



Skretting Australia  
Residue Monitoring Report  
**2023**

Summary of Results 2016-2023  
Issued April 2024

# About Skretting

## OUR PURPOSE

# Feeding the Future

Skretting is the world leader in the manufacture and supply of aquaculture feeds, making it an essential link in the feed-to-food chain. We apply our knowledge of ingredients and the nutritional needs of fish and prawns to develop innovations that achieve optimum nutritional value, sustainable production and economic performance as we seek to fulfil our company-wide mission of 'Feeding the Future'.

Read more at [www.skretting.com.au](http://www.skretting.com.au)

Nutreco is a global leader in animal nutrition and fish and prawn feed.

Experience across 100 years brings Nutreco a rich heritage of knowledge. Nutreco employs approximately 11,000 people in 35 countries, with sales in 80 countries.

Read more at [www.nutreco.com](http://www.nutreco.com)



# Feed to food quality & safety

Nutrace is Skretting’s unique, global feed-to-food quality and safety system. It ensures consistency throughout the production process, from raw materials to final feed solutions.

Nutrace is built on five strong pillars:

- Certified Quality & Food Safety
- Ingredient and Supplier Assessment & Management
- Monitoring & Control
- Risk Management
- Tracking & Tracing

Nutrace ensures that our customers and end consumers can have full confidence with regard to feeds in the farmed fish value chain.

[Click here to read more about Nutrace](#)



# About residue testing

Skretting conduct regular testing of our feeds for undesirable substances.

This is part of Skretting's Nutrace, Feed-to-Food Quality and Safety System, which acts to validate the quality controls performed throughout the year. These controls include frequent analysis of raw materials, supplier assessments and systems to control the pellet manufacturing process.

Skretting's Food Safety Team regularly review potential residues based on a risk assessment considering the scale of use, toxicity and persistence of each compound.

A global testing program for these residues is set annually. Testing is conducted by Skretting-approved, accredited laboratories that have demonstrated the highest level of competency and repeatability.

Skretting Australia undertakes residue testing on raw materials and finished feeds to ensure their quality.

Results reported here relate to complete fish feeds produced by Skretting Australia. Samples chosen best represent production since publishing the previous annual Residue Monitoring Report in 2022.

Skretting Australia undertakes residue testing on raw materials and finished feeds to ensure their quality

# About this report

This Residue Monitoring Report summarises the level of undesirable substances in Skretting Australia feeds from 2016 to 2023.

Australian residue limits [maximum residue limit (MRL) and the extraneous residue limit (ERL)] are set by the [Australian Pesticides and Veterinary Medicines Authority](#)

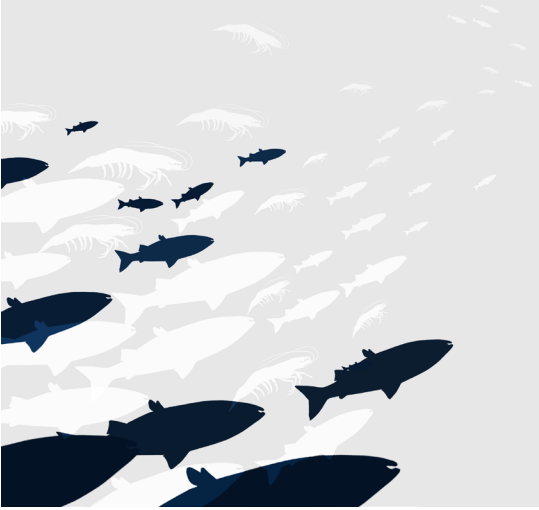
has been used. EU statutory limits are equivalent to MRL standards.

All results for Skretting Australia feeds were within the Australian and European limits.

We provide this report to keep Skretting customers informed of the status of our monitoring results.

To view previous reports, [please click here](#).

All results for Skretting Australia feeds were within the Australian and European limits.



## Definitions & Terminology

Maximum residue limit (MRL) means the maximum concentration of a residue resulting from the registered use of an agricultural or veterinary chemical which is legally permitted or recognised as acceptable to be present in or on a food, agricultural commodity or animal feed.

Extraneous residue limit (ERL) refers to a pesticide residue arising from environmental sources (including former agricultural uses) other than the use of the chemical directly or indirectly on the food, agricultural commodity or animal feed. ERL means the maximum concentration of the pesticide residue that is recommended to be legally permitted or recognised as acceptable in or on a food, agricultural commodity or animal feed.

EU limit refers to the MRL according to European Union (EU) legislation

Primary feed commodity means a pasture, grain, forage or fodder in, or nearly in, its natural state intended for use by:

(a) Farmers as stockfeed for use without further processing for livestock animals, or after silaging or similar farm processes; or

(b) Stockfeed manufacturers as a raw material for preparing compound feeds.

Compound feed is a nutritionally adequate feed for animals to be fed as the sole ration and is capable of maintaining life and/or promoting production without any additional substance being consumed.

Limit of quantification (LOQ) is the lower limit for a reliable quantitative measurement. Levels that are so low that they cannot be quantified with acceptable reliability will be reported as "below detection limit".

TEF and TEQ: The [World Health Organisation \(WHO\)](#) has established two lists of toxicity factors for dioxin and PCB congeners. These are called TEF values, (toxic equivalent factors). When a concentration is weighted with its corresponding TEF factor it is no longer called a concentration, but a toxic equivalent, a TEQ. The TEQ values have the same unit of measurement as a concentration, in this case ng/kg wet weight.

Definitions sourced from [FAO](#), [APVMA](#) and [NIFES](#) websites.

# PCBs & Dioxins

## BACKGROUND

Polychlorinated biphenyls (PCBs) are extremely persistent organic pollutants historically used as coolants, plasticisers, lubricants etc. The term “dioxins” includes polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). These are listed on laboratory reports as PCDD/F and are the main focus in terms of food safety. PCDD/Fs are unwanted by-products of chemical manufacture, bleaching processes and combustion processes.

## LIMITS

Substance	Unit	Australia <sup>1</sup>	EU/ Norway <sup>2</sup>
Dioxins (Dioxins & furans)	TEQ (WHO) ng/kg	No limit	1.75
Sum of Dioxin & Dioxin-like PCBs	TEQ (WHO) ng/kg	No limit	5.5

ng = nanogram

kg = kilogram

TEQ = Toxic Equivalent (the amount of toxin or other poison per kilogram of body weight necessary to kill an animal)

WHO = World Health Organisation (Standard)

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp

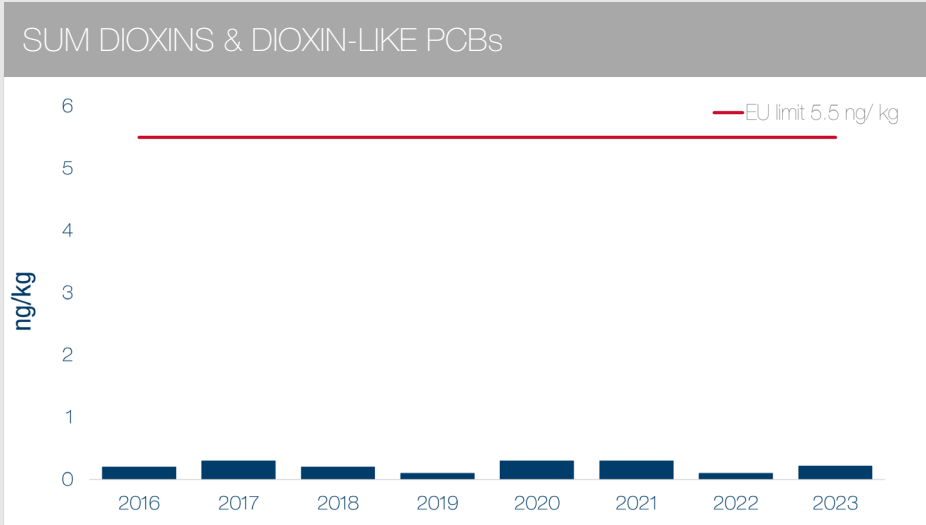
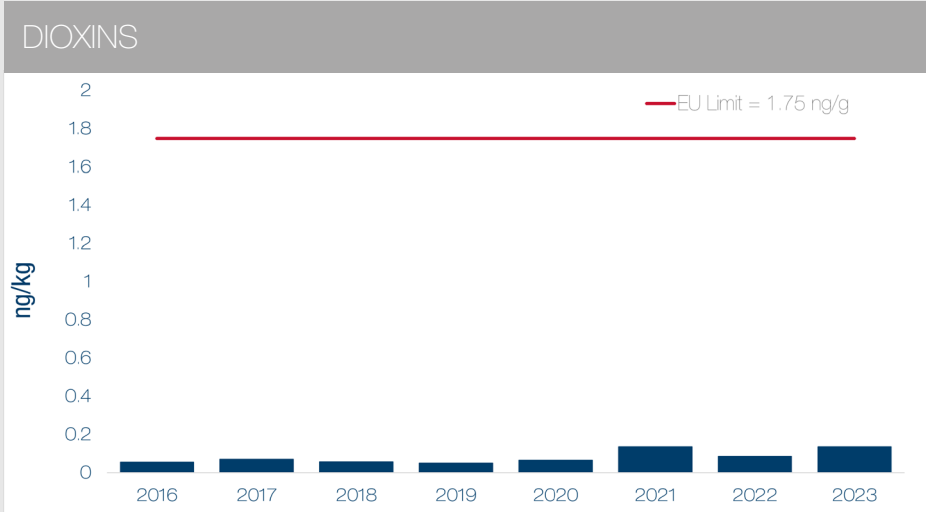
2. OJ L 91, 29.3.2012, p.18-20. Commission Regulation (EU) No 277/2012

# PCBs & Dioxins

Manufacturing of PCBs has been banned in most countries since the 1980s. Australia banned the importation of PCBs in 1975.

PCBs are usually present in much higher quantities than dioxins, but are less toxic. The most toxic PCBs are classed as 'dioxin-like' by the [World Health Organisation \(WHO\)](#). It is these 12 'dioxin-like' PCBs which the EU has set limits for in combination with dioxin residues.

Skretting Australia feeds have consistently met EU limits for PCBs & Dioxins since testing began in 2012.





# PFAS

## BACKGROUND

Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS) belong to a group of compounds referred to as per- and polyfluoroalkylated (PFAS) substances. PFOS and PFOA have been shown to be toxic to some animals, and because they don't break down they can bioaccumulate and biomagnify in some wildlife, including fish. This means that fish and animals higher in the food chain may accumulate high concentrations of PFOS and PFOA in their bodies. The toxicity, mobility, persistence and bioaccumulation potential of PFOS and PFOA pose potential concerns for the environment and for human health.

There is currently no MRL or ERL limit set in Australia or Europe for PFAS. Maximum limits are currently being evaluated by European and Australian food standards and will be included in reporting once they become available.

## LIMITS

Substance	Unit	Australia <sup>1</sup>	EU/ Norway <sup>2</sup>
PFOS	mg/kg	No limit	No limit
PFOA	mg/kg	No limit	No limit

ng = nanogram  
kg = kilogram

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp  
2. OJ L 91, 29.3.2012, p.18-20. Commission Regulation (EU) No 277/2012

Food Standards Australia New Zealand (FSANZ) have provided tolerable daily intakes TDI guidance in the absence of MRLs for PFAS.

# PFAS

In Australia, PFAS have been used in a variety of industrial processes, and in commercial and consumer products. PFOS, PFOA and related compounds are imported mainly for use as mist suppressants in the metal plating industry, hydraulic fluid in the aviation industry, as surfactants in the photography industry and as fire-fighting foams. Many articles such as textiles are likely to have also been treated with PFAS before being imported into Australia.

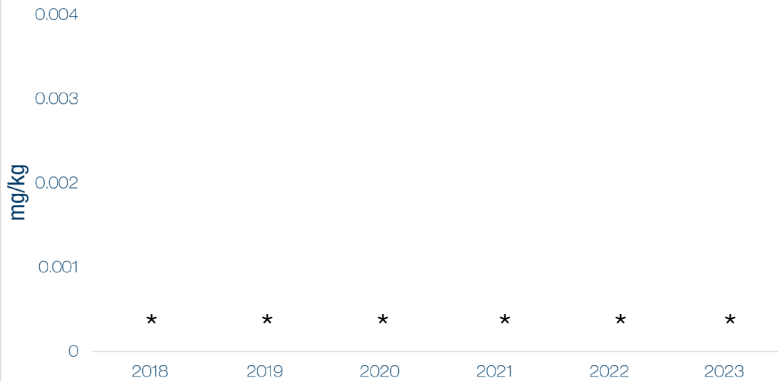
The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) has monitored PFOS and PFOA use in Australia through four national surveys, which show that these chemicals are not manufactured in Australia (2002).

PFOS and PFOA may be present in a range of imported consumer products, although many countries have phased out, or are progressively phasing out the use of PFOS and PFOA due to concerns about their persistence, bioaccumulation and environmental toxicity. NICNAS has recommended since 2002 that Australian industries should actively seek alternatives to PFASs and PFAS-related substances.

Skretting Australia had their feeds analysed by an independent laboratory to observe the levels of these undesirable substances. The subsequent results exhibited no detection for PFAS since testing commenced in 2018.

Skretting Australia will continue to monitor these substances and publically publish the results in their annual residue reports.

## PFAS



\* Below detection limit <0.001mg/kg

# Pesticides

## BACKGROUND

Pesticides have been widely and commonly used to protect crops, livestock, buildings and households from pests. Although the widespread use of pesticides posing significant health risks has been banned in many countries, several pesticides are still produced in developing countries. Many pesticides continue to be detected in precipitation, soil, sediment, biota, aquatic ecosystems and food.

## LIMITS

Pesticide	Unit	Australia <sup>1</sup>	EU/Norway <sup>2</sup>
Aldrin & Dieldrin (sum of HHDN & HEOD)	ng/g	E 10	20
DDT (sum of o,p'-DDT; p,p'-DDE; p,p'-DDT)	ng/g	E 50	50
Endosulfan (sum of alpha- & beta-endosulfan & endosulfan sulphate)	ng/g	No limit	50
Endrin (sum of endrin & delta-keto endrin)	ng/g	E 30	10
Glyphosate	mg/kg	E 200	200
Heptachlor (sum of heptachlor & heptachlor epoxide)	ng/g	E 20	10
Hexachlorobenzene (HCB)	ng/g	E 10	10
alpha-Hexachlorocyclohexane (alpha-HCH)	ng/g	No limit	20
beta-Hexachlorocyclohexane (beta-HCH)	ng/g	No limit	10
Toxaphene	ng/g	E 50	50

ng = nanogram  
g = gram

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp. 'E' denotes an Extraneous Residue Limit (ERL). All Australian ERLs are based on the value for a primary feed commodity as there is no specific MRL/ERL for compound fish feed.  
2. OJ L140, 30.5.2002, p.10. Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed.

In previous years, samples were screened for total pesticides, but from 2013 onwards each pesticide is analysed individually. The Residue Report will now show actual level, not just whether the sample was under the threshold.

# Pesticides

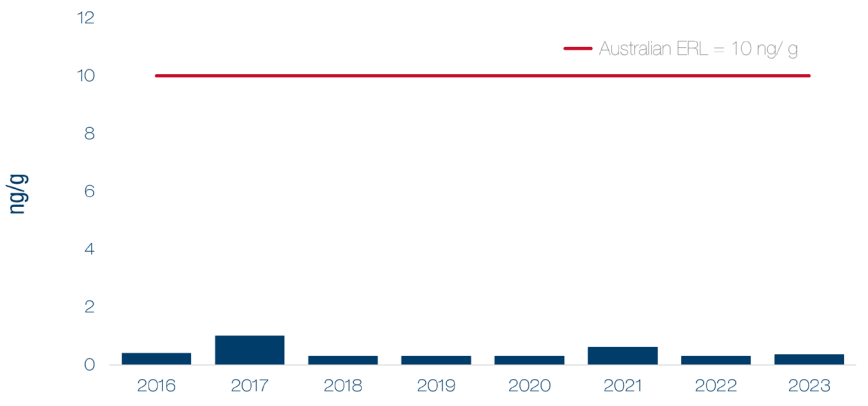
Aldrin and dieldrin (a metabolite of aldrin as well as a marketed pesticide) are both fat soluble, persistent and bio-accumulating organochlorine insecticides. (In the environment, aldrin is rapidly converted to dieldrin).

Widely used as insecticides in agriculture, the registration of the last aldrin and dieldren products in Australia were cancelled in 1994 and 1988 respectively.

Worldwide, the use of both compounds is severely restricted or banned in many countries.

Skretting Australia feeds have consistently met Australian limits for aldrin and dieldrin since testing began in 2012.

ALDRIN/DIELDRIN



# Pesticides

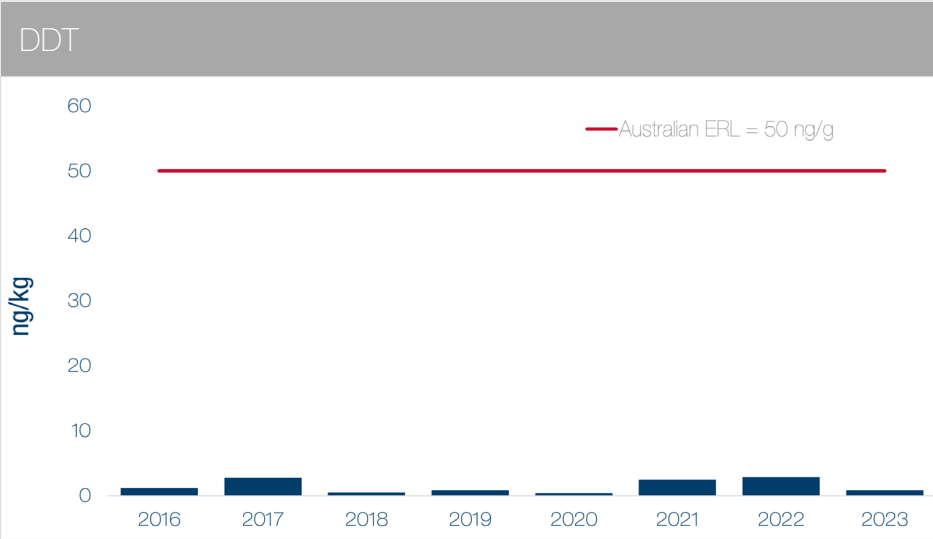
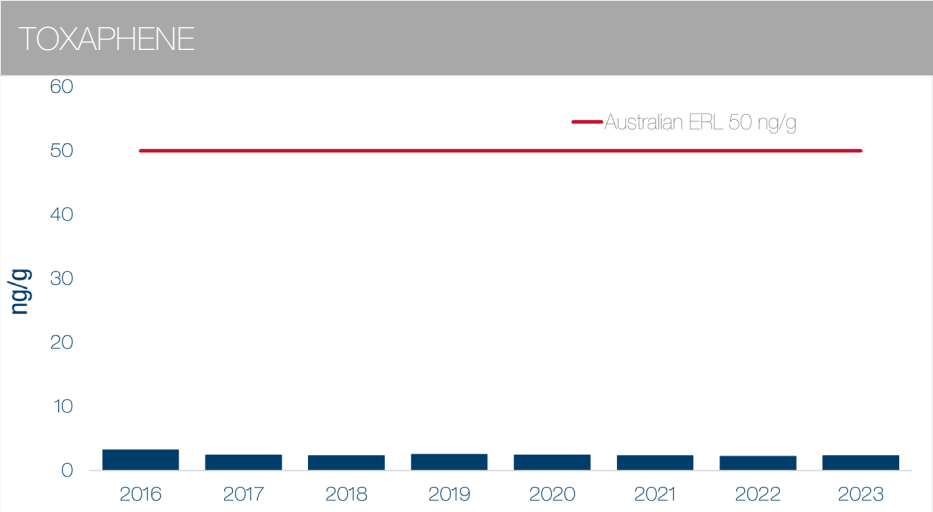
Toxaphene is a complex mixture of polychlorinated bornanes (CHBs) and other camphenes. Toxaphene was widely used as insecticides in agriculture. The registration of the last toxaphene products in Australia were cancelled in 1987.

Worldwide, the use of toxaphene is severely restricted or banned in many countries. Toxaphene is one of the persistent organic pollutant (POPs) listed in the Stockholm Convention-which aims to eliminate or restrict the production and use of POPs. The Australian government ratified the convention in 2004.

DDT is highly insoluble in water, lipophilic and persistent in the environment. Because of the lipophilic properties and persistence in the environment, DDT and related compounds are bio-accumulating and biomagnified along the food chain.

In Australia, registrations of all DDT products had been cancelled by the late 1990's (the majority of products had not been used since the mid-1980's).

Skretting Australia feeds have consistently met Australian limits for toxaphene & DDT since testing began.



# Pesticides

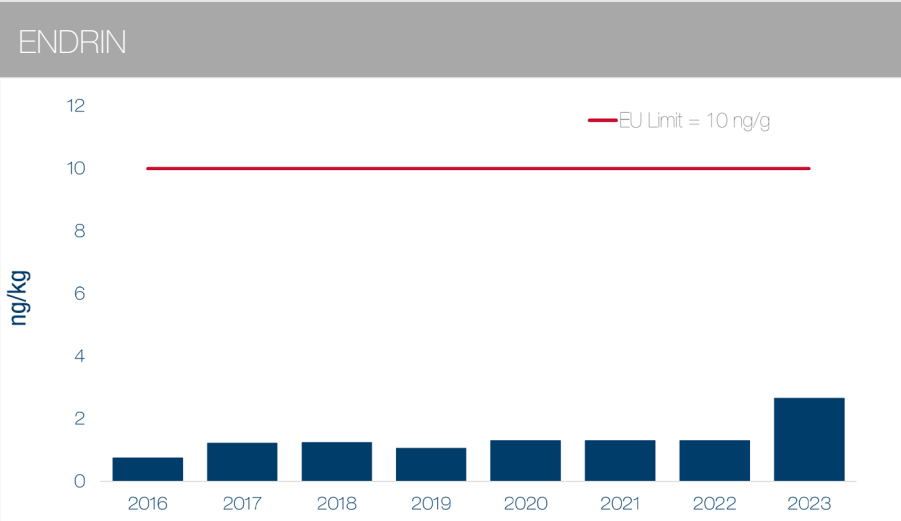
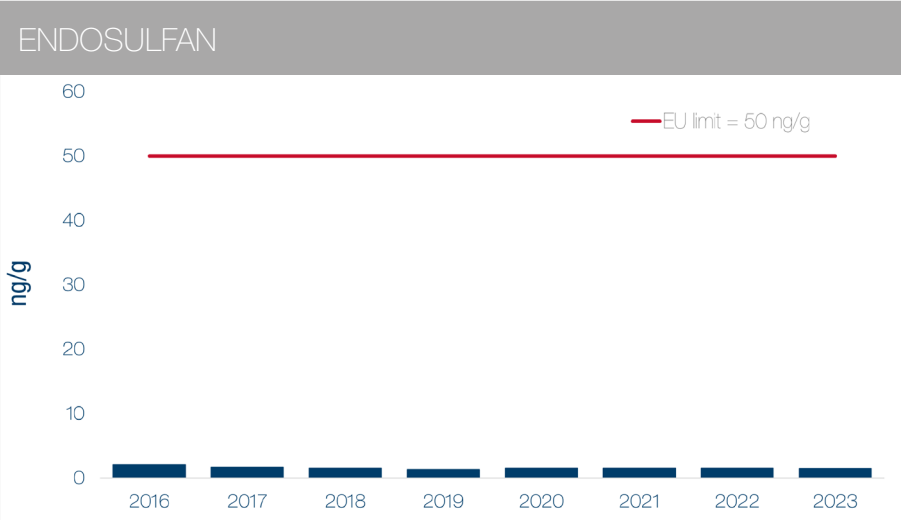
Endosulfan is a non-systemic organochlorine pesticide used in agricultural and horticultural crops for control of insects and mites.

Registration of endosulfan in Australia was cancelled in October 2010. Endosulfan is banned in Europe (2006) and currently restricted or banned in most other countries worldwide.

The last Australian-registered endrin product was cancelled in 1990. Endrin has been banned in most countries worldwide during the last 25 years.

Endrin is partly transformed in the environment into delta-keto endrin.

Skretting Australia feeds have consistently met Australian limits for Endrin since testing began in 2012.



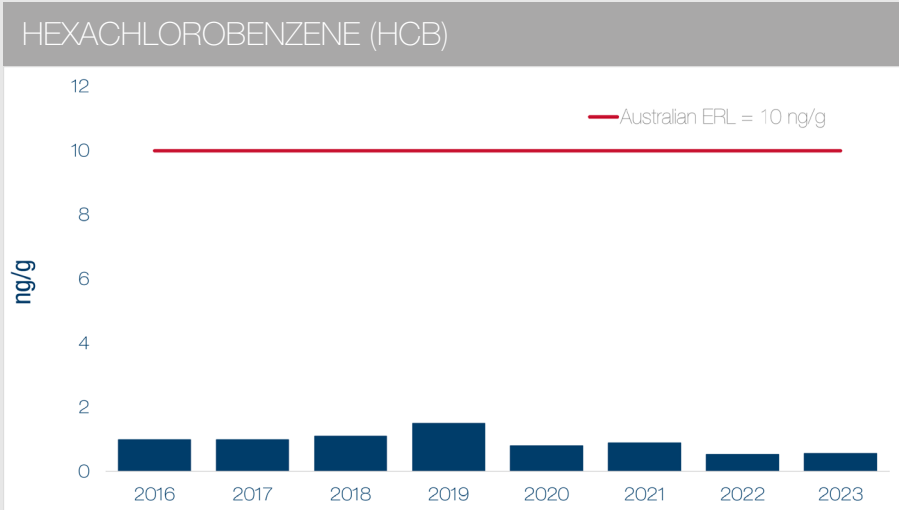
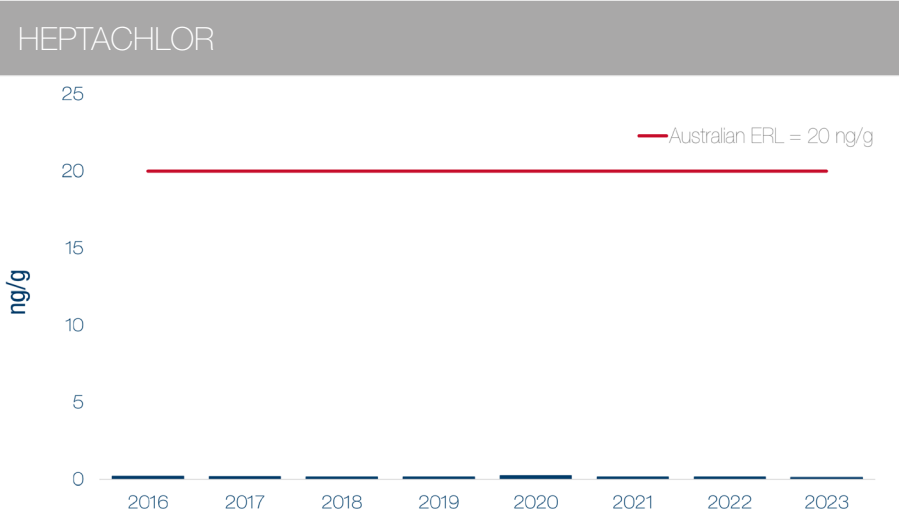
# Pesticides

The last Australian-registered heptachlor product was cancelled in 1997 (the majority of heptachlor products were cancelled by the end of 1990). Heptachlor is banned in Europe (1984) and most other countries worldwide.

In the environment, heptachlor breaks down to heptachlor epoxide and photoheptachlor. In accordance with the Australian residue limit (ERL) standard, heptachlor is reported as the the sum of heptachlor and heptachlor epoxide.

Hexachlorobenzene (HCB) is an agricultural pesticide used as a fungicide (seed disinfectant). The last Australian-registered HCB product was banned in 1987. HCB is banned in Europe (1981) and most other countries worldwide.

Skretting Australia feeds have consistently met Australian limits for Heptachlor and HCB since testing began in 2012.

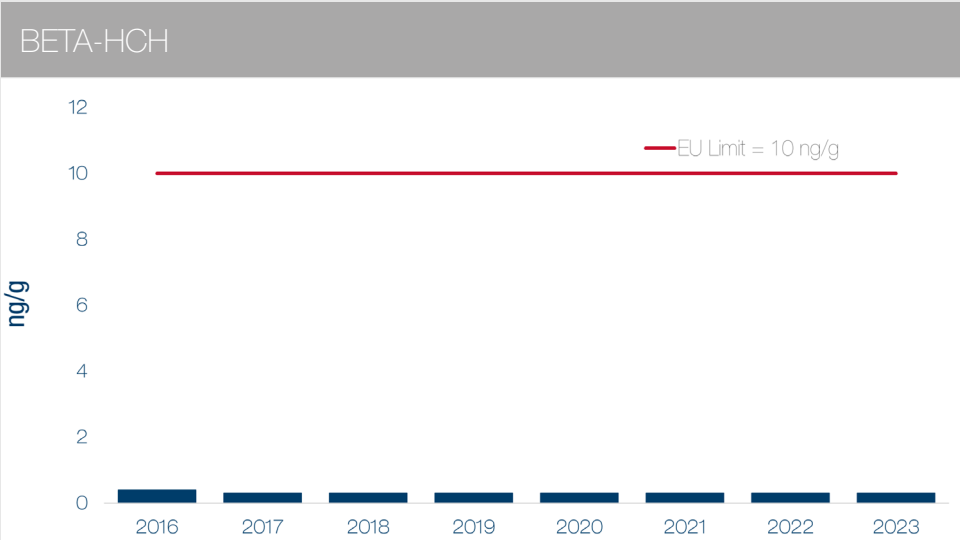
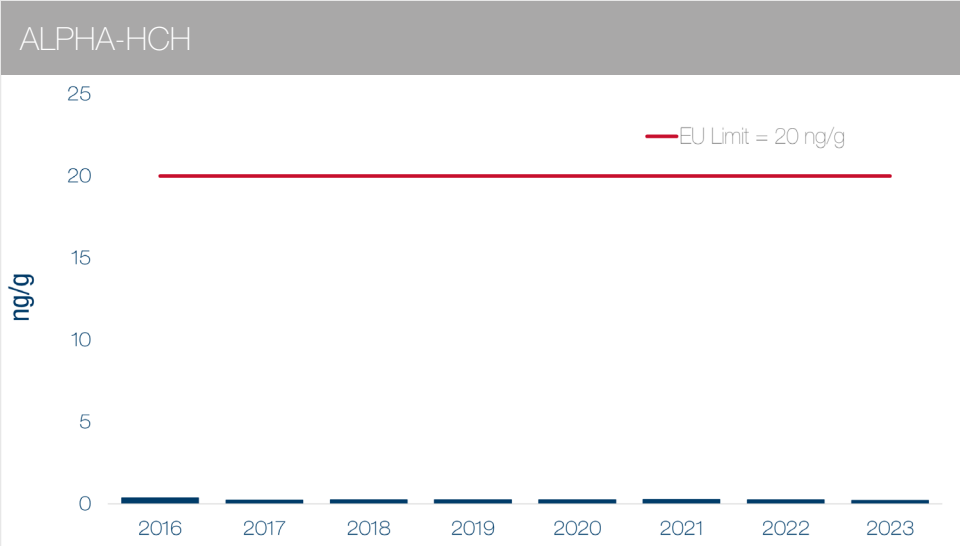


# Pesticides

Technical Hexachlorocyclohexane (HCH) was used as an insecticide worldwide. It is a mixture of isomers – the four predominant are alpha-, beta-, delta- and gamma-HCH (also known as lindane).

Technical HCH is banned in Europe (1978) and most other countries worldwide.

Skretting Australia feeds have consistently met EU limits for HCH since testing began in 2012.





# Heavy Metals

## BACKGROUND

Some heavy metals are either essential nutrients (typically iron, cobalt, and zinc), or relatively harmless (such as ruthenium, silver, and indium), but can be toxic in larger amounts or certain forms. Heavy metal pollution commonly arises from the purification of metals, and unlike organic pollutants, heavy metals do not decay. Emissions of heavy metals such as mercury, lead, cadmium and arsenic into the environment occur via a wide range of processes and pathways including the air, surface water, and soil.

## LIMITS

Substance	Unit	Australia <sup>1</sup>	EU/Norway <sup>2</sup>
Arsenic	ng/g	No limit	10.0
Cadmium	mg/kg	No limit	1.0
Lead	mg/kg	No limit	5.0
Mercury	mg/kg	No limit	0.2

ng = nanogram  
mg = milligram  
g = gram  
kg = kilogram

1. The MRL Standard: Maximum residue limits in food and animal feedstuff. APVMA December, 2012 32pp  
2. OJ L140, 30.5.2002, p. 10. Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed

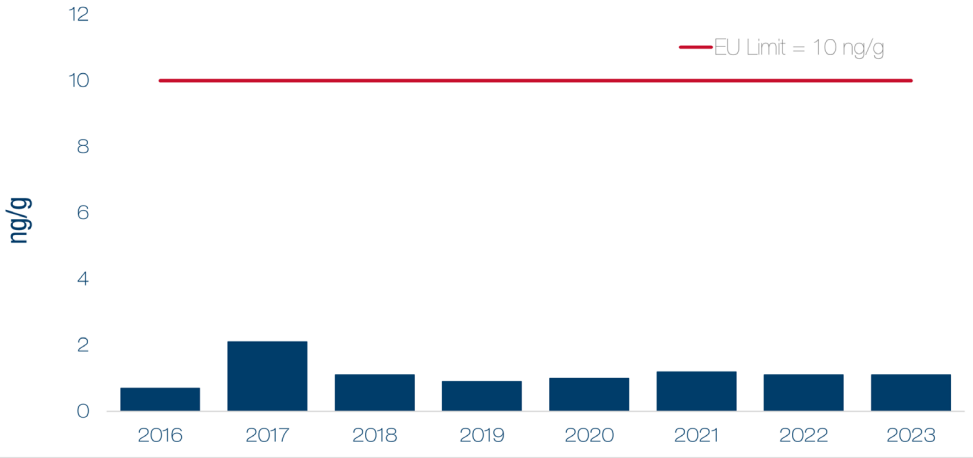
# Heavy Metals

Arsenic and its compounds are used as pesticides and in various alloys. The toxicity of arsenic is strongly dependent on its chemical form. Although inorganic arsenic is highly toxic, organic arsenic is not.

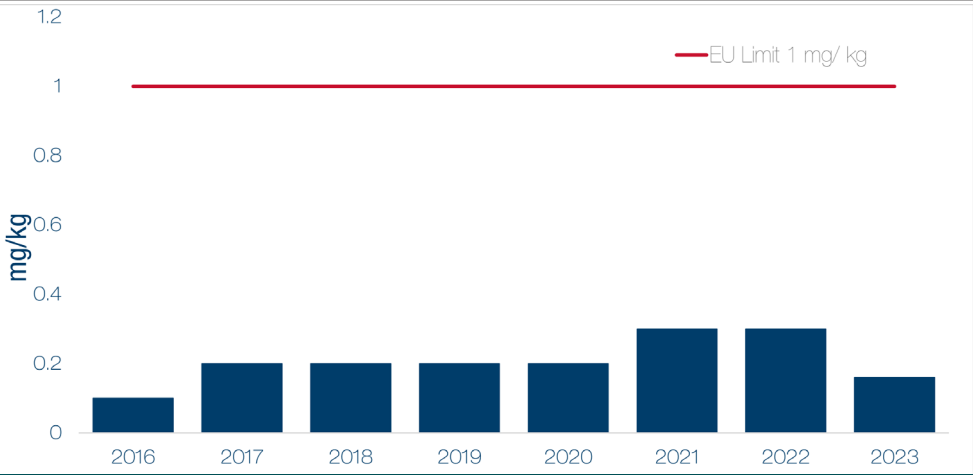
Cadmium is commonly found in its metallic form and as sulfides and sulfates. Globally, about three-quarters of cadmium is used in batteries and most of the remaining quarter is used mainly for pigments, coatings and plating, and as stabilisers for plastics.

Skretting Australia feeds have consistently met EU limits for Arsenic and Cadmium since testing began in 2012.

ARSENIC (predominately organic)



CADMIUM

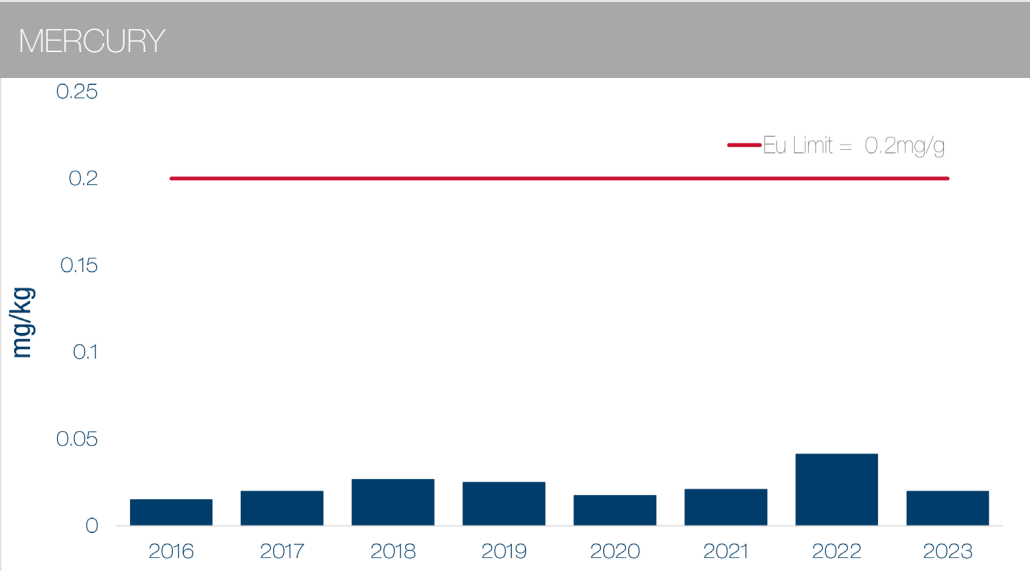
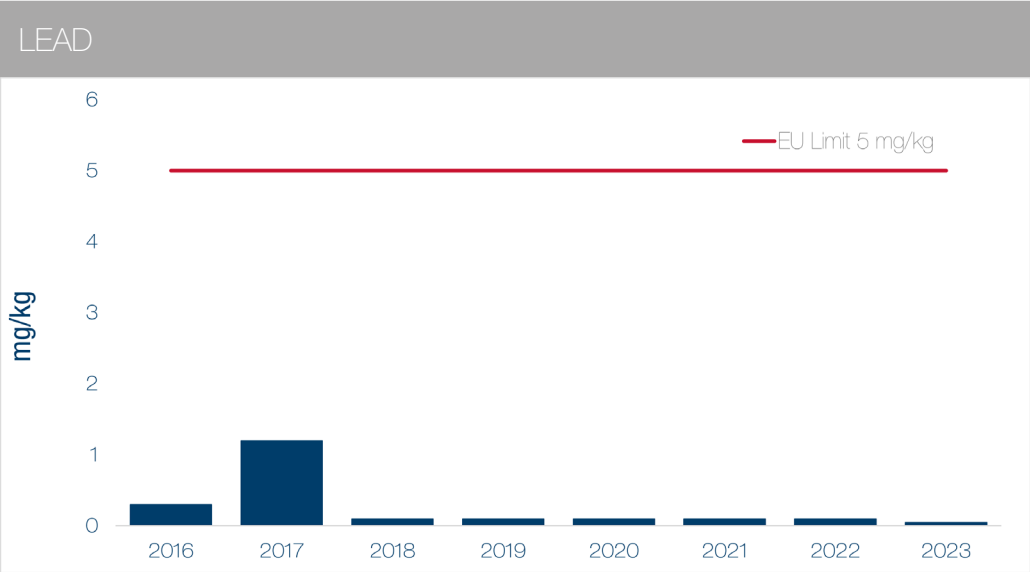


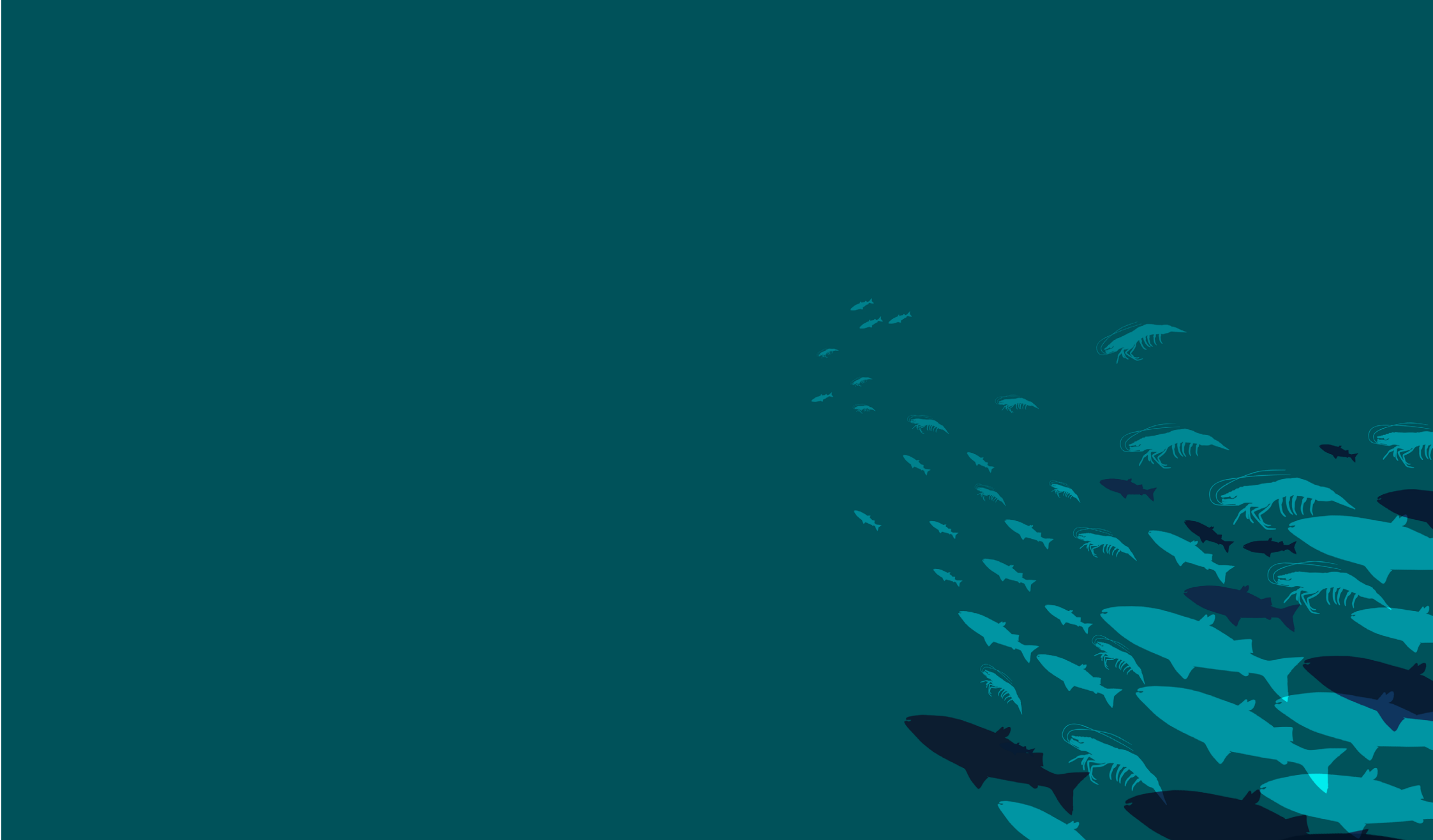
# Heavy Metals

Sources of lead found in the environment are multiple, and the metal is truly ubiquitous, being commonly found in food, water, and air. Evidence exists that lead in the environment has increased during the past 200 years.

Mercury is much more harmful to living organisms as an organic metal compound than as the element. In farmed salmon the levels of mercury are very low, almost not detectable.

Skretting Australia feeds have consistently met EU limits for Lead and Mercury since testing began in 2012.





[www.skretting.com.au](http://www.skretting.com.au)