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What is killing killer whales?

By Ella Davies Reporter, BBC Nature



Killer whales, the ocean's fiercest predators, are easily recognisable by their black and white markings.

But their future seems less clearly defined.

Marine experts are concerned about an invisible threat to the animals that has been building in our seas since World War II.

That was when industries began extensively using chemical flame retardants, such as PCBs.

These chemicals were later found to harm human health and the environment, and governments around the world banned their use in the 1970s.

But their legacy lives on in the world's seas and oceans, say biologists, posing a modern threat to animals such as killer whales, also known as orcas.

Small population

Ingrid Visser grew up watching killer whales, the largest members of the dolphin family, from the shores of her native New Zealand. She has dedicated her life to knowing more about the animals.

The island nation's orca population is made up of fewer than 200 individuals and as such is listed as threatened.

"New Zealand orca are unique as they are the only population that has so far been recognised to specialise in hunting for rays and sharks"

Dr Ingrid Visser, Orca Research Trust

"They hunt in New Zealand waters in the shallows for the rays and in deeper waters for the sharks," says Dr Visser.

"[These] orca are unique as they are the only population that has so far been recognised to specialise in hunting for rays and sharks."

But according to Dr Visser's studies, this diet could be the reason the population is not growing.

As large mammals, killer whales consume a large amount of prey.

But this position at the top of the food chain, as "apex predators", makes them particularly vulnerable to changes in their prey.

That is because orca feed on fish that in turn eat polluted prey or absorb pollution from the water. So the orca ingest all of the pollution in the chain, in a process called "bioaccumulation".

Dr Visser says her studies of the bodies of stranded orca and the sharks and rays they feed on have confirmed this fear.

"Their prey is definitely polluted - we are seeing spikes in the same chemicals as are seen in the orca," she says.

KILLER FACTS



- Adult killer whales can reach 9m in length
- They are known to hunt grey and blue whales
- Their scientific name *Orcinus orca* comes from Orcus, the Roman god of the netherworld

New Zealand orca are not the only ones living with pollution, according to Alex Rogers, Professor in Conservation Biology at the University of Oxford, UK.

"Studies have identified high levels of flame retardant chemicals in orca particularly from the Northern Hemisphere, for example from the north Pacific, particularly off Canada and the Arctic," he says.

"These chemicals have also been found at high concentrations in orca from the Southern Hemisphere."

PCBs (polychlorinated biphenyls) were banned globally from the 1970s.

In recent years, the European Union has also banned the use of PBDEs (polybrominated diphenyl ethers) in foam for furniture and electrical devices due to their potential toxicity.

"The two main groups of flame retardant chemicals, PCBs and PBDEs have a range of effects on animals including interference with thyroid function and vitamin A metabolism, negative effects on neurological and reproductive development and impacts on immune function," says Prof Rogers.

Persistent threat

But despite actions to limit use of these chemicals, also referred to as persistent organic pollutants (POPs), marine experts suggest the damage has already been done.

"If they are finding quite high levels in orcas in New Zealand it's really quite worrying for us"

Dr Paul Jepson, UK Cetacean Strandings Project

"PCBs are not water soluble, they only dissolve and accumulate in fatty tissue," says Dr Paul Jepson from the Zoological Society of London.

Dr Jepson says this fat solubility is a considerable issue for female cetaceans such as killer whales who feed their young for up to a year on high fat milk to kick-start their development.

"You get this huge maternal transfer. It's been calculated that in whales and dolphins about ninety percent or more of the mother's body burden of PCB can be offloaded, particularly to the first calf," he tells BBC Nature.

POPs are a problem that is not going away.

"Even though PCBs have been banned they're just so resistant to break down in the environment. The decline of these pollutants is happening very slowly," says Dr Jepson.

In his role as co-ordinator of the UK Cetacean Strandings Project Dr Jepson regularly comes into contact with marine mammals.

His studies into harbour porpoises, common to UK waters, have highlighted the ongoing impact of the chemicals.

"We're not really finding any decline at all in PCBs in our harbour porpoises... levels in the UK appear to have plateaued since about 1997."



Studying the predators close-up could help their future survival

Dr Jepson says that Dr Visser's findings could pose a serious cause for concern for orca worldwide, especially those in seas close to heavily populated and industrialised nations.

"Pollutant levels, particularly with PCBs, will be much higher in European waters than they would in New Zealand," says Dr Jepson.

"If they are finding quite high levels in orcas in New Zealand it's really quite worrying for us."

Little-known facts

This remains a controversial area of study however due to the elusive nature of the subjects.

Orca have the most cosmopolitan distribution of any animal, being found in every ocean around the world.

But their wide-ranging territories, predatory nature and deep-sea lifestyles have restricted long-term studies to determine population sizes.

SOURCES

There is precious little opportunity to study the animals on land either as orca rarely strand: Dr Jepson's last encounter with one on the UK coast was 12 years ago.

Not much is known therefore about the causes of orca's deaths and what, if any, pollutants are in their bodies.

Dr Visser however is determined to record New Zealand's orcas in the hope they will provide information that will help conservationists worldwide.

To do this, the scientist is literally immersing herself in the world of the killers: diving with the animals to document their behaviour and health.

Without in-depth studies of populations around the world, there will not be enough evidence to truly know whether populations are in decline.

Natural World: The Woman Who Swims With Killer Whales airs on BBC Two at 2000 BST on Wednesday, August 31.