

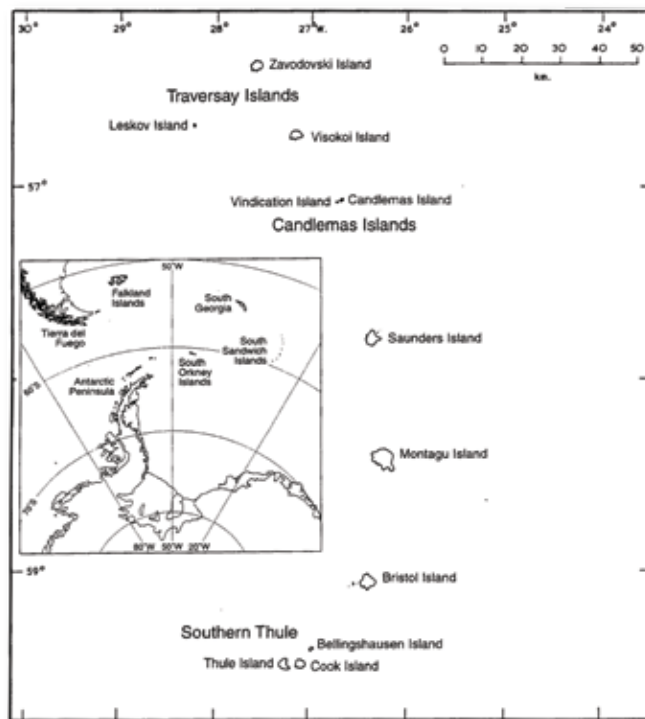
South Sandwich Islands: Sailing for Science in the Wake of Cook and Bellingshausen

by Skip Novak, Great Lakes Station

Nattriss Point, Saunders Island. We spent three days—based from the beach inboard of the rocks—busy with penguins, volcanology, and glaciology. Photo by Tom Hart.



TOP: The author and Mario Potocki pulling in Kieran Wood—and equipment—through the surf on Bellingshausen Island. This was much safer than landing the inflatable on the boulder beach.



The islands in the Southern Ocean are some of the most remote sailing destinations on the planet. Environmentally fragile, almost all of these subantarctic outliers are terrestrial protected areas within marine protected areas, where visits by cruisers are off limits. Pelagic Expeditions was granted the privilege to visit the South Sandwich Islands chain from the U.K. Foreign Office to conduct baseline surveys in four different science disciplines.

THE RULE OF THUMB when doing these tricky inflatable beach landings is to hang in above the surf line for a good ten minutes to watch the sets coming through. Maybe we were a bit premature, but I gave Thomas Geipel, our boat driver, the thumbs up to take the Bombard C5 ashore. We surfed into the cobbled beach, but before we could turn the boat around, it was flooded by the next breaking wave, our survival gear floating to the surface in dry bags as we snatched them out in waist-deep water and ran them up above the surf, stumbling like drunks, slipping and sliding on the football-size boulders. “Beach” was definitely a misnomer.

Having bailed out the C5, we pushed Thomas into a back wash, but he was caught by a breaker beam on and came close to capsizing. Only his aggressive and expert boat handling saved the day, and he made it back out to *Pelagic Australis*, rolling heavily in mist in the wide mouth of the bay a half-mile offshore.



LEFT: Handling the inflatable during a beach landing at Saunders Island. If the surf gets any worse, the team resorts to wet landings with a line system. RIGHT: Tom Hart, flying the drone off Zavodovski Island. A “penguinologist” from Oxford University, Tom successfully censused almost all of the colonies on the South Sandwich chain, all with drone transits—a first.



Clearly, this stretch of the coast was a nonstarter for getting the rest of our team and equipment ashore. We watched as big breakers came in one after another. Even with the line system we had developed to pull gear in and back out from the dinghy, the chance of someone getting dumped on their head on rocks was too great. We had tents, food, and fuel, which are always first in and last out. Although three of us had their personal gear drybag with clothing, mine had been mistakenly left on board, slated for the next trip. I was in a dry suit, hoodie, and booties and felt slightly vulnerable in what was looking like a stranding ashore. As I ripped off the hoodie and felt the chill wind, I realized the lack of my “lucky hat” was an unwelcome portent.

We had landed on the very open beach of Kraken Cove on Candlemas Island, which lies in the north-central section of the South Sandwich Islands chain. Here, it is all about plate tectonics. The 180-nautical-mile-long arc of 11 volcanic cones, some active, along with outliers, demarks the eastern margin of the Sandwich Plate, balancing on the edge of the 7,400-meter-deep abyss of the South Sandwich Trench. The trench is a subduction zone—the South American Plate to the east is diving under the Sandwich Plate and creeping west at an average of 70 millimeters per year. This dynamic interface releases magma from the earth’s crust, which rises and gives birth to these volcanic islands and associated sea mounts. Zavodovski Island, the northernmost and most active, is 300 miles southeast of the southern tip of South Georgia. We were truly deep in the Southern Ocean at latitude 57° S, well below the polar front, the boundary around 60° latitude in each hemisphere where a sharp gradient in temperature occurs between two air masses, each at very different temperatures.

Our South Sandwich Islands expedition had sailed from Port Stanley in the Falklands on December 30. Specialists in volcanology, climate change, penguin biology, and whale identification and acoustics were on the team, plus two filmmakers.

Candlemas Island, with its smoking crater, was on everyone’s hit list to be studied; chinstrap, Adélie, and macaroni penguins were to be counted; and vestigial glaciers were waiting to be drilled for ice cores.

Already midafternoon, we had no choice but to walk the kilometer around the length of the bay on those awkward boulders to Demon Point, a spit that defines the eastern side of Kraken Cove, in hopes of finding doable surf. This meant several trips to bring the survival gear around, and by the time this was accomplished, it was obvious we would have to abort the landing. Time had run out. Luckily, the surf under Demon Point was safe enough, between huge sets that ripped around the spit, to get a throw-line ashore from the C5 so we could be towed back out, one by one, with a gear bag each.

Back on board we had a debrief. We were convinced that if the swell did not increase the next day, we could get a slimmed-down version of Team Volcano ashore, along with a few of us in support. We had to scrub taking Team Penguin ashore, but they could fly a drone from the deck to conduct a census of the colonies. Team Ice would also have to take a pass with their heavy drilling gear. We were 14 on board, more than a full house, which meant elbows tucked in at the main salon table when eating our dinner from bowls—not plates—as usual in the unpleasant roll which had been a feature of every anchorage we had been to thus far.

As always, optimism had run high when we set sail from the Falklands. As soon as we cleared Cape Pembroke, Ted Cheeseman was letting out his 400 meters of Spectra with an acoustic probe to log whale “noise.” These data files would be translated by algorithms to identify the species heard. This was a passive bit of research until it was time to reel the probe in to download the chip—it took 40 minutes of grinding on the three-speed winch.



Team Volcano, trekking home after a very long day of taking rock and gas samples and flying the drone on the mountain.



Hewison Point, Thule Island: The easiest and only dry landing.



We all had to pitch in to get some exercise. Ted is the co-founder of happywhale.org, and on this trip he would log 33 humpback tail-fluke photos into his global database.

A thousand miles of sailing to reach the islands would be the easy part, running before the prevailing westerlies in a spell of fine weather, often double-poled out with the mainsail down. The sea state was settled enough for Dr. Emma Liu and Dr. Kieran Wood, from University College London and Bristol University respectively, to rig up their drone on the salon table. This was a quadcopter, big enough to carry an ad hoc gas sensor. The device was to be flown in the gas plumes of the craters to measure carbon dioxide and sulfur dioxide. They were slightly shocked, when firing up this gizmo, that the level of CO₂ in the main salon was somewhat above the recommended background level; I dutifully opened a few hatches.

Although this was a charter, it was clear that in order to pull off the objectives, our sailing crew would have to help facilitate the science, and the scientists would have to help sail and run the boat. Captain Chris Kobusch and his mate, Sophie O'Neill, on

their first season south and fresh from the Clipper Race organization, knew how to build the team. Thomas Geipel, a *Pelagic* veteran of many seasons, was seconded in specifically to do the boat driving, which would be more than challenging. These three got everyone, including the landlubbers, busy working the sails, cooking, washing up, and lending a hand where needed.

My role was overarching expedition leader, in charge of safety generally, calling the landings, and mountain safety for Team Volcano. The entire project was the brainchild of Dr. Tom Hart, a penguinologist from Oxford University, who was coordinator of the science disciplines. Tom, Jo Feldman, an emergency medicine doctor from California, and Gemma Clucas, a post-doc ornithologist from Cornell University working with Tom on Team Penguin, had all been to the islands before. Tom is possibly the only human to have landed on all the main islands during his three previous expeditions. We had plenty of chiefs, but luckily still enough Indians to go around.

Tom had been planning this project for the last three years. Of particular note was that in the Southern Hemisphere



Emma Liu and Kieran Wood, Team Volcano, on the crater rim of the semi-active Bellingshausen Island, taking gas samples. Not seen are hundreds of snow petrel nests along the inside of the crater. INSET: Snow petrel.



CLOCKWISE FROM LEFT: Professor Paul Mayewski and Mario Potocki from the University of Maine School of Earth and Climate Sciences, drilling ice cores to demonstrate levels of pollution; Gemma Clucas, ornithologist from Cornell University, taking fecal samples from king penguins on South Georgia—it's all about the DNA; elephant seal females, gathering for comfort during the molting season on Saunders Island.



fall of 2016, Zavodovski had violently erupted, so the fate of the 1.3 million pairs of chinstrap penguins—recognized as the largest vertebrate colony of any species in the world—was unknown. Were they buried in ash, or had they already molted and gone to sea for the winter? Tom was eager to find out.

Tom is a pioneer of using hunting camera traps to record activities at penguin colonies throughout the year. This is usually impossible to do by researchers for reasons of climate conditions, cost, and time. With his Oxford-based project, penguinwatch.org, he and his collaborators have placed on the order of 150 cameras at sites all around the Southern Ocean over the last ten years. The images are downloaded and batteries changed annually, if possible, the team supported by cruise ship and yacht logistics. The millions of images are then collated by a Penguin Watch citizen science program. It is popular with schoolchildren, but anyone can sign on—you simply click on the penguins in an image with your mouse, and the numbers are uploaded into the database.

Historically, penguins were counted by hand with a clicker with boots on the ground. If the colony was too vast, estimates of density were made by calculations based on photographs. With drone geo-referenced flights, large and awkwardly placed

colonies can now be recorded and recognition software does the counting. The accuracy and time efficiency are a game changer. Tom had four drones in his quiver.

The southernmost island group, aptly named Southern Thule, is 200 miles south of Zavodovski Island and sits just above latitude 60° S, on the edge of the winter sea-ice band around the Antarctic continent. The South Sandwich Islands are not in the Antarctic Treaty territory but the U.K., which owns this stretch of hostile real estate, is strict as can be in its governance. Managed from Stanley under the purview of the Foreign, Commonwealth & Development Office, the region, which includes South Georgia, is officially called the British Overseas Territory of South Georgia and the South Sandwich Islands. To visit the South Sandwich Islands is a hoops-and-ladders exercise of bureaucracy limited to scientific expeditions. The landmasses are a Special Protection Area (SPA). The waters in the maritime zone include Marine Protected Areas (MPAs), and for licensed fishing, specific No-Take Zones (NTZs). These are critical to protect krill stocks for foraging seals and penguins.

A permit process is in place and is more than rigorous. The two items on the government's agenda are biosecurity and safety. You must document and demonstrate that you will not introduce alien species to these otherwise pristine islands, and you must ensure that the expedition can be conducted safely and be self-sufficient. Anyone who has written risk assessments will know what this entails. Lots of columns, rows, and colors. And no matter how complete you made it, lots of follow-up



questions. When White Island in New Zealand blew its top on December 9, only 20 days before our departure, it put Team Volcano back to work, adding some rows.

Before we left Stanley, we inspected everyone's clothing, footwear, and equipment, down to vacuuming out pockets of jackets and pants, painstakingly picking seeds out of Velcro with needles, and disinfecting boots, ski poles, tripods, and anything else that can touch the ground. We had to be hard on each other, and it is amazing what you can find if you look hard enough. Before setting sail, we were visited by Sammy, the official four-legged rat catcher in Stanley. She jumped back ashore still hungry.

As we approached Saunders Island after a five-day transit, I remembered what one pundit in Stanley, who had been to these islands twice before, said to me: "You have too many people and you will be lucky to get ten percent of the objectives done." He had good reason to be pessimistic. I was bracing myself for days hove-to offshore in gale conditions amongst growlers and bergy bits while waiting to land, with time running out and a boatload of anxious researchers suffering from cabin fever.

Late in the evening of January 4, we made landfall and ghosted around the northern end of the island. At daybreak, we anchored in 15 meters in the open roads of Cordelia Bay. It is a cliché, but lend a thought to Captain Cook and the crew of the HMS *Resolution* in 1775. While searching for the terra incognita of Antarctica, he fetched up on a group of islands to the south which he named Southern Thule. Sailing north, he went

from island to island up the chain to Candlemas, assuming that, in the thick weather, he was looking at promontories of a landmass.

Not until 1819, when Captain Thaddeus von Bellingshausen discovered the northern three islands and then sailed south along the eastern side of the southern islands, was Cook's theory of a landmass discredited. Various sealing expeditions came and went until 1830 without much profit, but it was not until 1908 when Captain Anton Larsen, who developed the whaling industry on South Georgia, landed on Zavodovski. The islands were now firmly on the map, but all attempts at whaling and sealing failed due to the harsh weather and lack of any natural harbor, and they stayed pristine.

Following in the footsteps of only a handful of previous scientific parties that landed, we wasted no time to get ashore. Our first "wet landing," jumping out of the C5 Bombard in waist-deep water to turn the boat around and offload, was easy compared to what was to come. With 11 of us ashore, the scientists took off in different directions, and I in hot pursuit of the two young volcanologists, Emma and Kieran. Tom, Gemma, and Dr. Jo were flying drones over the penguin colonies, satellite-tagging 20 chinstraps to record foraging ranges, and taking fecal and blood samples for DNA analysis. *Pelagic* veterans professor Paul Mayewski and Mario Potocki from the University of Maine School of Earth and Climate Sciences went with their drilling gear in search of ice, water, and snow samples to demonstrate levels of pollution. Don't believe it? In the Antarctic,



ABOVE: Unable to exit and enter the water at Herd Point in the distance, thousands of chinstraps make this daily ant-like march from the beach at Ferguson Bay along the glacier to their nesting grounds. **RIGHT:** *Pelagic Australis* looking for a landing, but it was too rough to contemplate. The team “flew” the colonies by drone and hightailed it to South Georgia. Photo by Tom Hart.



this team has discovered levels of uranium in meltwater conclusively linked to an open-pit uranium mine in Australia. Ruth Peacey and Hamza Yassin, our film team, had a lot on their plate to cover. We all kept an hourly radio schedule while Chris on board kept us informed of any changes of weather that would mandate we call in the troops and evacuate in double-quick time.

The strange thing was, the weather was fine that day and for two more days thereafter, giving us all ten-hour days ashore and loads of data in all the disciplines. Tom said that if we got nothing else done during the rest of the trip, we had cracked it. He was particularly pleased that one of the three camera traps he had serviced in December 2014 had survived the 2016 eruption. When he downloaded the chip, the series of images had gone black, which narrowed the time of eruption to the first week of April. The only downside was that due to gale conditions above 500 meters, we could not access the top of the crater on Mt. Belinda, where a lava lake was rumored to be, one of the Holy Grails of the expedition—unfinished business.

During the next eight days, we kept pinching ourselves as the weather held fine and we could move from island to island at will. We landed on Thule, Bellingshausen, and Candlemas. On Cook, Bristol and its outliers, as well as Zavodovski, Tom

flew the drone from the deck with Gemma launching and catching—no mean feat in swell and wind. The good news was that Tom learned that the 2016 eruption on Zavodovski had spared the colony.

After eight days of fine weather on the South Sandwich, we took a window of opportunity and hightailed it to the relative tropical coastline of South Georgia. Here, we cherry-picked other objectives on foot and by drone in the time that was left. Back in Stanley, after five weeks in the field, *Pelagic Australis*' job was done, but the scientists' work had just begun—back in their labs.

No sooner had we returned to our respective home bases that the chatter began about how to return. I still *need* to climb Mt. Michael on Saunders Island to see the lava lake and make that precarious landing on Zavodovski. No doubt the scientists have more justifiable reasons. But for me, it is just for the doing. 🐧



The *Pelagic Australis* team, back on the jetty in Port Stanley after 30 days in the field. Job done.

About the Author

Skip Novak is perhaps best known for his participation in four Whitbread Round the World yacht races since 1977. But he is also a mountaineer, and, wishing to combine his mountaineering with sailing, he built the expedition yacht *Pelagic* in Southampton, England, in 1987. He has since spent every season in Antarctic waters. In 2002-03, Skip managed the construction in South Africa of his new *Pelagic Australis*, a 23-meter, purpose-built expedition vessel for high-latitude sailing in order to augment the charter operations of the original *Pelagic*. Launched in September of 2003, she is the flagship of Pelagic Expeditions.

In March 2015, Skip was awarded the CCA's prestigious Blue Water Medal in recognition of his many years of voyaging to high latitudes. In January 2016, the Royal Cruising Club awarded Skip the Tilman Medal, named after Bill Tilman, famous mountaineer and exploratory yachtsman, for a lifetime of leading sailing-to-climb expeditions in high latitudes.

Skip sits on the panel of experts that vets expeditions to South Georgia on behalf of the South Georgia government. From 2012 to 2017, he served on the executive committee of the International Association of Antarctic Tour Operators.

