

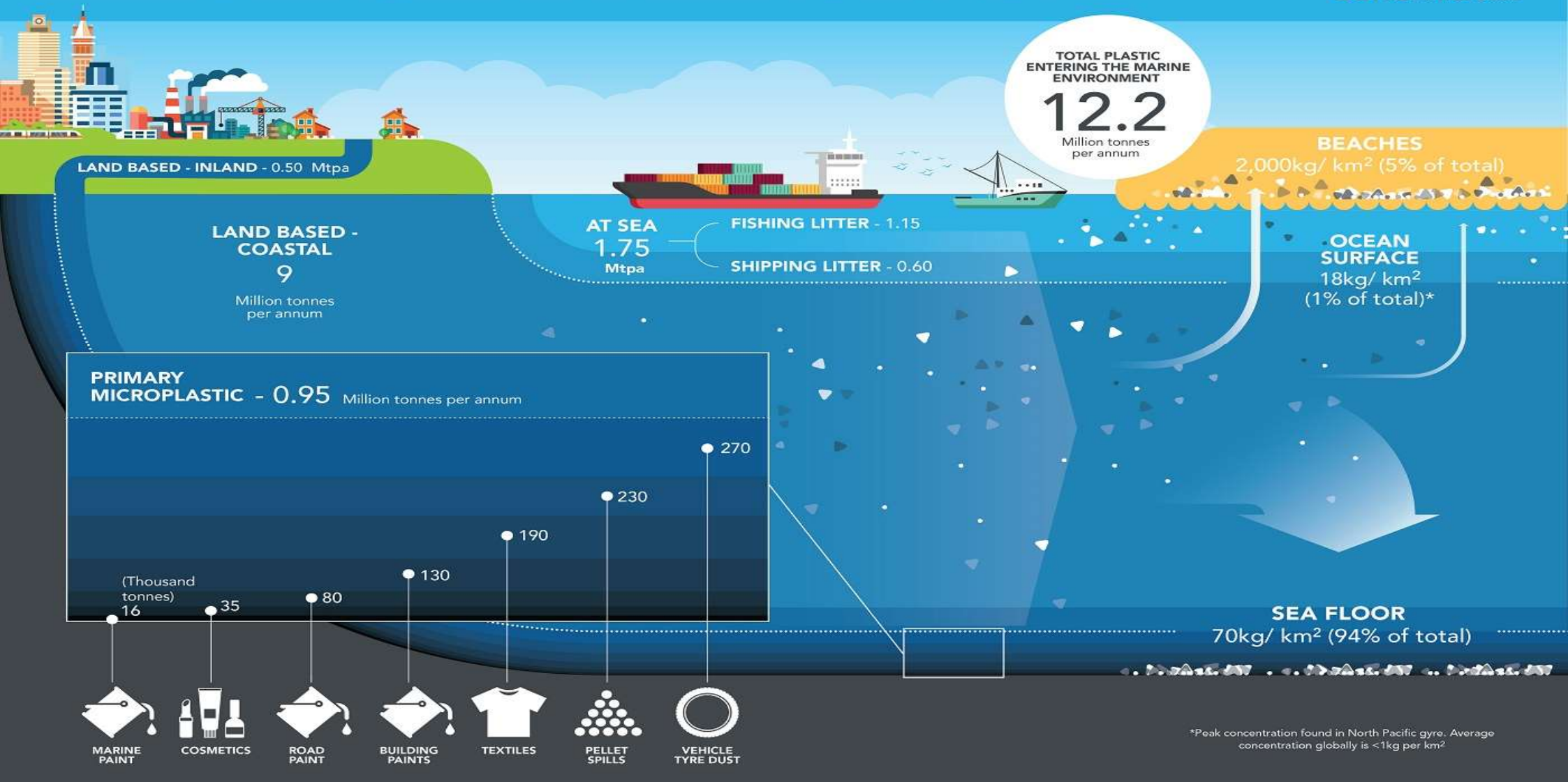
No Plastic Oceans



**SETTING A BASELINE FOR MONITORING SOUTHERN
HEMISPHERE OCEANIC MICROPLASTIC POLLUTION**

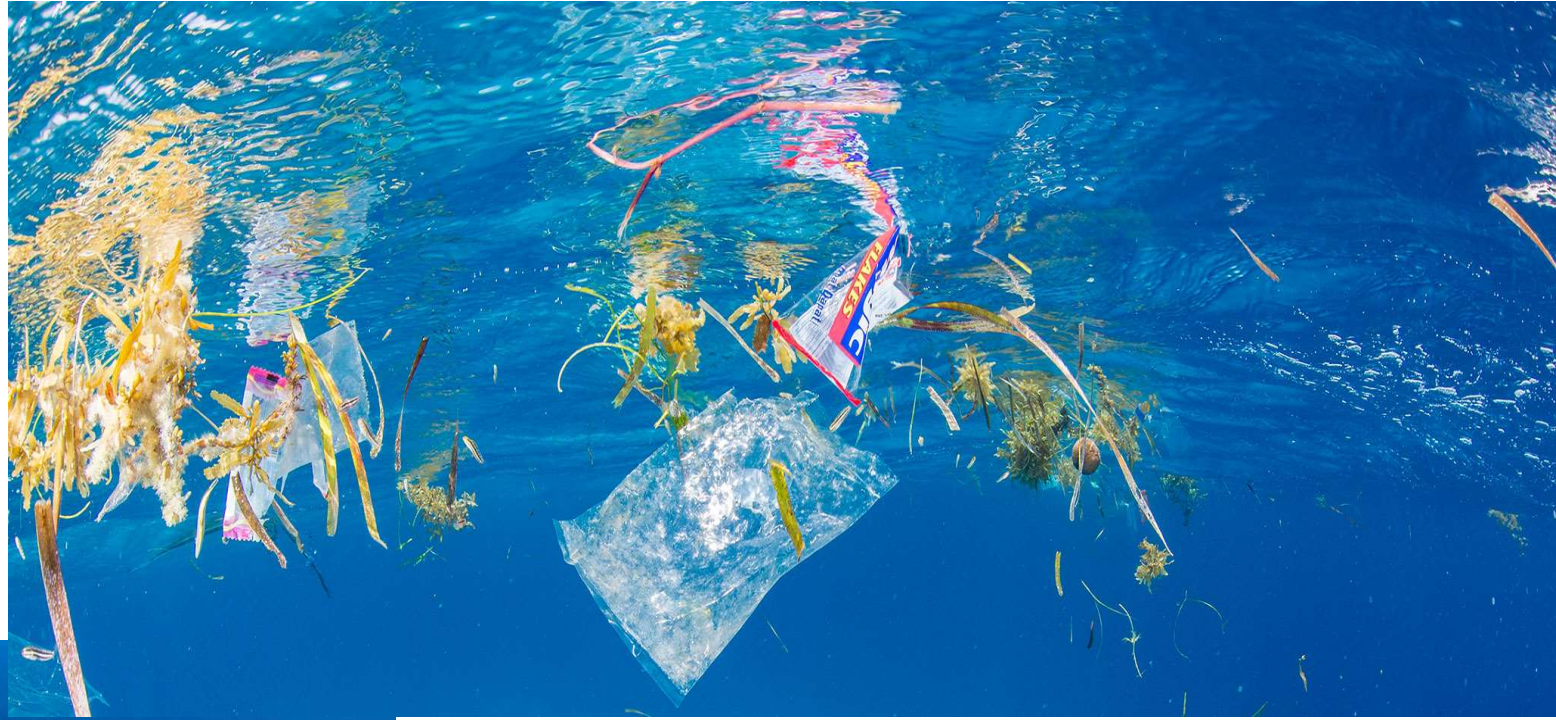


PLASTICS IN THE MARINE ENVIRONMENT: WHERE DO THEY COME FROM? WHERE DO THEY GO?



*Peak concentration found in North Pacific gyre. Average concentration globally is <1kg per km²

**IT MAY START
AT THE
TOP**



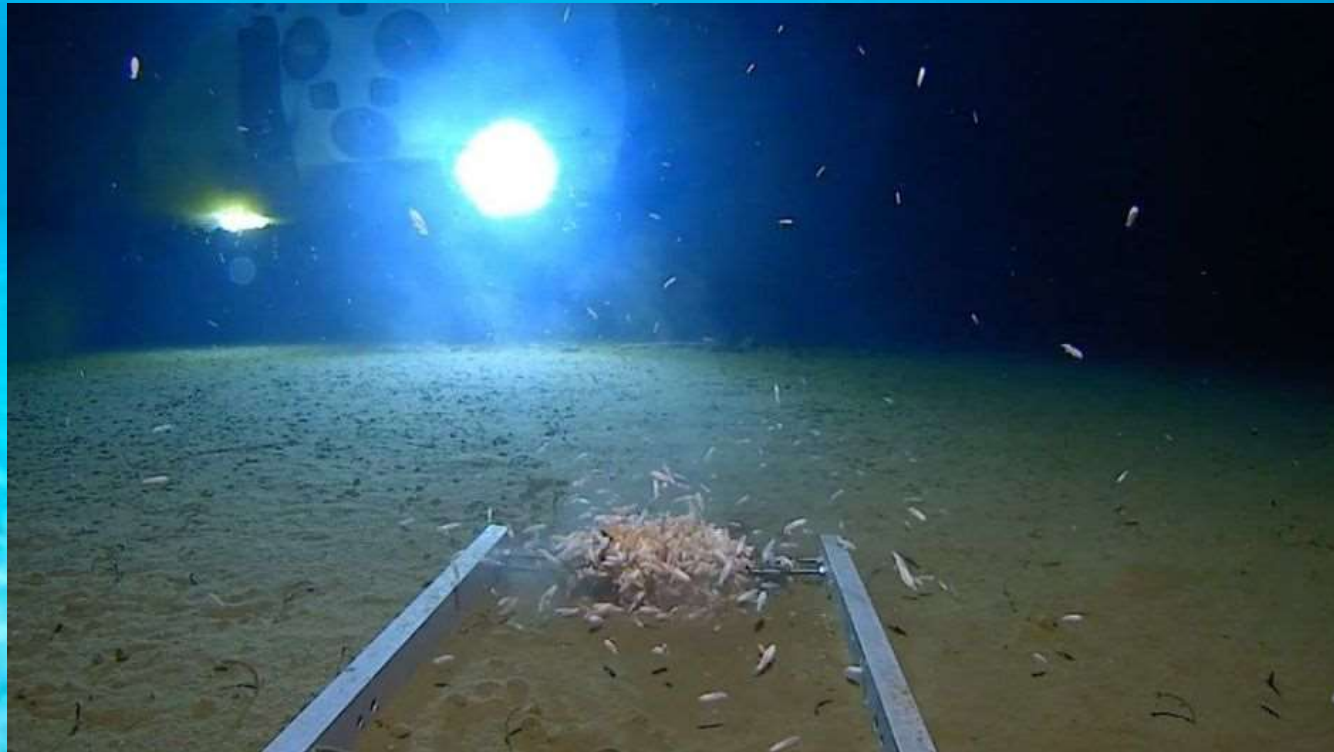
**BUT IT
ENDS AT THE
BOTTOM ... FOR A
THOUSAND YEARS OR MORE**

Explorer recounts making the deepest ocean dive in history

Nekesa Mumbi Moody, Wednesday, May 15, 2019

NEW YORK (AP) — Taking the hours-long journey to what is believed to be the deepest point mankind has visited in any ocean was a complicated one, and for Victor Vescovo, it meant being constantly on the alert as he monitored his state-of-the-art vessel.

But when he reached **10,928 meters** into the Challenger Deep in the **Mariana Trench** of the Pacific Ocean, Vescovo ... there was also an unsettling find — trash, particularly **plastic, in the deepest part of the water.**



How Much Oceanic Plastic?

Plastic Location	Approach	Study Basis	Approximate expanse of marine location	Approximate average litter density	Global Estimate (Tonnes)
Floating	Sea surface sampling data and modelling	Eriksen et al. (2014) ¹² , Cózar et al. (2014) ¹³	361m km ²	0.74 kg/km ²	0.27 million ¹³
Beach	Beach sampling data prorated by length of coastline	The Ocean Conservancy (2012) ¹⁴ , Ryan et al. (2014) ¹⁵ , Smith et al. (2013) ¹⁶	1.4m km	1,013 kg/km (2,000kg/km ²)	1.4 million
Buried under beach sand	Proportion of beach surface to buried litter applied to beach sampling data.	Kusui and Noda (2003) ¹⁷	0.52m km	110 kg/km	0.057 million
Sea Floor	Sea floor sampling data prorated by area of sea surface, assumed to approximate area of sea floor.	Pham et al. (2014) ¹⁸	361m km ²	70 kg/km ²	25.3—65million
Total					27—66.7 million

Effects of microplastics (< 1 mm)

A growing concern for park managers is the presence of microplastics and particularly plastic nurdles in many park locations ... including remote areas such as Wilsons Promontory... These materials are ... have potential to **cause significant harm to feeding chicks, and pose a particular risk to seabird colonies.**

Parks Victoria, Australia

Abundance of Microplastics

In north-west Australia, The Australian Institute of Marine Science has detected **small plastic particles and fibres in the most remote marine environments.**





Risk to Marine Life

The risks of marine plastic pollution to marine life, ecosystems and fisheries are uncertain.

At present it is not possible to rank the risks posed by marine plastic pollution in the marine environment (internationally or nationally) against more comprehensively studied pressures such as climate change or land-based pollution.



Picture: Archipelagos Institute

The Australian Senate Environment and Communications References Committee

Toxic tide: Toxic tide: the threat of marine plastic pollution in Australia

98% of Laysan albatross chicks from Midway Atoll National Wildlife Refuge **contained marine plastic debris in their stomachs multiple handfuls ...** of unidentified plastic, bottle caps, Styrofoam, beads, fishing line, buttons, chequers, disposable cigarette lighters (up to six per bird), toys, PVC pipe and other PVC fragments, golf tees, dish washing gloves, highlighter pens, medical waste and light sticks.

Dr Heidi Auman, Submission 190, p. 1.

Studies showed **79 per cent of fleshfooted shearwater chicks contained some ingested plastic**, fed to them by their parents who picked this debris up while foraging over the Tasman Sea.


Mr Ian Hutton, Submission 69, p. 1.



‘Over 70% of loggerhead turtles found dead in Queensland waters have ingested plastic’.

Wildlife Preservation Society of Queensland

Picture AMCS

A close-up photograph of a woman's face in profile on the left, looking towards the right. A hand is holding a small oyster shell with its lid open, revealing a piece of food inside, possibly a small oyster or a garnish. The background is a plain, light gray color.

**In a 100 g serving of oysters, 50 particles
would be consumed.¹**

*1. Van Cauwenberghe L and Janssen CR, 'Microplastics in bivalves cultured for human consumption', *Environmental Pollution*, 193, 2014, pp. 65–70.*

Laboratory experiments which involved fish being fed microplastic found there were **'cellular and tissue level disruptions'. A 'difference in cell growth means a cancer'.**

Dr Britta Denise Hardesty, CSIRO, Committee Hansard, 26 February 2016, p. 4.

Humans may ingest microplastics through the consumption of seafood. A study conducted on Belgian mussels concluded that approximately **300 plastic particles (or 1.5 µg) would be consumed in a 300 g serving of mussels.**

Source: See Bouwmeester H, Hollman PCH, Peters RJB, 'Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology', Environmental science and technology, 49(15), 2015, pp. 8932–9847.

It was assumed ingested plastic would simply pass through the digestive system. Now there is **'abundant evidence that when...microplastics are inhaled or ingested they pass from the point of entry into the circulatory system'.**

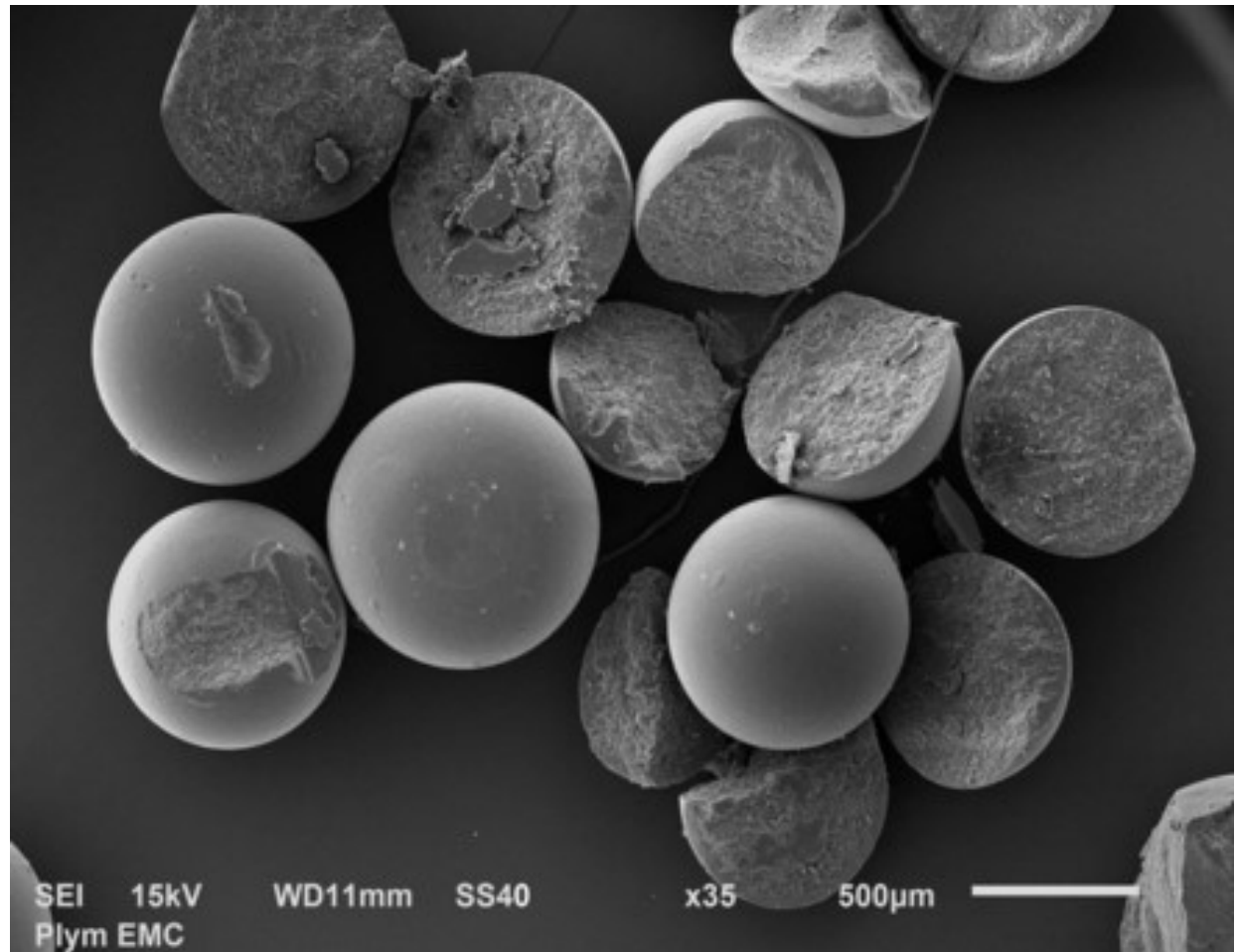
Dr Mark Browne, Committee Hansard, 18 February 2016, p. 6.

Once in the circulatory system, microplastics can be stored for a long time.

Dr Mark Browne, and co-authors Professor Tony Underwood, Professor Gee Chapman, Professor Emma Johnston, Submission 21, p. 3.

In humans, particles between 0.16 μm and 150 μm have been found to **translocate through the intestinal wall, mainly through lymphatic tissue.**

Hussain N, Jaitley V, and Florence AT, 'Recent advances in the understanding of uptake of microparticulates across the gastrointestinal lymphatics', Advanced Drug Delivery Reviews, 50, 2001, pp. 107–142 in Van Cauwenberghe L and Janssen CR, 'Microplastics in bivalves cultured for human consumption', Environmental Pollution, 193, 2014, pp. 65-70.



Polyethylene beads from a cosmetic product and shown in an electron micrograph. Image courtesy of Adil Bakir and Richard Thompson (Plymouth University, United Kingdom).

Microplastics have large surface area to volume ratios, thus absorbing large...quantities of chemicals, which can make them extremely toxic'.

The Senate Environment and Communications References Committee, Australian Parliament

Medical research into drug delivery systems has shown that the smaller the particle, the greater the rates of transfer.

Dr Mark Browne, Committee Hansard, 18 February 2016, p. 11



The effects of the movement of microplastics into the circulatory system of animals can include 'inflammation, fibrosis, breaks in DNA, sometimes mortality ...'

Dr Mark Browne, Committee Hansard, 18 February 2016, p. 6

Microscopic surface animals such as this Zooplankton ingest microplastics. *Picture: Matthew Cole, Environmental Science and Technology Journal*

No Plastic Oceans

The *No Plastic Oceans* voyage will collect ocean samples to be analysed by Curtin University for the purpose of **setting a baseline for future monitoring of southern oceanic microplastic pollution.**

Picture: The Guardian



Sample Collection

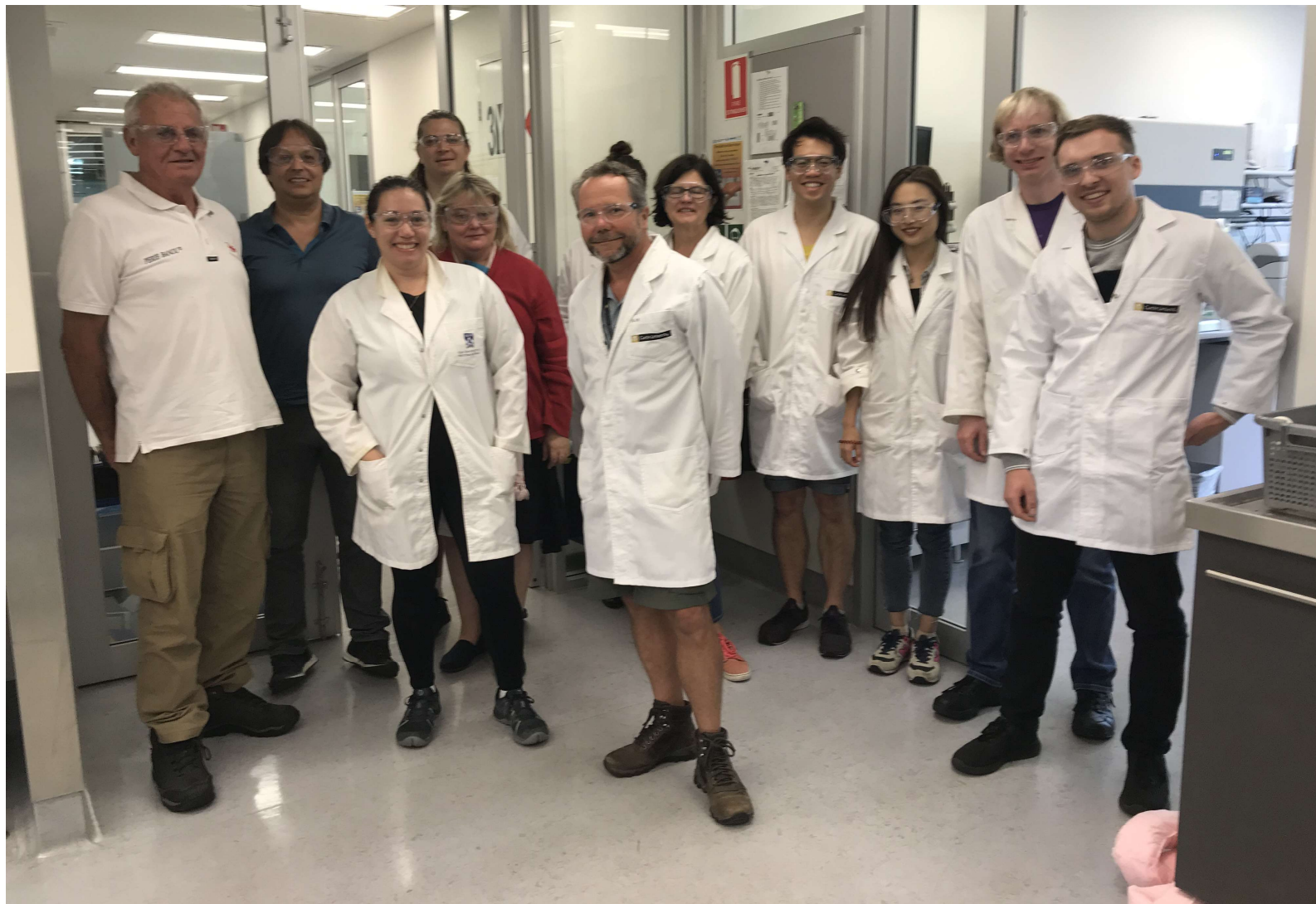
One litre of ocean water is collected each day and stored in a stainless steel bottle. In port the samples are processed using a Membrane Filter Technique which is a method of analyzing aqueous samples. The samples are filtered to extract material for laboratory testing by the research team.

A small microbiology pump is used to pull each water sample through a membrane filter. The filters from that leg of the voyage are dried and despatched to Curtin University's Organic & Isotope Geochemistry Centre in Perth.



Sentino Microbiology Pump

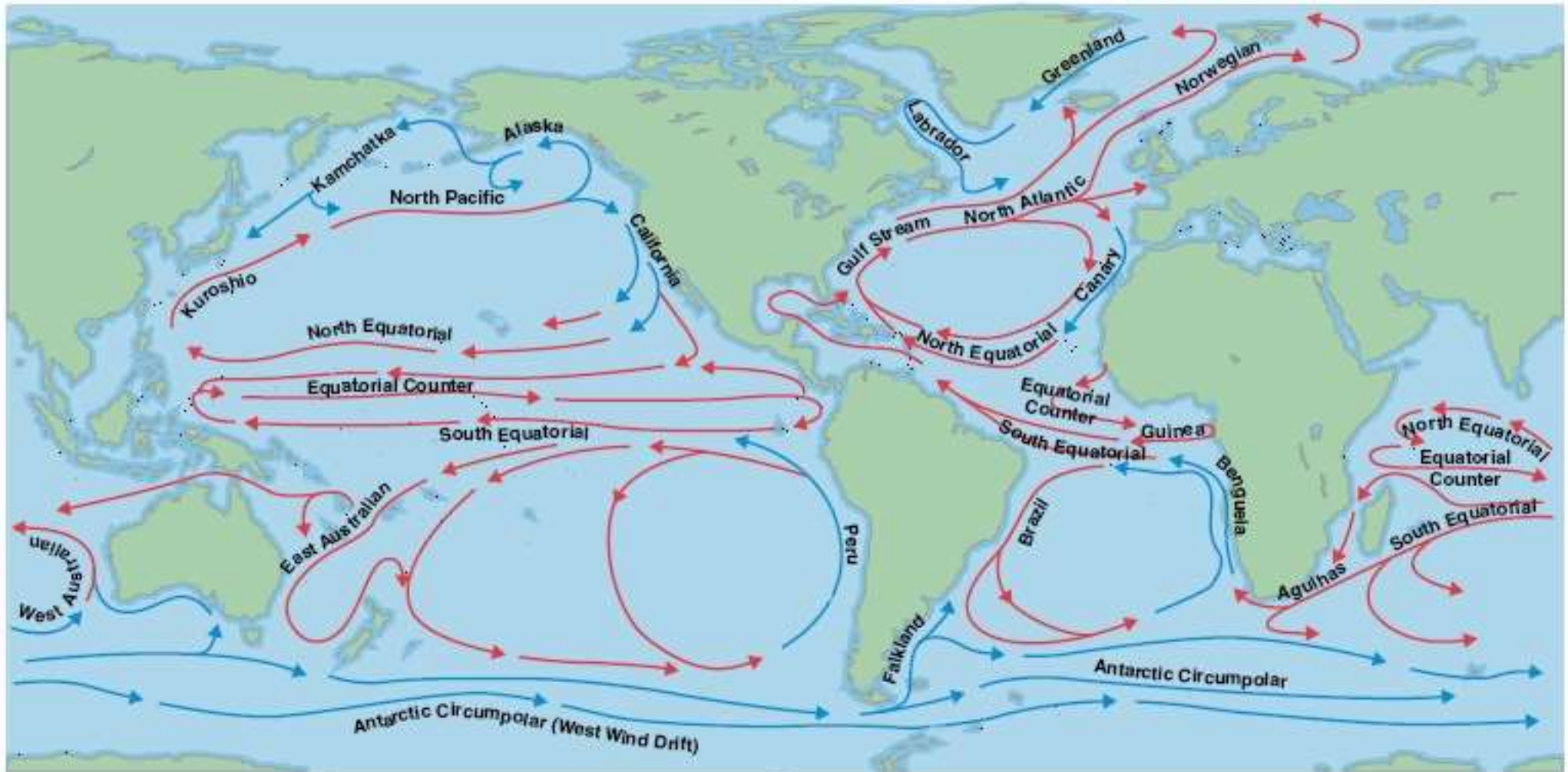
The Research Team



Curtin University Organic & Isotope Geochemistry Centre

- Prof Kliti Grice
- A Prof Marco Coolen
- Alan Scarlett
- Alex Holman
- Peter Hopper

Planning the Route – Using Major Global Currents

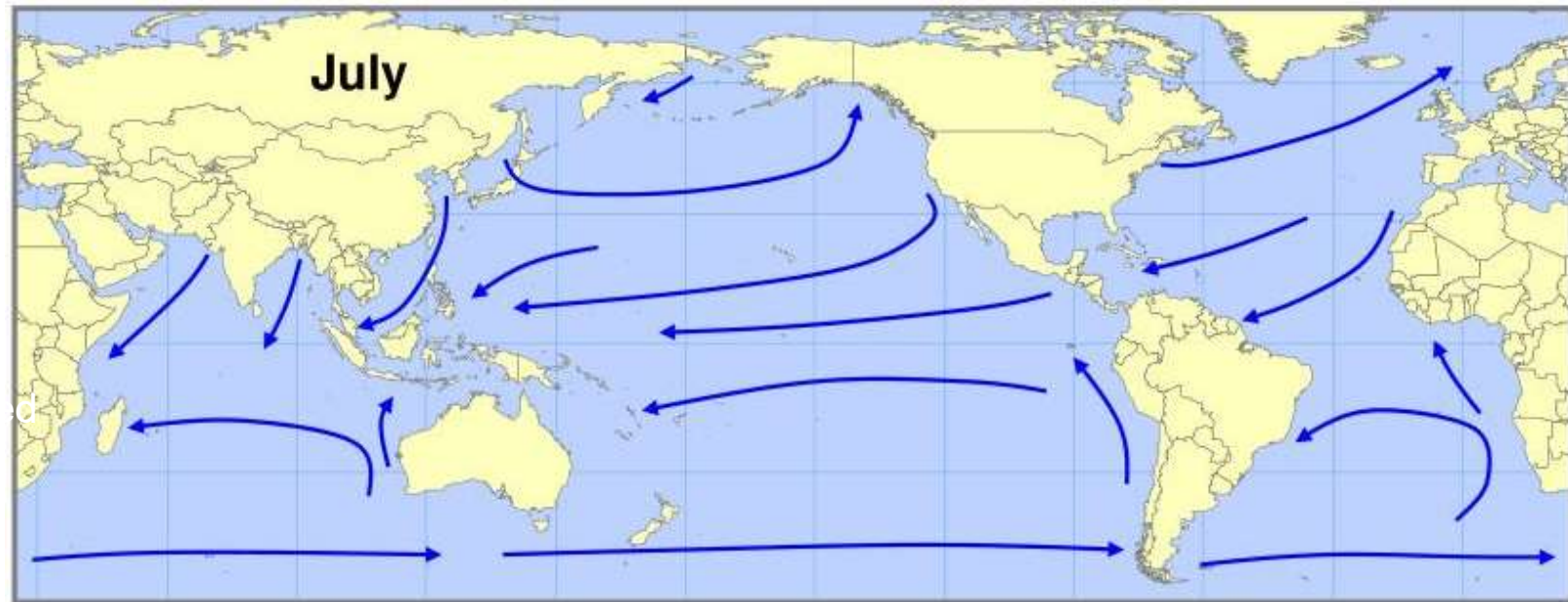
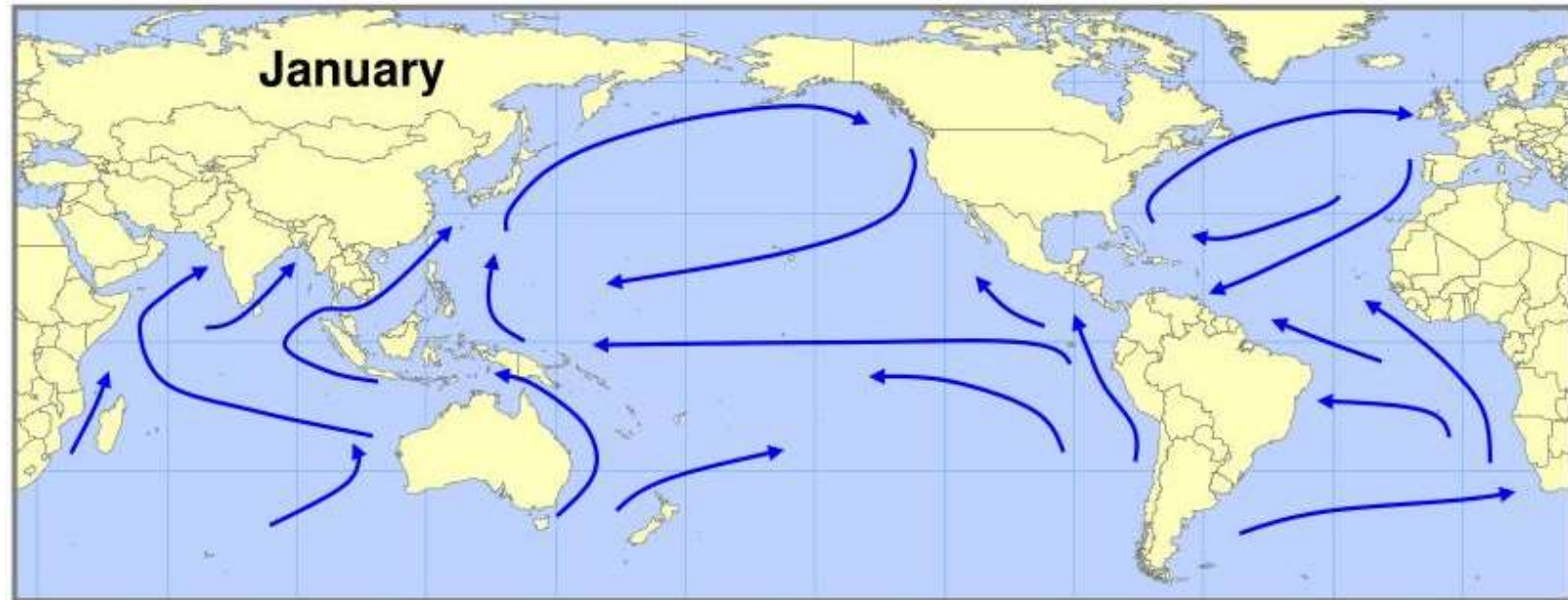


→ Warm-water current

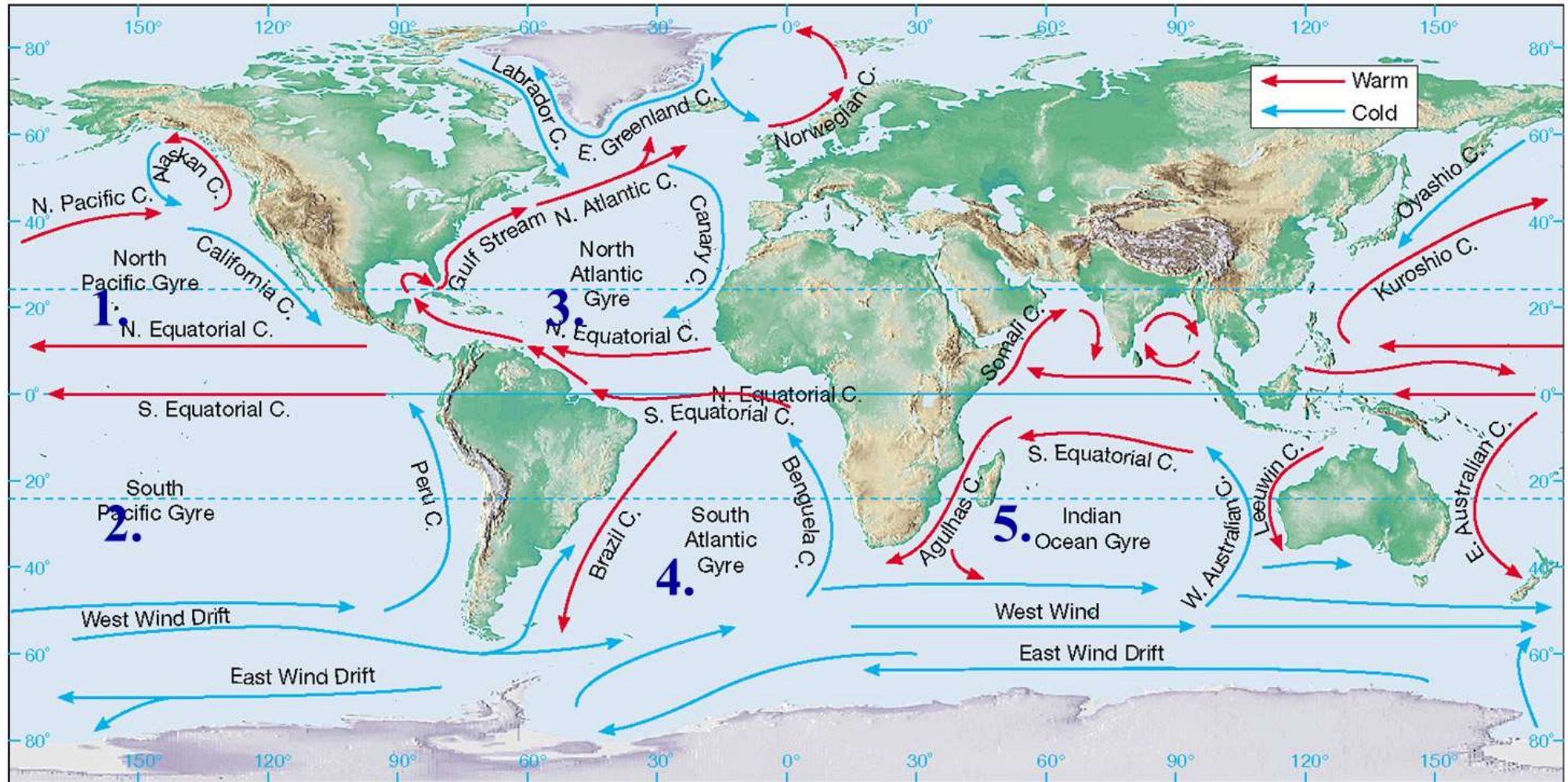
→ Cold-water current

Planning the Route - Using Major Global Winds

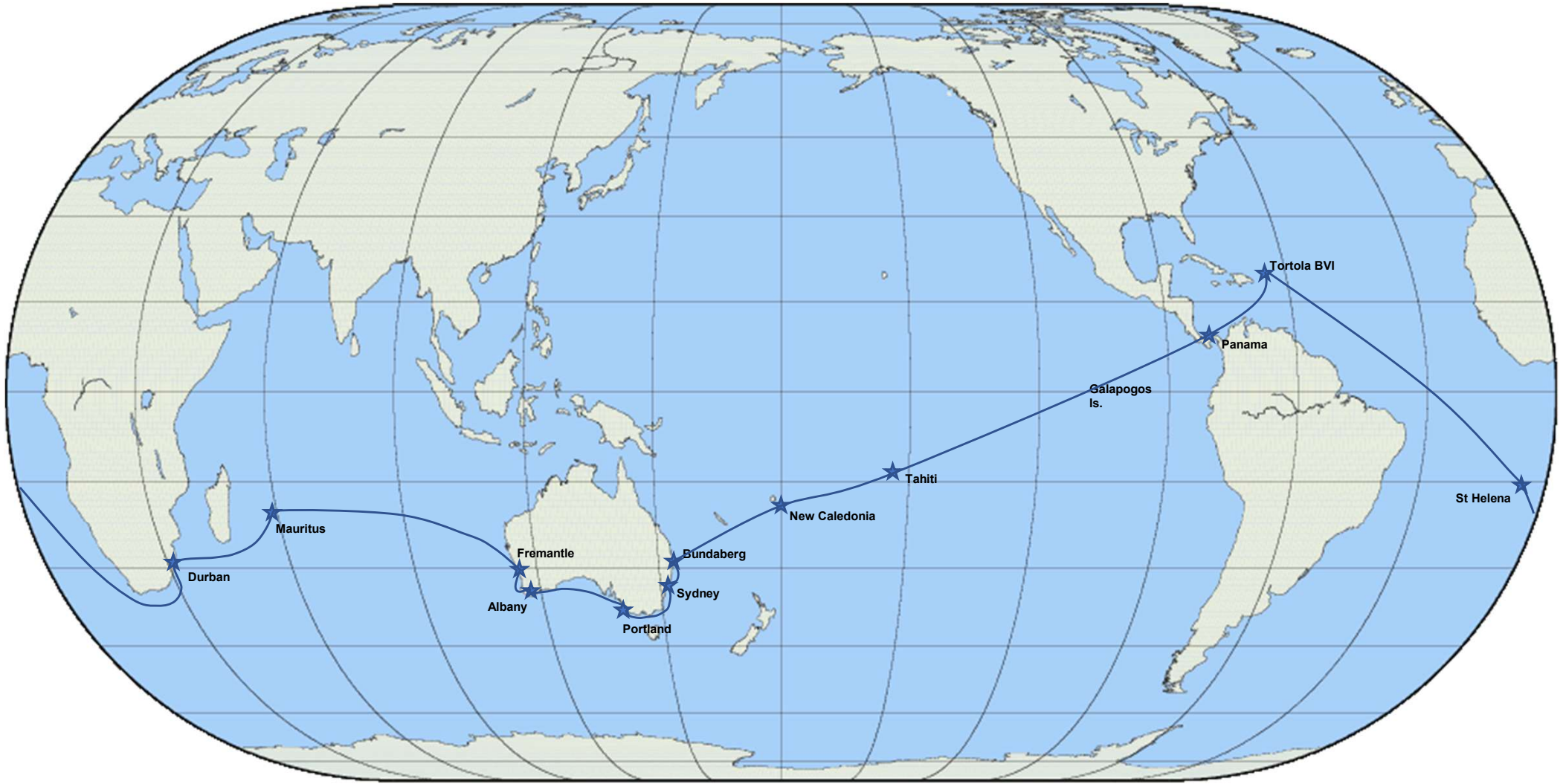
- Sailing east to west
- Predominantly in the southern hemisphere
- Jan-Mar Atlantic
- Jun-July Pacific
- Aug East Australia
- Sept Southern
- Oct-Nov Indian



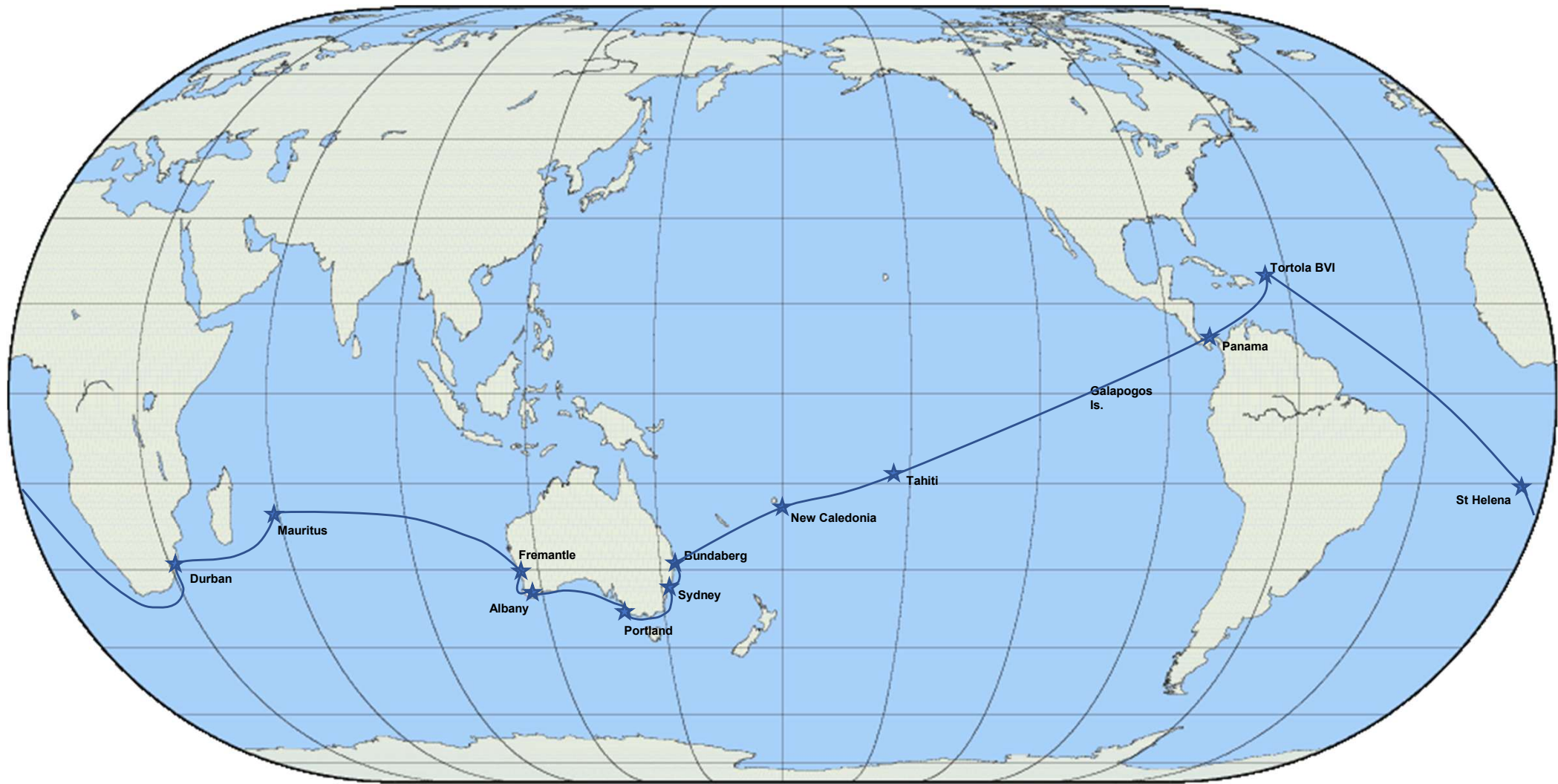
Avoiding the Gyres



Route Map



Route Map & Schedule



Jan'19 Dec'19 Nov'19 Oct'19 Sept'20 Aug'20 July'20 June'20 May'20 Apr'20 Mar'20 Feb'20

The Skipper – Jon Sanders OBE, AO – Awards and Records

- 10 solo global circumnavigations
- Cruising Club of America Blue Water Medal (without date)
- Australian Sailing Hall of Fame
- Longest distance sailed continuously by any vessel at 131,535 km
- James Cook Award
- Epic Achievement Award
- Advance Australia Award
- Chichester Award
- Fellow of the Australian Institute of Navigation
- Single-Handed Sailor's Hall of Fame



The Vessel – Perie Banou II



Sparkman & Stephens 39

- Displacement 8.5 tonnes
- Length: 39'
- Beam: 12'6"
- Mast height: 48'
- Draft: 6'6"
- Mast: Aluminium twin spreader masthead rig
- Motor: 50hp Yanmar
- Aires auto steering
- Year built: 1971
- Immediate self righting
- 3 Global circumnavigations