaemia / congestion, which may be agonal processes. The spinal cords will be removed tomorrow and a further report will be issued.

We will prioritized algal testing of the water and complete histopathology. Haematology and biochemistry are also underway.

NECROPSY FINDINGS 29/3/2025
The vertebral canals and spinal cords from both animals appear grossly normal.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: GP - GROSS PATHOLOGY Reported: 29/03/2025 18:08

Validated by [redacted].

Test: GP - GROSS PATHOLOGY Reported: 27/03/2025 13:34

NECROPSY REPORT

Interim report
CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].
SAMPLES SUBMITTED
Two adult female eastern grey kangaroos (Macropus giganteus)

NECROPSY FINDINGS
The animals are allocated numbers 1 and 2 at the laboratory. The descriptions refer to both animals except where noted.

There animals are in good body condition. There are minimal post mortem autolytic changes. There are low numbers of strongyle-like nematodes (10 to 35mm long, pale white) in the stomach. The stomach contains abundant moist green ingesta. No particular leaf type can be determined.

Kangaroo 1
The animal weighs 24.3kg. There is 100ml of translucent red tinged fluid in the abdomen. The total protein of the fluid is 20g/L.

Kangaroo 2
The animal weighs 33kg.

The spinal cords will be removed from each animal tomorrow.

GROSS SUMMARY
Kangaroo 1
Mild ascites
Gastric nematodiasis

Kangaroo 2
Gastric nematodiasis

SAMPLES COLLECTED & TESTING
Formalin fixed tissues are being processed for histopathology.

Freshwater (labelled creek) will be sent for blue-green algae testing.

We are in the progress of identifying the laboratory in South Australia which can test algal counts and identify algal species in Seawater (for the samples labelled ocean and lagoon).

As requested liver, kidney, spleen, heart, lung, brain, stomach contents and faeces are stored in case additional testing is required.

COMMENTS
There are no remarkable gross findings to explain the weakness and recumbency for the kangaroos. The spinal cords will be removed tomorrow and a further report will be issued.

We will prioritized algal testing of the water and complete histopathology. Haematology and biochemistry are also underway.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: GP - GROSS PATHOLOGY Reported: 27/03/2025 13:34

Validated by [redacted].

Test: GP - GROSS PATHOLOGY Reported: 27/03/2025 13:34

NECROPSY REPORT

Interim report
CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].
SAMPLES SUBMITTED
Two adult female eastern grey kangaroos (Macropus giganteus)

NECROPSY FINDINGS
The animals are allocated numbers 1 and 2 at the laboratory. The descriptions refer to both animals except where noted.

There animals are in good body condition. There are minimal post mortem autolytic changes. There are low numbers of strongyle-like nematodes (10 to 35mm long, pale white) in the stomach. The stomach contains abundant

moist green ingesta. No particular leaf type can be determined.

Kangaroo 1
The animal weighs 24.3kg. There is 100ml of translucent red tinged fluid in the abdomen. The total protein of the fluid is 20g/L.

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The animal weighs 33kg.

The spinal cords will be removed from each animal tomorrow.

GROSS SUMMARY
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Gastric nematodiasis

Kangaroo 2
Gastric nematodiasis

SAMPLES COLLECTED & TESTING
Formalin fixed tissues are being processed for histopathology.

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As requested liver, kidney, spleen, heart, lung, brain, stomach contents and faeces are stored in case additional testing is required.

COMMENTS
There are no remarkable gross findings to explain the weakness and recumbency for the kangaroos. The spinal cords will be removed tomorrow and a further report will be issued.

We will prioritized algal testing of the water and complete histopathology. Haematology and biochemistry are also underway.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: GP - GROSS PATHOLOGY Reported: 27/03/2025 13:34

Validated by [redacted].

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id: KANGAROO MORTALITY

Lab No. - Test: [redacted]

Owner:

Submitter:

PIC:

Submitter Id: [redacted]

Species: Kangaroo or Wallaby

Clinic Phone:

Age:

Submitted: 26/03/2025

Test: NEC - NECROPSY

Reported: 03/04/2025 19:27

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].

MACROSCOPY
Slides 1A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 1

Slides 2A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 2

MICROSCOPY
Kangaroo 1
Lung: The alveolar interstitium is expanded by hyperaemia/congestion. There is mild oedema multifocally expanding alveolar spaces. (Pulmonary oedema, congestion / hyperaemia)

Kidney: Multifocally within the cortical interstitium there are low numbers of lymphocytes and plasma cells. (Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic)

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Stomach: Within the lumen of the stomach there are multiple cross sections of nematode's. The nematode is approximately 40 to 60 m in diameter with smooth cuticle, coelomyarian -platymyarian musculature, lateral cords, pseudocoelom, alimentary tract lined by columnar epithelium and gravid uteri. (Gastric nematodiasis)

Skeletal muscle: Multifocally there is atrophy of myocytes and the interstitium surrounding the cells is mildly expanded by oedema. There are rare individualized degenerate myocytes with fragmented sarcoplasm. (Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration)

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain and medulla: Within the gray matter rare neurons contain fine dark brown to black granules with in the perikaryon.

The other organs including liver, spleen, heart, lung, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

Kangaroo 2
Lung: There is mild pulmonary oedema, congestion / hyperaemia.

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain, medulla, cerebellum: Within the gray matter of the midbrain and medulla moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon. Within the cerebellum moderate numbers of purkinje cells contain dark brown granules within the perikaryon.

The other organs including liver, spleen, heart, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

DIAGNOSIS
Kangaroos 1 and 2
Brain and spinal cord: Intraneuronal pigment consistent with Phalaris toxicosis.

Lung: Pulmonary oedema, congestion / hyperaemia

Stomach: Gastric nematodiasis

Additional findings
Kangaroo 1
Kidney: Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic

Skeletal muscle: Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration

COMMENTS
The histological findings, particularly the spinal cord of both animals and the cerebellum / midbrain/ brain stem of kangaroo 2, are consistent

with Phalaris toxicosis. Schmorls stains are pending to simply highlight the granules within the neurons.

The gastric nematodiasis in both animals (please refer to the necropsy report) is a normal finding.

The mild interstitial nephritis in kangaroo 1 is an incidental finding, suggestive of history bacteraemia e.g. Leptosira sp.

The mild oedema of the skeletal muscle in Kangaroo 1 may have been due to acute adrenalin release / stress and abrupt muscle contraction.

[redacted]

Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

Validated by [redacted].

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].

MACROSCOPY
Slides 1A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 1

Slides 2A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 2

MICROSCOPY
Kangaroo 1
Lung: The alveolar interstitium is expanded by hyperaemia/congestion. There is mild oedema multifocally expanding alveolar spaces. (Pulmonary oedema, congestion / hyperaemia)

Kidney: Multifocally within the cortical interstitium there are low numbers of lymphocytes and plasma cells. (Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic)

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Stomach: Within the lumen of the stomach there are multiple cross sections of nematode's. The nematode is approximately 40 to 60 m in diameter with smooth cuticle, coelomyarian -platymyarian musculature, lateral cords, pseudocoelom, alimentary tract lined by columnar epithelium and gravid uteri. (Gastric nematodiasis)

Skeletal muscle: Multifocally there is atrophy of myocytes and the interstitium surrounding the cells is mildly expanded by oedema. There are rare individualized degenerate myocytes with fragmented sarcoplasm. (Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration)

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain and medulla: Within the gray matter rare neurons contain fine dark brown to black granules with in the perikaryon.

The other organs including liver, spleen, heart, lung, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

Kangaroo 2
Lung: There is mild pulmonary oedema, congestion / hyperaemia.

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain, medulla, cerebellum: Within the gray matter of the midbrain and medulla moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon. Within the cerebellum moderate numbers of purkinje cells contain dark brown granules within the perikaryon.

The other organs including liver, spleen, heart, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

DIAGNOSIS
Kangaroos 1 and 2
Brain and spinal cord: Intraneuronal pigment consistent with Phalaris toxicosis.

Lung: Pulmonary oedema, congestion / hyperaemia

Stomach: Gastric nematodiasis

Additional findings

Kangaroo 1
Kidney: Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic

Skeletal muscle: Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration

COMMENTS
The histological findings, particularly the spinal cord of both animals and the cerebellum / midbrain/ brain stem of kangaroo 2, are consistent with Phalaris toxicosis. Schmorls stains are pending to simply highlight the granules within the neurons.

The gastric nematodiasis in both animals (please refer to the necropsy report) is a normal finding.

The mild interstitial nephritis in kangaroo 1 is an incidental finding, suggestive of history bacteraemia e.g. Leptosira sp.

The mild oedema of the skeletal muscle in Kangaroo 1 may have been due to acute adrenalin release / stress and abrupt muscle contraction.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

Validated by [redacted].

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id: KANGAROO MORTALITY

Lab No. - Test: [redacted]

Owner:

Submitter:

PIC:

Submitter Id: [redacted]

Species: Kangaroo or Wallaby

Clinic Phone:

Age:

Submitted: 26/03/2025

Test: NEC - NECROPSY

Reported: 17/04/2025 11:43

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]
ADDITIONAL FINDINGS 17/4/2025

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].

MACROSCOPY
Slides 1A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 1

Slides 2A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 2

MICROSCOPY
Kangaroo 1
Lung: The alveolar interstitium is expanded by hyperaemia/congestion. There is mild oedema multifocally expanding alveolar spaces. (Pulmonary oedema, congestion / hyperaemia)

Kidney: Multifocally within the cortical interstitium there are low numbers of lymphocytes and plasma cells. (Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic)

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Stomach: Within the lumen of the stomach there are multiple cross sections of nematode's. The nematode is approximately 40 to 60 in diameter with smooth cuticle, coelomyarian -platymyarian musculature, lateral cords, pseudocoelom, alimentary tract lined by columnar epithelium and gravid uteri. (Gastric nematodiasis)

Skeletal muscle: Multifocally there is atrophy of myocytes and the interstitium surrounding the cells is mildly expanded by oedema. There are rare individualized degenerate myocytes with fragmented sarcoplasm. (Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration)

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain and medulla: Within the gray matter rare neurons contain fine dark brown to black granules with in the perikaryon.

The other organs including liver, spleen, heart, lung, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

Kangaroo 2
Lung: There is mild pulmonary oedema, congestion / hyperaemia.

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain, medulla, cerebellum: Within the gray matter of the midbrain and medulla moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon. Within the cerebellum moderate numbers of purkinje cells contain dark brown granules within the perikaryon.

The other organs including liver, spleen, heart, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

DIAGNOSIS
Kangaroos 1 and 2
Brain and spinal cord: Intraneuronal pigment consistent with Phalaris toxicosis.

Lung: Pulmonary oedema, congestion / hyperaemia

Stomach: Gastric nematodiasis

Additional findings
Kangaroo 1
Kidney: Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic

Skeletal muscle: Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration

COMMENTS
The histological findings, particularly the spinal cord of both animals

and the cerebellum / midbrain/ brain stem of kangaroo 2, are consistent with Phalaris toxicosis. Schmorl's stains are pending to simply highlight the granules within the neurons.

The gastric nematodiasis in both animals (please refer to the necropsy report) is a normal finding.

The mild interstitial nephritis in kangaroo 1 is an incidental finding, suggestive of history bacteraemia e.g. Leptosira sp.

The mild oedema of the skeletal muscle in Kangaroo 1 may have been due to acute adrenalin release / stress and abrupt muscle contraction.

MICROSCOPY 17/4/2025
Kangaroo 2
Brain (Cerebellum) and cervical spinal cord: Rare melanin deposits are seen within neurons on Schmorl's stain.

COMMENTS
Phalaris toxicosis contributed to morbidity in the mob of kangaroos. However, given the high prevalence of morbidity in the mob and lack of evidence of recovery from clinical signs, intercurrent or multiple disease processes (not evident histologically) cannot be excluded.

Background
In a survey of Phalaris staggers in macropods, risk factors for outbreaks included a) low average rainfall in early autumn (March and April) , leading to outbreaks in winter and b) low forage abundance with dominant Phalaris pasture. This outbreak occurred in March - April (not winter). Phalaris was not dominant in the paddocks where the affected kangaroos were found in this outbreak. For sheep risk factors for Phalaris staggers include low soil cobalt caused by limestone and sandstone substrate, high soil manganese, pH, and nitrogen (Chen et al 2024).

Chen, T., Hufschmid, J., Whiteley, P., ElHage, C., Davis, N. and Skerratt, L.F., 2024. Chronic phalaris toxicity in macropods is widespread and peaks in July in Victoria, Australia. Australian Veterinary Journal, 102(7), pp.331-338.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted]

All tests on this request have now been completed

Test: NEC - NECROPSY Reported: 17/04/2025 11:43

Validated by [redacted]

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]

CLINICAL HISTORY
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24/3/25
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signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].

MACROSCOPY
Slides 1A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 1

Slides 2A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 2

MICROSCOPY
Kangaroo 1
Lung: The alveolar interstitium is expanded by hyperaemia/congestion. There is mild oedema multifocally expanding alveolar spaces. (Pulmonary oedema, congestion / hyperaemia)

Kidney: Multifocally within the cortical interstitium there are low numbers of lymphocytes and plasma cells. (Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic)

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Skeletal muscle: Multifocally there is atrophy of myocytes and the interstitium surrounding the cells is mildly expanded by oedema. There are rare individualized degenerate myocytes with fragmented sarcoplasm. (Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration)

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain and medulla: Within the gray matter rare neurons contain fine dark brown to black granules with in the perikaryon.

The other organs including liver, spleen, heart, lung, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

Kangaroo 2
Lung: There is mild pulmonary oedema, congestion / hyperaemia.

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain, medulla, cerebellum: Within the gray matter of the midbrain and medulla moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon. Within the cerebellum moderate numbers of purkinje cells contain dark brown granules within the perikaryon.

The other organs including liver, spleen, heart, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

DIAGNOSIS
Kangaroos 1 and 2
Brain and spinal cord: Intraneuronal pigment consistent with Phalaris toxicosis.

Lung: Pulmonary oedema, congestion / hyperaemia

Stomach: Gastric nematodiasis

Additional findings
Kangaroo 1
Kidney: Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic

Skeletal muscle: Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration

COMMENTS
The histological findings, particularly the spinal cord of both animals and the cerebellum / midbrain/ brain stem of kangaroo 2, are consistent with Phalaris toxicosis. Schmorls stains are pending to simply highlight the granules within the neurons.

The gastric nematodiasis in both animals (please refer to the necropsy report) is a normal finding.

The mild interstitial nephritis in kangaroo 1 is an incidental finding, suggestive of history bacteraemia e.g. Leptosira sp.

The mild oedema of the skeletal muscle in Kangaroo 1 may have been due to acute adrenalin release / stress and abrupt muscle contraction.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

Validated by [redacted].

Test: NEC - NECROPSY Reported: 03/04/2025 19:27

HISTOPATHOLOGY FROM NECROPSY

REF: [redacted]

CLINICAL HISTORY
Please refer to the clinical history on the request form and the emails from [redacted] and [redacted]. A brief summary of the clinical history;
24/3/25
On the property , near Deep Creek, [redacted] there were about 40 unwell/ staggering / weak eastern grey kangaroos in a small area near the beach. The kangaroos appear to be weak and did not have neurological signs.
The syndrome appeared after the algal bloom event reported a week or so ago, and the only drinking water available to these kangaroos(a freshwater creek emptying into a small lagoon on the beach) was clearly contaminated at some point (evidence of staining and dead sea-life on sand around the lagoon).
The available pasture was predominantly kikuyu.
On necropsy one animal had abundant ascarid-like worms. 2/5 roos had heavy worm burdens, 3/5 did not appear to have heavy worm burdens.

26/5/25
70 (mainly juveniles) of 200 kangaroos were affected. The affected animals were weak or recumbent. Two animals were euthanized and submitted to [redacted].

MACROSCOPY
Slides 1A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 1

Slides 2A-O contain liver, spleen, heart, lung, kidney, adrenal gland, stomach, duodenum, pancreas, jejunum, ileum colon, skeletal muscle (semimembranosus) and multiple sections of brain (including medulla, cerebellum, midbrain, thalamus, hippocampus, parietal and occipital cerebral cortices) from kangaroo 2

MICROSCOPY
Kangaroo 1
Lung: The alveolar interstitium is expanded by hyperaemia/congestion. There is mild oedema multifocally expanding alveolar spaces. (Pulmonary oedema, congestion / hyperaemia)

Kidney: Multifocally within the cortical interstitium there are low numbers of lymphocytes and plasma cells. (Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic)

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Stomach: Within the lumen of the stomach there are multiple cross sections of nematode's. The nematode is approximately 40 to 60 m in diameter with smooth cuticle, coelomyarian -platymyarian musculature, lateral cords, pseudocoelom, alimentary tract lined by columnar epithelium and gravid uteri. (Gastric nematodiasis)

Skeletal muscle: Multifocally there is atrophy of myocytes and the interstitium surrounding the cells is mildly expanded by oedema. There are rare individualized degenerate myocytes with fragmented sarcoplasm. (Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration)

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain and medulla: Within the gray matter rare neurons contain fine dark brown to black granules with in the perikaryon.

The other organs including liver, spleen, heart, lung, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

Kangaroo 2
Lung: There is mild pulmonary oedema, congestion / hyperaemia.

There is mild autolysis of elementary sections. Aside from this artefact the following changes are seen.

Cervical, thoracic and lumbar spinal cord: Within the gray matter of the spinal cord moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon.

Midbrain, medulla, cerebellum: Within the gray matter of the midbrain and medulla moderate numbers of neurons contain fine dark brown to black granules with in the perikaryon. Within the cerebellum moderate numbers of purkinje cells contain dark brown granules within the perikaryon.

The other organs including liver, spleen, heart, adrenal gland,, duodenum, pancreas, jejunum, ileum colon, and multiple sections of brain appear unremarkable.

DIAGNOSIS
Kangaroos 1 and 2
Brain and spinal cord: Intraneuronal pigment consistent with Phalaris toxicosis.

Lung: Pulmonary oedema, congestion / hyperaemia

Stomach: Gastric nematodiasis

Additional findings
Kangaroo 1
Kidney: Nephritis, interstitial, lymphocytic, plasmacytic, mild, multifocal, chronic

Skeletal muscle: Muscle, oedema, mild, multifocal subacute with rare myocyte degeneration

COMMENTS
The histological findings, particularly the spinal cord of both animals and the cerebellum / midbrain/ brain stem of kangaroo 2, are consistent with Phalaris toxicosis. Schmorls stains are pending to simply highlight the granules within the neurons.

The gastric nematodiasis in both animals (please refer to the necropsy report) is a normal finding.

The mild interstitial nephritis in kangaroo 1 is an incidental finding, suggestive of history bacteraemia e.g. Leptosira sp.

The mild oedema of the skeletal muscle in Kangaroo 1 may have been due to acute adrenalin release / stress and abrupt muscle contraction.

[redacted]
Specialist Veterinary Anatomic Pathologist
[redacted]

Validated by [redacted].

This request has other tests in progress at the time of reporting

Test:	NEC - NECROPSY	Reported:	03/04/2025 19:27

Validated by [redacted].

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id: KANGAROO MORTALITY

Lab No. - Test: [redacted]

Owner:

Submitter:

PIC:

Submitter Id: [redacted]

Species: Kangaroo or Wallaby

Clinic Phone:

Age:

Submitted: 26/03/2025

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 27/03/2025 08:13

STANDARD PROFILE ZOO **SPECIMEN : BLOOD**

Date:	**26/03/25**		26/03/25		
Coll. Time:	10:30		10:30		
Lab Number:	[redacted]		[redacted]		

HAEMATOLOGY

Red Cell Count		4.50		5.33	x10 \S\12 /L
Haemoglobin		135		176	g/L
Hct		0.38		0.47	L/L
MCV		84		88	fL
MCH		30.0		33.0	pg
MCHC		356		374	g/L
W.C.C.		6.0		16.7	x10 \S\9 /L
Neutro	65	3.9	81	13.5	x10 \S\9 /L
Lymph	35	2.1	19	3.2	x10 \S\9 /L
Mono	0	0.0	0	0.0	x10 \S\9 /L
Eosin	0	0.0	0	0.0	x10 \S\9 /L
Baso	0	0.0	0	0.0	x10 \S\9 /L
Platelets		174			x10 \S\9 /L (100-500)

[redacted] FILM MORPHOLOGY: RBC: Normal WBC: Leucocyte morphology normal PLATELETS: Adequate.

GENERAL BIOCHEMISTRY **SPECIMEN : SERUM**

Alk.Phosph.	253	786	U/L
Inorg.Phosph.	1.16	1.44	mmol/L
Calcium	2.57	2.49	mmol/L
Magnesium	0.9	1.0	mmol/L
Total Bili.	< 1	< 1	umol/L
ALT	323	141	U/L
AST (SGOT)	529	705	U/L
GGT	14	21	U/L
CK	18037	38355	U/L
Total Protein	63	63	g/L
Albumin	37	37	g/L
Globulins	26	26	g/L
Sodium	142	148	mmol/L
Potassium	4.0	4.1	mmol/L
Chloride	96	99	mmol/L
Bicarbonate	35	38	mmol/L
Anion Gap	15	15	mmol/L
Urea	11.1	19.2	mmol/L
Creatinine	157	138	umol/L
Cholesterol	1.7	1.4	mmol/L
Glucose	9	2	mmol/L

SERUM INDICES (Clear/+/++/+++/++++)

Icterus index Clear
Lipaemia index Clear
Haemolysis index Clear

This methodology (including reference ranges) has not been validated for this species.

Laboratory note: Glucose will decrease over time in non-preserved samples and may result in false low values

Validated by [redacted], Veterinary Pathologist.

All tests on this request have now been completed

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 27/03/2025 08:13

Validated by [redacted], Veterinary Pathologist.

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 27/03/2025 08:13

STANDARD PROFILE ZOO **SPECIMEN : BLOOD**

Date:	**26/03/25**		26/03/25	
Coll. Time:	10:30		10:30	
Lab Number:	[redacted]		[redacted]	

HAEMATOLOGY

Red Cell Count	4.50		5.33	x10 \S\12 /L
Haemoglobin	135		176	g/L
Hct	0.38		0.47	L/L
MCV	84		88	fL
MCH	30.0		33.0	pg
MCHC	356		374	g/L
W.C.C.	6.0		16.7	x10 \S\9 /L
Neutro	65	3.9	81	13.5 x10 \S\9 /L
Lymph	35	2.1	19	3.2 x10 \S\9 /L
Mono	0	0.0	0	0.0 x10 \S\9 /L
Eosin	0	0.0	0	0.0 x10 \S\9 /L
Baso	0	0.0	0	0.0 x10 \S\9 /L
Platelets	174			x10 \S\9 /L (100-500)

[redacted] FILM MORPHOLOGY: RBC: Normal WBC: Leucocyte morphology normal PLATELETS: Adequate.

GENERAL BIOCHEMISTRY **SPECIMEN : SERUM**

Alk.Phosph.	253	786	U/L
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Chloride	96	99	mmol/L
Bicarbonate	35	38	mmol/L
Anion Gap	15	15	mmol/L

[redacted]

Urea	11.1	19.2	mmol/L
Creatinine	157	138	umol/L
Cholesterol	1.7	1.4	mmol/L
Glucose	9	2	mmol/L

SERUM INDICES (Clear/+/++/+++/++++)

Icterus index	Clear
Lipaemia index	Clear
Haemolysis index	Clear

This methodology (including reference ranges) has not been validated for this species.

Laboratory note: Glucose will decrease over time in non-preserved samples and may result in false low values

Validated by [redacted], Veterinary Pathologist.

All tests on this request have now been completed

Test: ZPM - ZOO PROFILE - BIOCHEMISTRY & HAEMATOLOGY Reported: 27/03/2025 08:13

Validated by [redacted] Veterinary Pathologist.

PIIMS Laboratory Results Viewer

Result Details Page

Submission No: [redacted]
Animal/Batch Id: KANGAROO MORTALITY

Lab No. - Test: [redacted]

Owner:

Submitter:

PIC:

Submitter Id: [redacted]

Species: Kangaroo or Wallaby

Clinic Phone:

Age:

Submitted: 26/03/2025

Test: SRF - PRODUCTION ANIMAL REFERRED TEST Reported: 08/04/2025 12:54

REFERRED TEST

Disease/Test : Botulinum C & D toxin PCR
Specimen Type: Stomach contents

RESULT : C toxin gene - Negative
D toxin gene - Negative

This test was performed by: [redacted]

Validated by [redacted] Laboratory Scientist.

All tests on this request have now been completed

Test: SRF - PRODUCTION ANIMAL REFERRED TEST Reported: 08/04/2025 12:54

Validated by [redacted], Laboratory Scientist.

Government of South Australia
Department of Primary Industries and Regions

Phytoplankton Report

S.A. Shellfish Quality Assurance Program - Certificate of Analysis

Lincoln Marine Science Centre. PO Box 5 Pt Lincoln SA 5606 phone (08) 8688 3409

[redacted]

Toxic Phytoplankton Scan Report - Single Species

Location	Creek	**Sample Date**	26-Mar-2025
		Sample Time	
Site	[redacted]	**Count Date**	02-Apr-2025
		Sample Type	

Comments for Report

Toxic Dinoflagellates	Count (cells/l)	Action Level
Karenia mikimotoi	20,460	

Results Summary:

Est. Total Phytoplankton (cells/litre)	
Est. Total Diatoms (cells/litre)	
Dominant Diatom spp.	
Estimated percentage of Total Diatoms	

Report Status: **Finalised**

Date of Report: 02-Apr-2025

Test Method P-050

SASQAP

Signature: [redacted]

Program Leader

Government of South Australia
Department of Primary Industries and Regions

Phytoplankton Report

S.A. Shellfish Quality Assurance Program - Certificate of Analysis

Lincoln Marine Science Centre. PO Box 5 Pt Lincoln SA 5606 phone (08) 8688 3409

[redacted]

Toxic Phytoplankton Scan Report - Single Species

Location	Lagoon	**Sample Date**	26-Mar-2025
		Sample Time	
Site	[redacted]	**Count Date**	02-Apr-2025
		Sample Type	
Comments for Report	No toxic species present		

Results Summary:

Est. Total Phytoplankton (cells/litre)	
Est. Total Diatoms (cells/litre)	
Dominant Diatom spp.	
Estimated percentage of Total Diatoms	

Report Status: **Finalised**

Date of Report: 02-Apr-2025

Test Method P-050

SASQAP

Signature: [redacted]

Program Leader

Government of South Australia
Department of Primary Industries and Regions

Phytoplankton Report

S.A. Shellfish Quality Assurance Program - Certificate of Analysis

Lincoln Marine Science Centre. PO Box 5 Pt Lincoln SA 5606 phone (08) 8688 3409

[redacted]

Toxic Phytoplankton Scan Report - Single Species

Location	Beach	**Sample Date**	26-Mar-2025
		Sample Time	
Site	[redacted]	**Count Date**	01-Apr-2025
		Sample Type	

Comments for Report

Toxic Dinoflagellates	Count (cells/l)	Action Level
Karenia mikimotoi	608,000	

Results Summary:

Est. Total Phytoplankton (cells/litre)	
Est. Total Diatoms (cells/litre)	
Dominant Diatom spp.	
Estimated percentage of Total Diatoms	

Report Status: **Finalised**

Date of Report: 02-Apr-2025

Test Method P-050

SASQAP

Signature: [redacted]

Program Leader

[redacted]

[redacted]

Sent: Wednesday, 25 June 2025 3:30 PM
To: [redacted]
Su ALITY, (Ka) [redacted]

[redacted]

[redacted]

Tested on 17/06/25
Reported on 25/06/25 16:00
Referred on 26/03/25 **by:** [redacted]

[redacted] [redacted]

Owner:
KANGAROO MORTALITY

Animal/s:
Kangaroo or Wal

DOB: N/A

Collected: 26/03/25 10:30 **Subm.No:** [redacted] **Lab No.:** [redacted]

Samples tested as received All Tests Complete

REFERRED TEST

Disease/Test : PST in Biota
Specimen Type: 1 - Brain, Heart, Kidney, Spleen, Liver, Lung
2 - Liver, Kidney, Brain, Heart, Lung, Spleen

RESULT :

C1	- All samples <0.01 STX.2HCI eq. mg/kg
C2	- All samples <0.02 STX.2HCI eq. mg/kg
C3	- All samples <0.02 STX.2HCI eq. mg/kg
C4	- All samples <0.02 STX.2HCI eq. mg/kg
dcGTX1	- All samples <0.02 STX.2HCI eq. mg/kg
dcGTX2	- All samples <0.02 STX.2HCI eq. mg/kg
dcGTX3	- All samples <0.02 STX.2HCI eq. mg/kg
dcGTX4	- 2Liver - 0.07 STX.2HCI eq. mg/kg - 2Brain - 0.05 STX.2HCI eq. mg/kg - All other samples <0.02 STX.2HCI eq. mg/kg
dcNEO	- All samples <0.02 STX.2HCI eq. mg/kg
dcSTX	- All samples <0.01 STX.2HCI eq. mg/kg
doSTX	- All samples <0.01 STX.2HCI eq. mg/kg
GTX1	- All samples <0.01 STX.2HCI eq. mg/kg
GTX2	- All samples <0.01 STX.2HCI eq. mg/kg
GTX3	- All samples <0.01 STX.2HCI eq. mg/kg
GTX4	- All samples <0.01 STX.2HCI eq. mg/kg
GTX5	- All samples <0.02 STX.2HCI eq. mg/kg
GTX6	- All samples <0.02 STX.2HCI eq. mg/kg
NEO	- All samples <0.02 STX.2HCI eq. mg/kg
STX	- All samples <0.01 STX.2HCI eq. mg/kg
Total PST	- All samples <0.10 STX.2HCI eq. mg/kg

Comment : NATA/RCPA accreditation does not cover the performance of this service

This test was performed by: [redacted]

Validated by [redacted], Veterinary Pathologist.

[redacted]

[redacted]

Tested on 17/06/25
Reported on 25/06/25 16:00
Referred on 26/03/25 **by:**
[redacted]

Owner:
KANGAROO MORTALITY

Animal/s:
Kangaroo or Wal

DOB: N/A

Collected: 26/03/25 10:30 **Subm.No:** [redacted] **Lab No.:** [redacted]

Samples tested as received All Tests Complete

REFERRED TEST

Disease/Test : Lipophilic Toxins in Shellfish
Specimen Type: 1 - Brain, Heart, Kidney, Spleen, Liver, Lung
2 - Liver, Kidney, Brain, Heart, Lung, Spleen

RESULT :

AZA1	- All samples <0.01 mg/kg WMB
AZA2	- All samples <0.01 mg/kg WMB
AZA3	- All samples <0.01 mg/kg WMB
Domoic Acid	- All samples <0.05 mg/kg WMB
DTX1 Free	- All samples <0.01 mg/kg WMB
DTX1 Total	- All samples <0.01 mg/kg WMB
DTX2 Free	- All samples <0.01 mg/kg WMB
DTX2 Total	- All samples <0.01 mg/kg WMB
GYM	- All samples <0.01 mg/kg WMB
Homo-YTX	- All samples <0.02 mg/kg WMB
OA Free	- All samples <0.01 mg/kg WMB
OA Total	- All samples <0.01 mg/kg WMB
PnTx-G	- All samples <0.01 mg/kg WMB
PTX2	- All samples <0.01 mg/kg WMB
SPX1	- All samples <0.01 mg/kg WMB
Total DST	- All samples <0.01 OA eq. mg/kg
YTX	- All samples <0.01 mg/kg WMB

Comment : NATA/RCPA accreditation does not cover the performance of this service

This test was performed by: [redacted]

Validated by [redacted], Veterinary Pathologist.

[redacted]

[redacted]

To: [redacted]

Su TALITY, (Ka) [redacted]

[redacted]

Tested on 17/06/25

Reported on 25/06/25 14:00
Report Addressee: **Referred on** 26/03/25 **by:**

[redacted]

[redacted]

Owner:
KANGAROO MORTALITY

Animal/s:
Kangaroo or Wal

DOB: N/A

Collected: 26/03/25 10:30 **Subm.No:** [redacted] **Lab No.:** [redacted]

Samples tested as received

REFERRED TEST

Disease/Test : Biotoxins in Biota
Specimen Type: 1 - Brain, Heart, Kidney, Spleen, Liver, Lung
2 - Liver, Kidney, Brain, Heart, Lung, Spleen

RESULT : Brevetoxin 2 - All samples <0.01 mg/kg WMB
Brevetoxin 3 - 1Heart - 0.03 mg/kg WMB
1Kidney - 0.01 mg/kg WMB
1Spleen - 0.01 mg/kg WMB
1Liver - 0.03 mg/kg WMB
2Liver - 0.04 mg/kg WMB
All other sample <0.01 mg/kg WMB

Comment : NATA/RCPA accreditation does not cover the performance of this service

This test was performed by: [redacted]

Validated by [redacted], Veterinary Pathologist.