Pumice arrives delivering 'vitamin boost' to the reef

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Professor Bryan recovering pumice from the Tonga August 2019 eruption. Credit: QUT

The giant pumice raft created by an underwater volcanic eruption last August in Tonga has begun arriving on the Australian eastern seaboard,

delivering millions of reef-building organisms that researchers say could be a 'vitamin boost' for the Great Barrier Reef.

Associate Professor Scott Bryan, who has been studying the impact of pumice rafts for nearly 20 years, was part of an international team that earlier this year used underwater robots with cameras and sampling gear to collect material from the volcano near Tonga that produced the raft that at one stage was twice the size of Manhattan.

The unnamed volcano, which is known only as Volcano F or 0403-091, became the center of international headlines last year when Shannon Lenz's video footage of the giant pumice raft, and the first-hand accounts of Australian sailors Michael Hoult and Larissa Brill, went viral.

Pumice, a lightweight bubble-rich rock that can float in water, forms when frothy magma cools rapidly.

Professor Bryan said the pumice had started arriving on Australia's shoreline by April, and had spread out along an area from about Townsville to northern New South Wales.

"Pumice rafts alone won't help mitigate directly the effects of climate change on the Great Barrier Reef," Professor Bryan said.

"This is about a boost of new recruits, of new corals and other reef-building organisms, that happens every five years or so. It's almost like a vitamin shot for the Great Barrier Reef."

Professor Bryan published world-first research in 2004 of a previous eruption from the same volcano and last month published research in the journal *Frontiers in Earth Science* examining pumice rafts following the 2012 eruption of the Havre volcano.

Professor Bryan described the process of the pumice raft boosting the Great Barrier Reef as part of a "very ancient process" in which oceans and volcanoes have likely combined to transfer marine life around the Earth for hundreds of millions of years.

"This shows that the Great Barrier Reef has connections to coral reefs that are thousands of kilometers further east," he said.

"In terms of the health of the Great Barrier Reef, it's also important that these distant reefs are taken care of."

Professor Scott Bryan recovering pumice. Credit: QUT

Earlier this year, Professor Bryan was part of an international research team, including Professor Matt Dunbabin from QUT's Center for Robotics, which received funding from the National Environment Research Council UK (nerc.ukri.org/funding/availabl … earchgrants/urgency/) to explore the underwater volcano and examine the eruption site.

"It was really our first chance to go and explore the summit of this underwater volcano," Professor Bryan said.

"We were able to send underwater robots down with cameras and sampling gear to collect material from the actual volcano that produced this pumice raft last year.

"It's allowed us to see what these volcanoes look like underwater.

"It's a volcano that's getting close to breaching the surface and will become an island in years to come.

"We've been able to see how life has come back to the summit of this volcano after this eruption, and see that restoration of life," he said.

"One of the advantages of our trip to Tonga is that for the first time we've been able to collect samples from the vent, from the seafloor so soon after the eruption."

Professor Bryan now has four groups of pumice from the August eruption to study and compare: the pumice collected from the sea by the Australian sailors shortly after the eruption; the pumice that sunk directly at the eruption site; pumice that washed up in Fiji a month later, and the pumice that has traveled more than 3000 km to land on Australia's coastline.

"We don't understand why some pumice sinks during the eruption at the location and others can float for many months and years on the world's oceans," Professor Bryan said.

"This will help us understand the mechanisms and dynamics of these explosive eruptions and understand better why these eruptions produce potentially hazardous pumice rafts."

Professor Bryan published world-first research in 2004 of a previous eruption from the same volcano. The research shows how pumice waves from the south-west Pacific could not only be something that helps the Great Barrier Reef but also supported earlier ideas on how the reef was formed in the first place.

Professor Bryan has been collecting pieces of pumice from the eruption as they arrive on the beaches in south-east Queensland, and is examining the marine organisms to determine when in the journey they latched on for the ride.

"Overall, we've identified more than one hundred different species attached to the pumice—a tremendous diversity of plants and animals," Professor Bryan said.

"Anything that is looking for a home out in the ocean tends to find a home on this pumice.

"Each piece of pumice has its own little community that has been transported across the world's oceans—and we have had trillions of pieces of this pumice floating out there following the eruption.

"Each piece of pumice is a home, and a vehicle for an organism, and it's just tremendous. The sheer numbers of individuals and this diversity of species is being transported thousands of kilometers in only a matter of

months is really quite phenomenal."

Professor Bryan said the tools to track pumice rafts had changed dramatically since he began exploring this area of research.

"How I got into this was walking along a beach in 2002 and seeing a line of pumice that had washed up on the shore thinking this had come from an eruption but I don't know where," he said.

With this most recent eruption, unlike in 2002, he was able to work with QUT spatial scientist Dr. Andrew Fletcher to use high-resolution daily satellite images to follow the pumice raft for weeks after the eruption.

Part of the research project ahead will be to examine the chemical composition of the pumice from the 2019 eruption, and compare it to the pumice produced in the 2001 eruption.

"Given the volcano erupted 18 years ago, we want to know whether this is left-over magma from 2001 that has erupted now, or is it a totally new batch of magma that has arrived at the volcano causing the eruption," Professor Bryan said. "This can then give us insights into how volcanoes work and what the triggers are for eruption."

More information: Joseph Knafelc et al, Defining Pre-eruptive Conditions of the Havre 2012 Submarine Rhyolite Eruption Using Crystal Archives, *Frontiers in Earth Science* (2020). DOI: 10.3389/feart.2020.00310

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