

A GUTFUL OF PLASTIC

Australian seabirds face a new threat

Many *Wingspan* readers would have enjoyed a wonderful holiday experience on Lord Howe Island. But as **Ian Hutton** and **Dr Jennifer Lavers** point out, even this remote paradise is affected by our modern throwaway society.

An early morning walk along Ned's Beach on remote Lord Howe Island. The scene looks idyllic—waves from the turquoise ocean lapping gently on a beach of pristine white sand—easy to see why this was voted Australia's best beach in 2008.

But follow the thin line of flotsam at the high tide line and an unpleasant surprise awaits. Amongst the fragments of seaweed, small leaves from island trees, bits of dead crab skeletons, cuttlebone and the exquisite spiralled shell of the deep sea octopus *Spirula spirula*, lies something else—a colourful collection of plastic refuse. In fact we are here to measure this. Laying out a 20 m tape and counting the number of pieces of micro plastic in every 1 m block, the results are disturbing: “this one has 189 pieces”. This on an island that has World Heritage Listing, a tiny population and some of the best conservation policies in the world.

The sad truth is that the ocean is awash with plastic debris. Just about any beach in the world has large plastic items: clothes pegs, rope, balloon ties, pens, toys, and bottles that contain everything from soft drink to the latest shampoo. We may be used to seeing these, and many of us pick up and dispose of these objects, but we only see a small percentage of the plastic debris that's driven ashore by wind; the majority is still out there floating in every ocean in the world.

What we may also fail to see is the increasing quantity of micro plastic; the larger pieces of marine debris that break down into ever smaller pieces plus the ever-increasing numbers of 'nurdles', the tiny raw pellets used by the plastics industry, that find their way into the oceans. It is this micro plastic that is the focus of this phase of our project on Lord Howe Island. Beach transects measure the amounts of plastic driven ashore and provide insight into how much is in the ocean. Towing special nets behind boats around Lord Howe Island next year will allow us to measure just how much plastic there is.

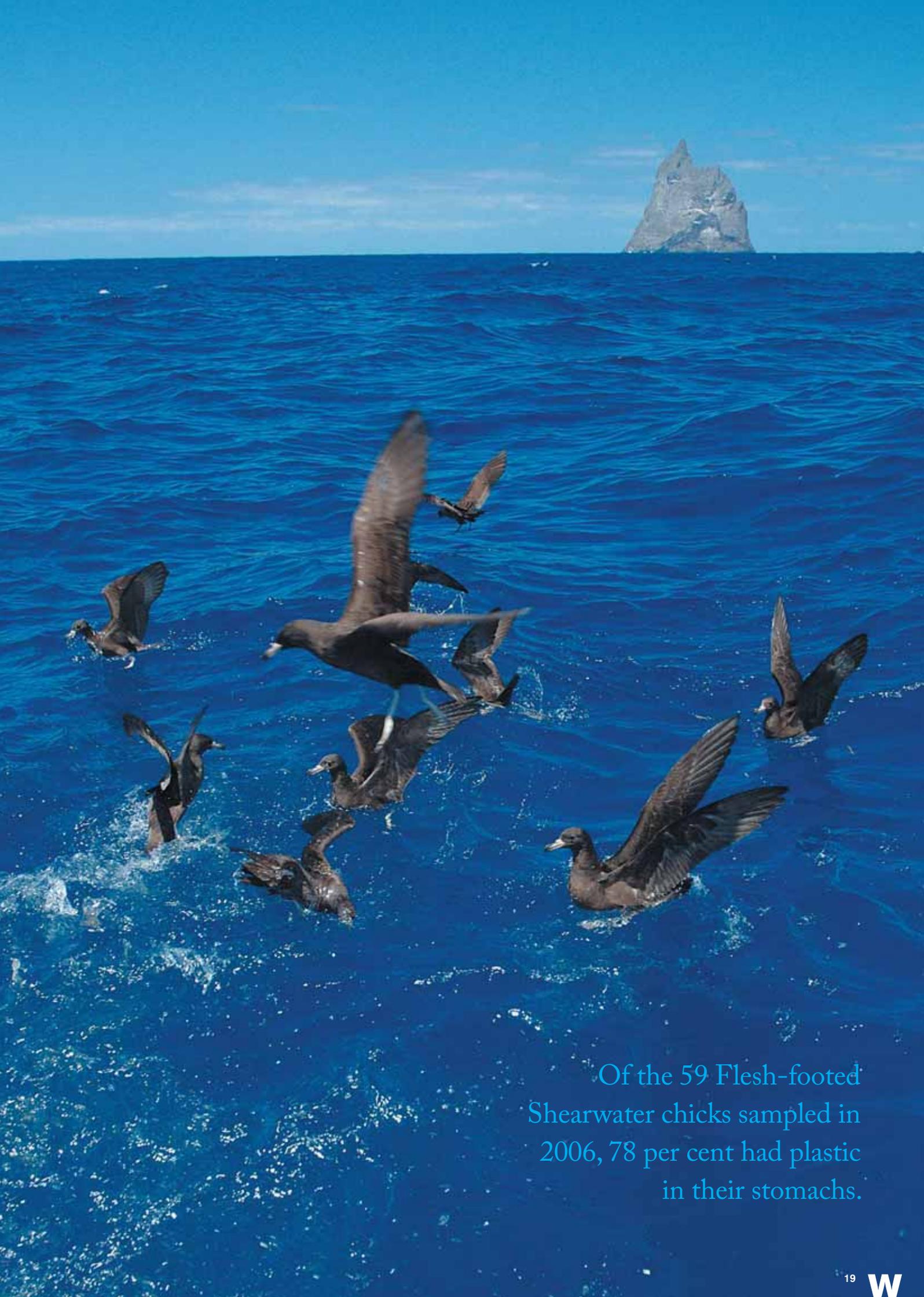
Main image, right: Flesh-footed Shearwaters feeding in the beautiful blue waters off Lord Howe Island.

Below left: Rapidly seizing food from the top layers of the water, it is easy for shearwaters to mistake floating pieces of plastic for its usual prey.

Below right: A Flesh-footed Shearwater chick on Lord Howe Island—plastic is ingested when the young bird is fed by its parents.

Photos by Ian Hutton





Of the 59 Flesh-footed Shearwater chicks sampled in 2006, 78 per cent had plastic in their stomachs.



Walking around the shearwater colonies, dead chicks and skeletons are found with stomach cavities full of plastic.

Some estimates put the amount of plastic now in the ocean at up to 200,000 pieces per square kilometre. This floating plastic is a big problem for many marine species including whales, seals, fishes, turtles and seabirds, with the Laysan Albatross the focus of international attention on marine debris in recent years. One of their main breeding colonies, Midway Island in Hawaii, is located in the centre of the now infamous North Pacific Gyre or ‘Garbage Patch’—a huge whirlpool in the ocean that concentrates the rubbish of many countries into one area. The ocean around this Pacific Gyre is where the adult Laysan Albatross feed. Here these large, graceful seabirds pick up our plastic refuse mistaking it for food and then pass it on to their chicks during feeding. Midway Island is littered with the skeletons of dead albatross chicks; their body cavities filled with plastic items picked up, including toothbrushes, disposable cigarette lighters and plastic bags.

This plastic, however, is not just a problem for the North Pacific. In recent years, the consequences of plastic pollution have become apparent much closer to home. Lord Howe Island is home to the only breeding population of Flesh-footed Shearwaters in eastern Australia. Through our research, we have uncovered the dismaying situation that the Flesh-footed Shearwaters on Lord Howe are as impacted by the negative effects of plastic as the Laysan Albatross.

Plastic ingested by seabirds can affect them in several ways. Each piece of indigestible

plastic decreases the volume in the stomach available for food, thus lowering the body condition and health of individuals and reducing their chance of survival in harsh conditions. Sharp pieces of plastic can puncture the stomach, leading to infection and death; other pieces simply accumulate inside the bird and block the intestines. The silent killer, however, is the accumulation of toxic chemicals released by ingested plastic, for example the polychlorinated biphenyls (PCBs) that leak into the bird’s blood stream reducing hormone levels and causing reproductive failure. Other plastic-based chemicals such as mercury, cadmium and arsenic damage the nervous system and can cause cancers to develop.

To understand just how fast toxins leach from plastic into a bird’s stomach, we have simulated shearwater stomach conditions in the laboratory using a glass flask with pH and temperature levels comparable to that in a seabird’s stomach. Sadly, results indicate that plastic only needs to be inside a seabird for less than 12 hours before deadly toxins put the birds at risk. Analysis of shearwater feathers from Lord Howe Island found some birds to contain more than six times the level known to be toxic. How the birds are still alive is a mystery.

Another surprise came when we looked to see where adult shearwaters were collecting this plastic. While Flesh-foots migrate through the Pacific Gyre and are likely to encounter plastic there, evidence suggests the plastic fed to their chicks on Lord

A gutful of plastic



Top left: Dr Jennifer Lavers collects small particles of plastic from a beach on the island.

Top right: This image shows the amount of plastic items found in the stomach cavity of a single shearwater.

Above: A Flesh-footed Shearwater with Ball's Pyramid in the background; this species faces a new threat to its survival.

Photos by Ian Hutton

Howe Island originates here in the Tasman Sea—and comes from Australia and New Zealand.

If too much plastic is fed to a chick, this can lead to insufficient food being taken in for proper development. This can occur through a feeling of satiation with a stomach full of plastic, or simply not enough room in the stomach for the food required for full development. Each year, walking around the shearwater colonies, dead chicks and skeletons are found with stomach cavities full of plastic. The total number of chicks that die as a result of plastic ingestion is not known, as the burrow length for this species can exceed three metres and many chicks likely die unobserved, lacking the strength to emerge from the burrow. In addition, those chicks that do survive likely suffer reduced lifespan, thus plastic pollution has the potential to impact the long-term viability of entire populations.

From 2006 to 2011, we sampled shearwater chicks about to fledge in late April by searching colonies at night when the chicks emerge to fly off. These chicks were flushed with water using a technique sometimes called water offloading or lavaging. As the stomach fills with water, plastic and other items are displaced and can be collected when the bird is turned upside down over a basin.

Of the 59 Flesh-footed Shearwater chicks sampled in 2006, 78 per cent had plastic in their stomachs. Close examination of the plastic recovered showed mostly flat pieces of broken bottles, but also golf tees, biro tops, bottle caps, milk carton tops, plastic bag ties and strapping tape.

Follow-up sampling in 2010 and 2011 has unfortunately indicated that things are getting worse for Flesh-footed Shearwaters. Of 43 chicks sampled, 96 per cent were found to contain plastic. In April 2011, a small chick was found in exceptionally poor condition weighing 50 per cent (or 400 g) less than other chicks of similar age. The next morning the chick was dead and was subject to examination by dissection. Over 200 pieces of plastic were recovered from the stomach. Sadly, this chick had survived more than 80 days inside its burrow, slowly being fed plastic items dumped by humans out of carelessness and collected by its hard-working parent.

We are continuing research into many areas associated with the issue, including levels of contaminants in the shearwaters and monitoring the beaches and ocean around Lord Howe Island as an indicator of the quantity of plastic in the Tasman Sea.

The lethal consequences of plastic pollution for wildlife, especially seabirds, warrants global attention. Plastic is a global product which requires coordinated effort and worldwide awareness to encourage government action to minimise plastic waste entering the oceans and explore ways of removing plastic from the oceans. Through increasing public awareness and demand, individuals can encourage governments to legislate for compostable plastic in containers that have been traditionally made from petroleum. Already in the USA, Pepsi Cola and Coca Cola are developing compostable plastic bottles for their products, changes which resulted from consumer demand.

It's clear that the choices we make as individuals do a lot to help. Consider refusing plastic bags at shops, seeking out and supporting proactive companies that sell their products in compostable bottles and using a stainless steel container instead of buying bottled water. If you enjoy beach walking, take a bag and remove plastic items; lobby your member of parliament about this issue; if you do use conventional plastic items, ensure you sort and place in recycle bins; consume less plastic; and encourage others to do the same. And finally, if you join a Lord Howe Island Birdweek tour in November or March, you can take part in the beach plastic monitoring program.

Ian Hutton is a tour leader and curator of the *Lord Howe Island Museum* and **Dr Jennifer Lavers** is a Research Fellow, *Institute for Marine & Antarctic Studies* and a Zoologist at the *Tasmanian Museum & Art Gallery*.

Further reading:

Hutton, I., Carlile, N. and Priddel, D. 2008., 'Plastic Ingestion by Flesh-footed Shearwaters, *Puffinus carneipes* and Wedge-tailed Shearwaters *Puffinus pacificus*', *Papers and Proceedings of the Royal Society of Tasmania*, Vol 142 (1) 2008.

Bond, AL, and Lavers, JL. 2010., "Contemporary trace element concentrations in Flesh-footed Shearwater (*Puffinus carneipes*) feathers from across their breeding range", *Archives of Ecological Contamination and Toxicology*.

www.jennifer.lavers.org and www.lhimuseum.com