

Algal bloom wildlife post-mortem report



Government of South Australia

Department for Environment and Water

Species – Pied cormorant

Date collected – 7 July 2025

Location – Bay of Shoals, Kangaroo Island

History relating to the animal

Eight pied cormorants (*Phalacrocorax varius*) were submitted from a single mass mortality event from Bay of Shoals, Kangaroo Island.

Examination

Three birds were seen alive, weak with paralysis (weakness of limbs) and ataxia (wobbly). Two of these birds were on the sandy beach and were unable to fly and ataxic (wobbly). The third bird was in the shallow water and was unable to swim and circling (moving in circles with no apparent intent). The affected birds were euthanised on humane grounds. Another 5 deceased birds were found in the same area and were submitted to the laboratory. These animals were already dead and so could not be examined prior to death.

Necropsy

The necropsies (looking at the whole body) revealed that the animals had mild effects from decomposition. The birds were in moderate to poor body condition with atrophy (wasting) of muscle over the pectoral (breast) bone. There was no food present in the proventriculus/ventriculus (the top part of a bird's stomach/ stomach). There were nematodes (round worms) present in the gastrointestinal tract (gut), which is a normal finding in wild cormorants. All birds were adults, of mixed sex, except for one which was a juvenile female.

Tissues were collected to test for avian influenza testing and Newcastle disease, 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. Samples were collected for other testing that might be indicated after these tests were performed.

Histopathology

Samples from every major body system were examined under the microscope for the three freshest birds. All organs appeared normal (including the presence of the nematodes) except for the kidney and liver in bird 2.

In the kidney, there were ova (eggs) of a parasite (fluke worm) that was an incidental finding and has previously been found in cormorants.

In the liver there was a bacterial infection that was causing tissue necrosis (tissue death).

The diagnosis from the histopathology was that the hepatitis contributed to the death in bird 2.

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Culture

Following the histopathology findings, which suggested a possible infection, the liver of bird 2 and 3 were cultured to try to identify bacteria.

In bird 2, there was no bacterial growth after 48 hours, and anaerobes (those bacteria that do not need an oxygenated environment), including *Salmonella* species, *Listeria* species and *Yersina* species, were not isolated.

In bird 3, there was a light growth of *Clostridium perfringens* (a common, widespread bacteria) and mixed organisms (e.g. bacteria), but anaerobes including *Salmonella* species, *Listeria* species and *Yersina* species, were not isolated. The bacteria found were not clinically significant (not likely to be causing disease).

Brevetoxins

Brevetoxin 3 was found in the brain (0.01 mg/kg), liver (0.09 mg/kg) and lung (0.02 mg/kg) of bird 1, in the brain (0.02 mg/kg), liver (0.03 mg/kg) and lung (0.01 mg/kg) of bird 2 and the lung (0.01 mg/kg) of bird 3.

Other algal biotoxins

Results were below reporting limits or the sample was insufficient for testing.

Avian influenza

Results were negative.

Newcastle disease

Results were negative.

Summary

Eight pied cormorants were found dead or in poor condition at Bay of Shoals, Kangaroo Island.

Of these, three live birds were observed with neurological symptoms (weakness of limbs, wobbly). The remaining five birds were already dead.

Laboratory examination (necropsy and histopathology) on all birds could not determine the cause of chronic weight loss, neurological signs and death. Hepatitis (liver inflammation) may have contributed to one of the birds being unwell.

Three birds were sent for additional testing.

Testing for avian influenza and Newcastle disease was negative.

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Brevetoxins were detected in the tissues of all birds tested. The levels detected are consistent with those found in marine birds overseas that were reported to have been exposed to harmful algal blooms.

It cannot be determined whether the brevetoxin presence in the cormorants was a direct contributor to their death or a non-lethal co-morbidity given the poor condition of the birds at death. Pied cormorants primarily feed on fish. It is considered that the most significant exposure of the cormorants to brevetoxins is likely to have been via their consumption of fish organs containing brevetoxins.



Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by:



Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25

Subm. No.: [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

NECROPSY REPORT

CLINICAL HISTORY

Please refer to the clinical history on the request form and the clinical notes sent with the request form. A brief summary of the clinical history;

Dead cormorants and cormorants with neurological signs were found on Shoal Beach, Kangaroo Island

SAMPLES SUBMITTED

8 dead cormorants (Phalacrocorax sp.)

The birds are allocated numbers 1-8 at the laboratory

NECROPSY FINDINGS

These descriptions refer to all birds;

There is atrophy of the pectoral muscles. There is no ingesta in the proventriculus / ventriculus. There are low numbers of ascarids 30-50mm long in the proventriculus / ventriculus and intestines. All birds are adults except for bird 8.

Additional findings

1

The tag on the bag is " this is the freshest bird"

This is a male bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.1 kg. There are minimal post mortem autolytic changes.

2

This is a male bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.0 kg. There are minimal post mortem autolytic changes.

3

This is a female bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.2 kg

There are minimal post mortem autolytic changes.

4

This is a female bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.5 kg
There are mild post mortem autolytic changes.

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by: [REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

5

This is a male bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.0 kg. There are moderate post mortem autolytic changes.

6

This is a female bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.0 kg. There are marked post mortem autolytic changes and maggots in the oral cavity.

7

This is a female bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 1.0 kg. There are moderate post mortem autolytic changes.

8

This is a female juvenile bird. The bird is in moderate to poor body condition, there is atrophy of both pectoral muscles and the bird weighs 0.5 kg. There are moderate post mortem autolytic changes.

GROSS SUMMARY

Birds 1-8

Chronic weight loss

Alimentary ascariasis

SAMPLES COLLECTED & TESTING

Birds 1-3

Cloacal and tracheal swabs are pooled for 1 x NDV PCR and 1 x AI PCR.

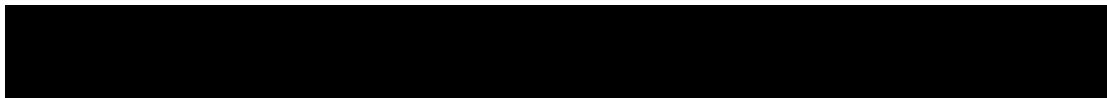
Formalin fixed tissues are processed for histopathology.

Fresh liver (10g), spleen, heart, lung, kidney, brain (< 500mg for these tissues) are stored frozen.

No samples are collected from birds 4-8

COMMENTS

The cause of chronic weight loss and death is not determined by gross findings. Alimentary ascariasis (likely *Anisakis* or *Contracaecum* sp.) is a normal finding in cormorants.



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[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED]

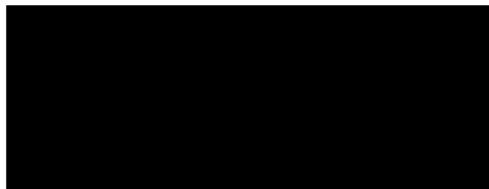
Lab No.: [REDACTED]

Samples tested as received

[REDACTED]
Specialist Veterinary Anatomic Pathologist
[REDACTED]

[REDACTED]
Specialist Veterinary Anatomic Pathologist
[REDACTED]

Validated by [REDACTED].

PATH RESULTS: COMORANT MORTALITY, (Wi)**From****Date** Wed 13/08/2025 5:00 PM**To**

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 **by:**

**Owner:**

COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:

Wild Birds

DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:**

Lab No.:

Samples tested as received**HISTOPATHOLOGY FROM NECROPSY**

REF: 2025/V HI 1249

CLINICAL HISTORY

Dead cormorants and cormorants with neurological signs were found on Shoal Beach, Kangaroo Island

MACROSCOPY

Slides 1A-C to 3A-C correspond to birds 1-3; tissues for each bird include liver, spleen, heart, lung, kidney, brain, crop, proventriculus / ventriculus, duodenum, pancreas, jejunum, ileum, caecum

MICROSCOPY

Bird 1

Crop and proventriculus: There are multiple cross sections of ascarids (30-40 micron across, smooth cuticle, platymyarian musculature, pseudocoelom, lateral cords and alimentary tract)

There is mild autolysis of the alimentary sections.

Bird 2

Kidney: Multifocally the renal pelvises are expanded by abundant oval

ova (10 micron diameter with smooth capsule and operculum) within their lumens.

Liver: Multifocally necrotizing and heterophilic hepatitis with intralesional short rod bacteria effaced the hepatic acinar architecture. (Moderate, multifocal, subacute necrotizing heterophilic hepatitis with intralesional short rod bacteria)

There is proventricular ascaridiasis.

Bird 3

There is proventricular ascaridiasis.

Those tissues not described for each bird appear normal.

DIAGNOSIS

Bird 1-3

Alimentary ascardiasis

Bird 2

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by:
[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25

Subm. No.: [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

Renal trematode ova
Bacterial hepatitis

COMMENTS

Bacterial hepatitis contributed to morbidity for bird 2. Please contact the laboratory within the next 5 working days if microbiological culture of bird 2 is required.

Alimentary ascariasis (Anisakis sp. or Contracaecum sp.) are a normal finding in marine birds.

The trematode Renicola has been recorded in the kidneys of cormorants (P. Ladds Pathology of Australian native wildlife 2009). This is an incidental finding.

[REDACTED]
Specialist Veterinary Anatomic Pathologist
[REDACTED]

Validated by [REDACTED].

MICROBIOLOGY

SPECIMEN: Liver
ANIMAL ID:BIRD 3

MICROSCOPY

No bacteria seen.

CULTURE

1. Light growth of Mixed organisms

COMMENT: Culture is continuing.

INTERIM REPORT

12/08/25

Validated by [REDACTED], Laboratory Scientist.

[REDACTED]

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by:
[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED] **Lab No.:** [REDACTED]

Samples tested as received

MICROBIOLOGY

SPECIMEN: Liver
ANIMAL ID:BIRD 2

MICROSCOPY

No bacteria seen.
A small number of leucocytes. Scanty epithelial cells.

CULTURE

1. No growth after 48 hours incubation.

COMMENT: Anaerobes NOT isolated.

No *Salmonella* sp., *Listeria* sp. or *Yersinia* sp. isolated.

Final Report

21/07/25
Validated by [REDACTED], Laboratory Scientist.

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by:
[REDACTED]
[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED] **Lab No.:** [REDACTED]

Samples tested as received

MOLECULAR DIAGNOSTICS

NEWCASTLE DISEASE VIRUS RNA PCR (REAL TIME REVERSE TRANSCRIPTASE)

Specimen type: Tracheal + Number of specimens: 1
cloacal swabs in VTM

SPECIMEN ID	F Gene	M Gene	L Gene
CORMORAN	Not detected	Not detected	Not detected

Validated by [REDACTED], Laboratory Scientist.

Tested on 09/07/25
Reported on 13/08/25 17:30
Referred on 07/07/25 by:
[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

MOLECULAR DIAGNOSTICS

INFLUENZA A RNA PCR (REAL TIME REVERSE TRANSCRIPTASE)

Specimen type: Tracheal + cloacal swabs in VTM

SPECIMEN ID Type A H5 H7

CORMORAN Not detected

Validated by [REDACTED], Laboratory Scientist.

CASE MANAGEMENT DETAILS

Case Managed by: [REDACTED]

Case Management Requested by:
Case Management Requested on:

Case Details: Mortality



Outlook

PATH RESULTS: COMORANT MORTALITY, (Wi)

From [REDACTED]

Date Thu 14/08/2025 11:00 AM

To [REDACTED]



Tested on 09/07/25
Reported on 14/08/25 11:30
Referred on 07/07/25 **by:** [REDACTED]



Owner:

COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:

Wild Birds

DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

MICROBIOLOGY

SPECIMEN: Liver
ANIMAL ID:BIRD 3

MICROSCOPY

No bacteria seen.

CULTURE

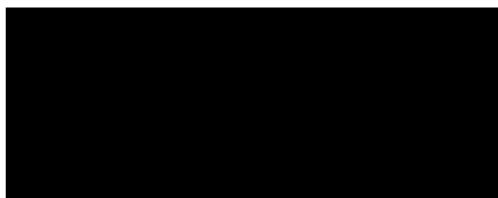
1. Light growth of Clostridium perfringens
2. Light growth of Mixed organisms

COMMENT: No Salmonella sp., Listeria sp. or Yersinia sp. isolated.

Final Report

14/08/25

Validated by [REDACTED] Laboratory Scientist.

PATH RESULTS: COMORANT MORTALITY, (Wi)**From****Date** Tue 26/08/2025 11:00 AM**To**

Tested on 09/07/25
Reported on 26/08/25 11:30
Referred on 07/07/25 **by:**



Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds

DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:**

Lab No.:

Samples tested as received

All Tests Complete

SUMMARY DIAGNOSIS

Bird 2
Chronic hepatitis
Renal trematodiasis

Birds 1-8
Alimentary ascariasis

SUMMARY COMMENTS

The cause of chronic weight loss, neurological signs and death is not determined by laboratory tests. Avian influenza and Newcastle disease are excluded as causes of morbidity, neurological signs and death based on the negative PCR results.

Hepatitis contributed to morbidity for bird 2. Bacterial cultures are unremarkable. The renal trematode *Renicola* has been recorded in the kidneys of cormorants (P. Ladds 2009; Pathology of Australian native wildlife). This is an incidental finding.

The *C. perfringens* from bird 3 liver culture is a post mortem overgrowth.

Alimentary ascariasis (*Anisakis* sp. or *Contracaecum* sp.) is a normal finding in marine birds.

[REDACTED]

Specialist Veterinary Anatomic Pathologist

[REDACTED]

Validated by [REDACTED].

CERTIFICATE OF ANALYSIS

Customer:
Address:
Contact:

Submission Description:
Sample Received Date:
Contract Number:
Client Order Number:
Program/Quote Reference:
[REDACTED] Cormorants Birds 1-3, Shoals Beach
22/08/2025
[REDACTED] - Brevitoxin, lipophilic toxin and paralytic shellfish
toxins

Sample(s) analysed as received. Sampling date and time data supplied by the client. The document shall not be reproduced except in full.

Additional information relating to this submission can be found in the sample receipt notification.

This report supersedes any previous reports with this submission number.

Many tests specify a holding time which gives the recommended timeframe by which a sample should be preserved/extracted and/or analysed after the sample is taken.

Holding time information can be found on the AST website <https://analyticalservices.tas.gov.au/our-services/containers-samples-and-submissions>.

Whilst every effort is made to analyse samples within these timeframes, situations can occur where this is not possible.

Where a test has been conducted outside the recommended sample holding time this should be taken into account when interpreting results.

The results in this report were authorised by:

Name	Position
[REDACTED]	Section Head - Organic Chemistry

Test Information:

Method ID	Test Description	Date Commenced:
3411	Lipophilic Toxins in Shellfish by LC-MS/MS	03-09-2025
3411A	Brevetoxins in Biota by LC-MS/MS	02-09-2025
3416	PST in Biota by LC-MS/MS (Boundy Method)	03-09-2025



Accreditation No.5589

Accredited for compliance with ISO/IEC 17025 - Testing

Sample Comments

Sample Number: [REDACTED]

3411A Brevetoxins in Biota by LC-MS/MS

Brevetoxin 3

The accuracy of this result may be affected by the small sample size provided.

Sample Number: [REDACTED]

IS - Insufficient Sample. Sample not submitted.

Sample Number: [REDACTED]

3411A Brevetoxins in Biota by LC-MS/MS

Brevetoxin 3

The accuracy of this result may be affected by the small sample size provided.

Sample Number: [REDACTED]

IS - Insufficient Sample. Sample not submitted.

Sample Number: [REDACTED]

IS - Insufficient Sample. Sample not submitted.

Sample Number: [REDACTED]

IS - Insufficient Sample. Sample not submitted.

IS- Insufficient Sample

* NATA accreditation does not cover this result

Chemistry Test Results (Biota - Food)		Sample Description	Cormorant 1 Brain	Cormorant 1 Kidney	Cormorant 1 Liver	Cormorant 1 Lung	Cormorant 2 Brain	Cormorant 2 Kidney	Cormorant 2 Liver	Cormorant 2 Lung
			Sampled Date/ Time	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00
Method ID	Analyte	Units	338829	338830	338831	338832	338833	338834	338835	338836
3411	AZA1	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	AZA2	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	AZA3	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	Domoic Acid	mg/kg WMB	*IS*	*IS*	<0.05	<0.05	*IS*	*IS*	<0.05	<0.05
	DTX1 Free	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	DTX1 Total	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	DTX2 Free	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	DTX2 Total	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	GYM	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	Homo-YTX	mg/kg WMB	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	OA Free	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	OA Total	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	PnTx-G	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	PTX2	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
3411A	SPX1	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	Total DST	OA eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
3416	YTX	mg/kg WMB	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	Brevetoxin 2	mg/kg WMB	<0.01*	*IS*	<0.01*	<0.01*	<0.01*	*IS*	<0.01*	<0.01*
	Brevetoxin 3	mg/kg WMB	0.01*	*IS*	0.09*	0.02*	0.02*	*IS*	0.03*	0.01*
	C1	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	C2	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	C3	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	C4	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	dcGTX1	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02*	<0.02*	*IS*	*IS*	<0.02*	<0.02*
	dcGTX2	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	dcGTX3	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	dcGTX4	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02*	<0.02*	*IS*	*IS*	<0.02*	<0.02*
	dcNEO	STX ₂ HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02

IS- Insufficient Sample

* NATA accreditation does not cover this result

Chemistry Test Results (Biota - Food)		Sample Description	Cormorant 1 Brain	Cormorant 1 Kidney	Cormorant 1 Liver	Cormorant 1 Lung	Cormorant 2 Brain	Cormorant 2 Kidney	Cormorant 2 Liver	Cormorant 2 Lung
		Sampled Date/ Time	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00
Method ID	Analyte	Units	338829	338830	338831	338832	338833	338834	338835	338836
3416	dcSTX	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	doSTX	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01*	<0.01*	*IS*	*IS*	<0.01*	<0.01*
	GTX1	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	GTX2	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	GTX3	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	GTX4	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
	GTX5	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	GTX6	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	NEO	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.02	<0.02	*IS*	*IS*	<0.02	<0.02
	STX	STX.2HCl eq. mg/kg	*IS*	*IS*	<0.01	<0.01	*IS*	*IS*	<0.01	<0.01
Total PST		STX.2HCl eq. mg/kg	*IS*	*IS*	<0.10	<0.10	*IS*	*IS*	<0.10	<0.10

IS - Insufficient Sample

* NATA accreditation does not cover this result

Chemistry Test Results (Biota - Food)		Sample Description	Cormorant 3 Brain	Cormorant 3 Kidney	Cormorant 3 Liver	Cormorant 3 Lung
			Sampled Date/ Time	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00
Method ID	Analyte	Units	338837	338838	338839	338840
3411	AZA1	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	AZA2	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	AZA3	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	Domoic Acid	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	DTX1 Free	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	DTX1 Total	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	DTX2 Free	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	DTX2 Total	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	GYM	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	Homo-YTX	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	OA Free	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	OA Total	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	PnTx-G	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	PTX2	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
3411A	SPX1	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	Total DST	OA eq. mg/kg	*IS*	*IS*	*IS*	*IS*
	YTX	mg/kg WMB	*IS*	*IS*	*IS*	*IS*
	Brevetoxin 2	mg/kg WMB	<0.01*	*IS*	*IS*	<0.01*
	Brevetoxin 3	mg/kg WMB	<0.01*	*IS*	*IS*	0.01*
3416	C1	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	C2	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	C3	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	C4	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	dcGTX1	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02*
	dcGTX2	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	dcGTX3	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	dcGTX4	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02*
	dcNEO	STX.2HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02

IS - Insufficient Sample

* NATA accreditation does not cover this result

Chemistry Test Results (Biota - Food)		Sample Description	Cormorant 3 Brain	Cormorant 3 Kidney	Cormorant 3 Liver	Cormorant 3 Lung
Method ID	Analyte	Sample Date/ Time	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00	07/07/25 0:00
3416	dcSTX	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	doSTX	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01*
	GTX1	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	GTX2	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	GTX3	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	GTX4	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
	GTX5	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	GTX6	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	NEO	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.02
	STX	STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.01
Total PST		STX ₂ HCl eq. mg/kg	*IS*	*IS*	*IS*	<0.10

IS - Insufficient Sample

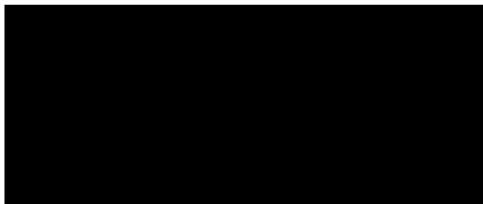
* NATA accreditation does not cover this result

PATH RESULTS: COMORANT MORTALITY, (Wi) [REDACTED]

From [REDACTED]

Date Fri 19/09/2025 4:00 PM

To [REDACTED]



Tested on 09/07/25
Reported on 19/09/25 16:30
Referred on 07/07/25 by: [REDACTED]

[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds

DOB: N/A

Collected: 07/07/25 00:25 Subm. No: [REDACTED]

Lab No.: [REDACTED]

Samples tested as received

All Tests Complete

SUMMARY DIAGNOSIS

Bird 2
Chronic hepatitis
Renal trematodiasis

Birds 1-8
Alimentary ascariasis

SUMMARY COMMENTS

The cause of chronic weight loss, neurological signs and death is not determined by laboratory tests. Avian influenza and Newcastle disease are excluded as causes of morbidity, neurological signs and death based on the negative PCR results.

Hepatitis contributed to morbidity for bird 2. Bacterial cultures are unremarkable. The renal trematode *Renicola* has been recorded in the kidneys of cormorants (P. Ladds 2009; Pathology of Australian native wildlife). This is an incidental finding.

The *C. perfringens* from bird 3 liver culture is a post mortem overgrowth.

Alimentary ascariasis (*Anisakis* sp. or *Contracaecum* sp.) is a normal finding in marine birds.

ADDITIONAL COMMENTS 19/9/2025

Brevetoxin 3 was detected in the liver (0.09mg/kg), brain (0.01mg/kg) and lung (0.02mg/kg) of cormorant 1, brain (0.02mg/kg), liver (0.03mg/kg), lung (0.01mg/kg) of cormorant 2 and lung (0.01mg/kg) of cormorant 3. Based on the history of neurological signs in this flock of cormorants and the detection of brevetoxin 3, brevetoxin may have contributed morbidity for this flock. These findings should be interpreted in conjunction with any algal counts in the ocean waters near where they birds were found, around the time they showed neurological signs / were found dead.

Additional comments:

As little as 4.8 ng PbTx-3 eq./g, brevetoxin 3, and 3 ng PbTx-3 eq./g were detected by high performance liquid chromatography in the livers and 3 ng PbTx eq./kg in the brain from stranded brown pelicans exposed to *Karenia brevis* blooms along the central west coast of Florida, USA (Fauquier et al 2013). Fauquier and co-authors assessed that brevetoxin exposure was the probable cause of stranding in birds if they presented

Tested on 09/07/25
Reported on 19/09/25 16:30
Referred on 07/07/25 by:
[REDACTED]

Owner:
COMORANT MORTALITY
KANGAROO ISLAND
SHAOLS BEACH

Animal/s:
Wild Birds
DOB: N/A

Collected: 07/07/25 00:25 **Subm. No.:** [REDACTED]

Lab No.: [REDACTED]

Samples tested as received All Tests Complete
debilitated with detectable premortem or post mortem brevetoxin levels and had clinical neurological signs or stranded during the Karenia brevis bloom on the central west coast of Florida. Many of the affected birds on necropsy had chronic weight loss. There were no specific histopathological changes related to brevetoxicosis.

Fauquier, D.A., Flewelling, L.J., Maucher, J.M., Keller, M., Kinsel, M.J., Johnson, C.K., Henry, M., Gannon, J.G., Ramsdell, J.S. and Landsberg, J.H., 2013. Brevetoxicosis in seabirds naturally exposed to Karenia brevis blooms along the central west coast of Florida. Journal of wildlife diseases, 49(2), pp.246-260.

[REDACTED]
Specialist Veterinary Anatomic Pathologist

Validated by [REDACTED].