

Wrangel Island

A Greentours Itinerary

Though one of the world's most amazing wildlife locations Wrangel has remained firmly off the wildlife-photographers map because it has been virtually impossible to get to. However a thaw in political relations and the recent retreat of sea-ice in the Chukchi Sea now allows a sea passage from the east. We journey from the eastern tip of Asia, joining our expedition ship in the northern port of Anadyr then rounding Cape Dezhnev, only fifty miles from Alaska. We'll visit famed Whalebone Alley on Yttygran Island and sea cliffs and estuaries where we'll see vast flocks of puffins and auklets, Emperor Geese and maybe the fabled Spoon-billed Sandpiper. Pods of Killer Whales patrol these coastal waters and anywhere on our voyage sightings are likely of Gray, Humpback and Bowhead Whales.

Day 1

Depart from Anadyr

We'll convene on the dock in Anadyr at five in the afternoon and be transferred to our floating home for the next twenty days, the Akademik Shokalskiy. Originally a research vessel and still serving in that capacity on occasion, the Akademik Shokalskiy will no doubt be a welcome sight after the many hours of travel most of you will have endured to reach the Russian Far East! Once on board we'll have a welcome dinner and if time permits an expedition briefing before turning in as the ship moves out of the harbour. Anadyr is not far south of the Arctic Circle so daylight is long at this season, indeed the sun sets after 10pm and rises again by 2.15am so it is only dark for two or three hours given the long twilight. Thus late in the evening I'm sure many of us will be out on deck watching for the pods of Belugas that inhabit the waters just offshore of Anadyr as well as pretty Larcha Seals, their maculated coats giving rise to their other common name; Spotted Seal.

Day 2

Anadyrskiy Bay

This morning we'll get our first taste of the excellent meals provided by the galley as the smell of fresh coffee and a hot cooked breakfast lure us inside from the bird-rich waters of Anadyrskiy Bay. We'll watch for pods of Killer Whales and maybe our first Gray Whales and there will be time for learning a little about life on board our vessel with orientation and zodiac travel talks by our expedition leader. Later in the day we'll get our first chance to take our cameras aboard the zodiacs and get up close and personal with the wildlife. The zodiacs take us under the beautiful fluted granite cliffs of Cape Aachen where thousands of nesting auks and both Glaucous and Vega Gulls make an arresting sight. Kittiwakes, Guillemots and lovable Tufted Puffins nest on ledges in endless rows. There's all sorts of alcids, notably Crested Auklets, Least Auklets, Parakeet Auklets and Whiskered Auklets. Thousands of birds are commuting back and forth into the food-rich bay so the skies above our heads are a continual whirr of wings, it is a very busy place. Such cliffs are sought after as all these birds need to keep their eggs safe from the Arctic Foxes, and the foxes are pretty nimble of foot, so it is only the most vertical of cliffs that keep them at

bay! The different species of auks nest at different levels and so we'll be very close to lowest nesters notably the often solitary Pigeon Guillemots whose striking black and white plumage is set off by astonishingly red feet.

Day 3

Yttygran, Nuneangan and Arakamchechen Islands

As we continue northeastwards we'll have time during the day to stop at a series of islands, one of which is home to perhaps the foremost archaeological site in all the Arctic. We'll be able to see the renowned "Whalebone Alley," comprised of scattered white columns of Bowhead Whale jaw bones, visible well before our ship has anchored in the bay. The jaw bones have been sunk into the ground and braced with large stones. It is thought that boats were stored off the ground on the line of bones. Nearby is an intriguing rectangular pit, walled up with carefully stacked flat beach stones and encircled at the top by three huge whale skulls. The purpose of the pit is unknown, though it has obviously been constructed with a lot of thought and care. Among a jumble of rocks back from the shore are many rough stone "cellars" that are thought to have been used to store meat. Studies of Whalebone Alley suggest it has never been a permanent settlement, but rather a temporary summer hunting and fishing camp, possibly used by many surrounding clans or groups.

Arctic Skuas and Sandhill Cranes occupy the flowery tundra that ascends to two hills from the site. We'll have the chance to visit a hot spring and may well come across a semi-nomadic Chukchi fisherman or two as they fish for salmon or collect wild mushrooms around their summer camps. Pelagic Cormorants are common around the islands and we'll see Long-tailed Ducks and stunning Harlequin Ducks too.

Day 4

Cape Dezhnev

Cape Dezhnev is the Northeastern-most point of Eurasia, and lies only fifty miles from Alaska. On top of the cape are original stone dwellings which were homes for the Eskimos who occupied the village, called "Naukan," for about 300 years. Most of the foundations and some walls of the dwellings are intact, and a few even retain the jaw bone roof trusses that supported a cover originally made of hides. The surrounding tundra is covered in wildflowers especially along the boggy streams where there's an abundance of Arctic Forget-me-not with its beautiful sprays of bright blue flowers. Offshore we've a chance of Fork-tailed Storm Petrel as well as both Sooty and Short-tailed Shearwaters, and rafts of eiders including the gorgeous Spectacled. We'll move northwards into the Chukchi Sea, north of the Bering Strait before visiting the town of Uelen, where there's a museum showing modern examples of walrus ivory carving and scrimshaw, and we can learn a little about the Chukchi language and culture. In the evening we'll cross the Arctic Circle and will no doubt celebrate the event in suitable fashion!

Day 5

Kolyuchin Island

As we travel along the north Siberian shore the landscapes are immense. Much of the Siberian Arctic is low-lying but here high hills are dissected by the cascading waters of impressive rivers, these emerging from deep gorges as the land drops abruptly to the sea. Kolyuchin Island rises in front of us its cliffs festooned with seabirds, with impressive numbers of Horned Puffins, Pigeon Guillemots and Brunnich's Guillemots and we'll take our zodiacs amongst this mesmerising show. Sometimes Kolyuchin is where we have our first meetings with Polar Bears. Back at sea we'll now be into very good waters for marine mammals and will soon be sighting Gray Whales and Bowheads.

Days 6 – 15

Wrangel and Herald Islands

Very few people have ever set foot on Wrangel Island. Just four rangers and a few (about fifteen) staff look after the huge nature reserve that covers almost the entire 7600 square kilometres of Wrangel Island, made a strict reserve in 1976, and with just a few tourists and scientists allowed to visit each year. Musk Oxen and Reindeer roam surprisingly biodiverse tundra where Siberian and Wrangel Island Collared Lemmings sustain a big population of Snowy Owls.

However it is the breeding population of Polar Bears that brings Wrangel fame with the highest density of dens anywhere in the world. Meeting a single Polar Bear is an incredible experience on all sorts of levels, but imagine watching and photographing numbers of them! We'll see Polar Bears throughout the trip and on some days on Wrangel we'll see dozens. Over two hundred were seen on one visit last year. It is also the quality of the sightings that will amaze – you'll be surprised at the photographic opportunities with this most feared and charismatic predator. Though currently listed on the IUCN's Red List as 'Vulnerable' the plight of the Polar Bear resonates strongly as its likely long term fate – extinction – is surely a direct result of global warming. These arch-predators range throughout the ice-covered waters of the circumpolar Arctic. Though some reside permanently in the multi-year pack-ice of the central Arctic Basin of the far north they are most common in the annual ice over the continental shelf and inter-island archipelagos that border the Polar Basin. In areas where the ice fully melts they may spend several months on land fasting, surviving on stored fat reserves, until the sea again freezes. In the past few weeks there have been disturbing photographs emerging from Svalbard of Polar Bears not surviving the summer famine as the ice retreats further north. Though distributed over such a wide area Polar Bears need a lot of protein and so necessarily they are patchily distributed. Current estimates put the total population at around 20,000 bears with the likelihood that this will decrease by between 30% and 50% over the next forty years, and some have suggested that they may be extinct in the next hundred years.

So the importance of the Wrangel Island Polar Bears can hardly be overstated. Each year up to a remarkable 500 females come to give birth on the island. Some areas have 12 dens per square km. In recent summers, when there is little ice

around the islands, the land is crucial in supporting the lives of this supreme predator. Bears from a huge area around gather on the Island, waiting for the new icepack to be formed. There are recent records of circa 180 bears seen in just 3 days here, 150 on one day from a recent cruise. The time we have chosen to be there gives us the best chance to photograph good numbers of bears, both on floating ice and on land. Safety is of course paramount when dealing with Polar Bears however during the course of our visit there will be opportunities to be surprisingly close to these amazing animals, and photographic opportunities, though different with every bear, will at times be very good.

We'll visit Herald Island, a remote, forbidding rock to the northeast of Wrangel. Its claim to fame is as a prime denning site for Polar Bears, with even higher den densities than Wrangel Island, no less than a hundred Polar Bears den on this tiny island! The island's towering cliffs are home to huge colonies of Common Guillemots, many Black-legged Kittiwakes and Pigeon Guillemots and the occasional pair of Horned Puffins. Back on Wrangel we'll visit Cape Florence where among floating pieces of pack ice we'll be able to get up close to hundreds of Walrus that regularly haul out here. We'll be so close we'll hear them snorting at one another, and probably at us, and we'll have plenty of chance to get great photographs of the social interactions of these charismatic behemoths. Wrangel has the largest colonies of Walrus on earth and again we will have opportunities to photograph them both on ice and land. In the summer up to 80,000 animals can be found on the shores of the island and together with those on floating ice the total goes up to a staggering 130,000. Ringed seal is very common too and we stand a chance of seeing the rare and beautiful Ribbon. The waters around Wrangel support good numbers of Gray Whale and Beluga, while Bowhead Whales, Fin Whales, and especially Humpback Whales, will be seen. We expect to see whales on a daily basis, and on occasion be very close to them.

Wrangel is home to several land mammals. We'll come across the cheeky and beautiful Arctic Fox pretty much daily, but Wolf and Wolverine are much chancier. Sometimes Wolverines make a den in the research station's buildings.

Musk Oxen encapsulate the very essence of the Arctic. These stocky Bovids have thick shaggy brown coats covering surprisingly pure white socks! The males often stand alone amongst the cotton grass and rhododendron that cover the landscape in a pinky-white haze. Herds of females search out the reticulate-leaved willow that they so like. These animals are relatively easy to approach though one has to beware males who might fancy a spot of sparring - luckily they have rigid behavioural patterns so it'll be easy to tell if we need to back away! Reindeer in the Arctic rarely see humans and often behave strangely when they do, sometimes trotting back and forth right near us, as if they are not sure what to do!

The story of the mammoths here is an intriguing one and in some way imparts the unique nature of Wrangel. Wrangel remained ice-free during the last ice-age and a population of the Pygmy Woolly Mammoth *Mammuthus primigenius wrangelensis* survived here until 2000BC. It is really amazing to think that this unique

subspecies of the Mammoth survived until only 4000 years ago. Living alongside the mammals was a fauna that is both familiar and unfamiliar to us today and on Wrangel there have been abundant finds of Primeval Bison *Bison priscus*, Przewalski's Horse *Equus caballus* and the Furry Rhinoceros *Coelodonta antiquitatus* from roughly the same period. There have been finds of whole well-preserved Pygmy Woolly Mammoths and indeed it is even possible we might stumble across evidence of these creatures - a Mammoth tusk protruding from the ground was spotted by a party from this ship's sister-vessel on the 2011 trip!

Another unique aspect of Wrangel is its exceptionally diverse flora. 417 species have been recorded, twenty-three of them endemic. This is twice the number of species recorded from similar sized areas in the Arctic and more than is found throughout the entire Canadian Arctic Archipelago. Wrangel's immense tundra-scapes are covered in a strikingly colourful mass of flowers. There are blue lupins, purple and yellow milk-vetches, yellow and white anemones and pink rhododendrons. No less than six louseworts decorate damp tundra including the beautiful Woolly Lousewort and crimson-tipped *Pedicularis albolabiata*. *Primula borealis* and *Primula pumila* join various buttercups in wet flushes whilst scree are covered in lichens, Arctic River Beauty and the lovely pink Pallas's Wallflower. There's many saxifrages, the vari-coloured Painted Cup, abundant Bog Rosemary and even a couple of orchids, the Coralroot Orchid and *Habenaria obtusata*. By the coast we'll find Marsh Felwort, Oysterplant, massed displays of Beach Pea and on stoney beaches the gorgeous Arctic Poppy. False-asphodels, the minute moss-inhabiting *Pinguicula villosa*, and the striking Fireworks Flower are part of a rich tapestry of flowers perhaps surprising so far north.

Around 200,000 pairs of Lesser Snow Geese breed each year in these fabulous landscapes. Pomarine Skuas and elegant Long-tailed Skuas skim across the skies and we'll find breeding Sabine's Gulls and maybe Ivory Gull and Ross's Gull too, the latter congregates here in large numbers in the autumn, but we'll be looking for the first few arrivals. Abundant Siberian and Wrangel Island Collared Lemmings support a healthy population of Snowy Owls.

During our visit there will be an opportunity to cross the island on a two night/three day overland trip which will be an extraordinary opportunity to really get deep into the wilderness. In particular this will be a great chance to get up close to Musk Ox and Reindeer and offers the best chance of Wolf. The landscapes are fantastic.

Days 16

North Siberian Coast

Mile after mile after mile of untouched Arctic wilderness lies on our route today. Fabulous almost metre-long Yellow-billed Loons and noisy Red-throated Loons are on the agenda, so too Arctic Loon. Cute Arctic Ground Squirrels inhabit burrows throughout, and we may flush a Rock Ptarmigan or two from the flowery tundra. Mealy Redpolls sit atop a few squat alders as Western Sandpipers and Red-necked

Stints give their little song flights. Red-necked Phalarope breed on the nearby ponds and Glaucous and Vega Gulls sit on sandbars offshore.

Day 17

Kolyuchin Inlet

Sandhill Cranes and Yellow-billed Loons inhabit the sweeping spits marked by old beach dune formations in the wild landscapes of Kolyuchin Inlet. Here we'll encounter Whistling Swans, and small flocks of strikingly coloured Emperor Geese. This is Spoon-billed Sandpiper territory but sadly the news in the last year or two has not been good and few if any have been seen. We've a better chance with Pectoral Sandpipers and Western Sandpipers. We're still in Polar Bear territory here and a sighting or two is likely. Inland the landscape changes to peaty clumps of moss and grass, coloured yellow by various Asteraceae amongst bare elevated areas colonised by Lichens, Cloudberry, Crowberry, and willows. Here we might flush a Willow Grouse or two and find Pechora Pipits. Offshore we'll look for eiders, here there are plenty of Common Eiders and Spectacled Eiders, and if we are lucky we might find a Steller's Eider or two amongst them

Day 18

Bering Strait and Chukotka Coast

Today we might (it is important to remember that throughout this trip our itinerary remains flexible...) visit Big Diomedede Island home to some fabulous seabird colonies. The numbers of birds whirring around us is quite staggering. Both Horned Puffins and Tufted Puffins are everywhere and there are lots of smaller alcids, notably large numbers of Crested Auklets, Parakeet Auklets and Least Auklets. Pigeon Guillemots too. Pelagic Cormorants are plentiful and we'll likely encounter Harlequin Ducks. This is a great feeding area for whales, with groups of Gray Whales commonplace, we'll likely see in excess of a hundred during the day.

Day 19

At sea

Today we'll be steaming back towards Anadyr and so the day will largely be spent at sea. Northern Minke Whales and yet more Gray Whales will help us pass the journey and as usual marine birdlife will be outstanding, notably shearwaters, Kittiwakes, Phalaropes and Fulmars.

Day 20

Arrive Anadyr

The Kamchatka Extension

Kamchatka is the most active and spectacular part of the Pacific Ring of Fire, awesome volcanoes, several of them active, form our daily scene, and the backdrop for sightings of (Kamchatka) Brown Bears. We'll spend plenty of time around stunning Kurilskoye Lake where we'll be able to photograph the bears at

our leisure as they fish for salmon close by our lodge. Steller's Sea Eagles hunt over pristine valleys. An optional helicopter flight takes us to the world's greatest concentration of geysirs and fumaroles and we'll visit active volcanic vents and calderas. A boat trip out into Avacha Bay gives us close-up views of Tufted Puffins, Red-faced Cormorants and Red-legged Kittiwakes as well as Dall's Porpoises. Estuaries along the peninsula are home to Larcha Seals, Harlequin Ducks, and we'll encounter endearing Sea Otters too.

Day 1 to Petropavlovsk-Kamchatsky

We'll have arrived from various quarters and will be met at the airport and transferred to the Hotel Complex Petropavlovsk.

Days 2 – 4 (am) Mutnovsky and Gorely active volcanos

We'll spend the next two and a half days exploring some of the most striking geology observable on the Earth's surface. A 6WD bus will take us to our campsite on the lower slopes of Mutnovsky and we'll have two nights of camping where our baggage and tents are moved by the 6WD and we walk over the volcanoes through a surreal landscape that truly seems of another world.

During the first day we'll walk up over the Mutnovsky 3 Caldera. We start along a gorge where banks of hard snow have accumulated in winter. Much of the surface is covered in wind-blown ash, and some of it is melted into little astrugi pinnacles; the caldera drainage flows in snow caves on the rock surface, and is sometimes seen or heard deep in crevasses. The gorge walls are cut in coarse rhyolitic pyroclastic flows laced with thin dark dykes. The caldera's eastern glacier lies ahead where it melts on a steep rock slope, aided by a series of fumaroles; steam from these has created ice tunnels that emerge in the glacier snout. We'll walk up slopes of volcanic tephra and glacial till and descend slightly to the snout of the western glacier, which is also advancing over fumaroles. A way between the ice and the caldera wall passes various geothermal vents; these include fumaroles, mud pools and solfataras, and their style may change within hours as melt-water from the adjacent glacier seeps into the ground and is boiled at very shallow depth. A lake is sometimes dammed up behind the glacier; at other times it drains through the ice, leaving a flat bed of reworked ash pitted by solfataras and boiling mud-pools. Streams emerge from the snow and ice fields, and flow back under the glacier. The caldera floor is at an altitude of about 1540m, which is still 800m below the ice-capped summit of the Mutnovsky volcano. The walk continues up the western snow-fields below the caldera wall cut in thinly bedded pyroclastic flows that are probably old surge deposits. Rope handlines help lead us up coarse welded pyroclastics to a knife-edge ridge between the caldera and the active crater. The steam plume from the active crater rises far above, but when the wind blows it around, the vigorous fumaroles and solfataras that are its source can be seen on the crater floor. The crater is about 350m across, and its

walls drop nearly vertically for over 100m to its flat floor of scree and ash. An extraordinary sight!

Our 6WD bus takes us to some lake flats from whence we have a walk up the volcano of about 5km, climbing steadily to gain 750m in height. The walk up the huge shield volcano is over a mixture of rough grassy tundra with very low dwarf willow and bare stripes of basaltic lava. Some lava flow structures are recognizable, and there are also patches of volcanic ash redistributed by the wind. Once on the top of the crater rim you can admire a truly stunning volcanic landscape. The first large crater contains a cold lake about 100m below; its surface has ice floes from a small glacier on its internal slope. The walls of all the craters expose profiles through thick sequences of lava flows with a limited component of interbedded pyroclastics. We'll have a picnic lunch on a shelf overlooking the huge central crater. Just ahead, there is a sudden, unguarded, vertical descent into the active crater. Over 100m down, a hot acidic lake has active fumaroles and solfataras around its margin and beneath the surface. The recent eruptions of Gorely have been largely steam events produced when these vents heat up and therefore increase their output.

In the afternoon we'll return to Petropavlosk-Kamchatsky and then board our boat, the "Kathleen", and head out into the waters of Russkaya Bay where we'll overnight. Departing from a pier near the centre of town, we'll soon view the splendid setting of Petropavlovsk and its dramatic volcanoes. Further toward the middle of the bay, both Koryaksky and Avacha volcanoes come into view behind the city. When Avacha erupted in 1991, people living in Petropavlovsk could watch the red stream of lava coming down the slope towards the city, while hot ashes were shooting into the skies above the summit crater. Avacha Bay is geographically as perfect a bay as a city could hope for. It is large and deep, with a narrow opening which keeps out foul weather and ice. The harbor is open to shipping year round, and is also well protected from the dreaded tsunami waves that are created by earthquakes around the Pacific Ocean margins. The boat heads toward the mouth of the bay, allowing views of the Northwest side of Petropavlovsk and the many boats that make their home in these ports. Near the mouth of the bay, the Three Brothers are tall finger-like sea stacks, whose rock faces rise vertically out of the water. The cliffs around the bay house many colonies of seabirds with Tufted Puffins common.

Day 4 (pm) & 5

Boat trip in Russkaya Bay

Morning will see us keen to experience the diverse wildlife and spectacular scenery of Russkaya Bay. Those most endearing of creatures, Sea Otters, are common in this area and we'll encounter several during the day. They are quite approachable in the zodiacs. Huge male Steller's Sea Lions haul out on rocks around the bay, with groups of Pelagic Cormorants holding their wings aloft and regarding these impressive seals disdainfully. There are abundant sea birds in the bay, with plentiful guillemots and auklets to the fore. In particular we'll look for Ancient Murrelets and beautiful Tufted Puffins. Steller's Sea Eagles sit atop cliffs

surveying the scene, however don't be at all surprised if one comes a whole lot closer, maybe even perching on the boat's Navigation Lights! Will this be the top wildlife sighting of the day, or will it be a pod of Killer Whales? These sleek powerful whales patrol these waters regularly, aware of the plentiful supply of marine life! Pods of Dall's Porpoises are a lovely sight and we'll see whales, which species we seen on the day will depend on luck, but Humpback Whales and Northern Minke Whales are the most frequent. Fin Whales are sometimes seen too. As we head back towards Petropavlovsk-Kamchatsky we'll watch out for Slaty-backed Gulls, Pomarine Skuas, Long-tailed Skuas, Fork-tailed Storm-Petrel, Terns, and even rare Red-legged Kittiwakes.

Day 6 - 9

Bear and Wildlife-watching around Kurilskoye Lake and visits to Ksudach Volcano & Khodutka Hot Springs

After a night in Petropavlovsk-Kamchatsky a flight by MI-8 helicopter takes us to Ksudach Volcano where we will make an excursion to the crater lake of Shtubelya which sits inside Ksudach Volcano and visit a lovely waterfall where water cascades out of the crater. We'll have the chance to enjoy some hot springs that create a "hot beach" on the lake's shore. From this incredibly scenic spot it's just a short flight to Kamchatka's famed Kurilskoye Lake.

Just 250 meters from the lodge is a bear-viewing platform located at the mouth of one of the many rivers that drain into Kurilskoye Lake. Here you'll have a good chance of taking great close-up shots of bears fishing for migrating salmon. The salmon pause briefly in the lake and then make their way from the lake into the streams where they spawn. Having said this, there's a good chance you'll see bears fishing just a few yards away as you walk along the banks of streams between the lodge and the viewing platform; there are unbelievable photographs that people have taken of themselves with a bear behind them from this spot!

We'll also take longer walks to a large meadow where bears feed on wild berries and we'll visit other spawning streams farther from the lodge. Along these streams you'll see spawning salmon and many signs of the large number of bears in the area. The photographic opportunities amongst all these bears are top-class and you could spend your entire time doing just that, though with three days here, there's time to just sit and enjoy the bears living their lives just a few metres from you. And there's plenty of other wildlife in the area too including Steller's Sea Eagles, and of course spectacular scenery....but then that's a given in this part of the world.

During the evening of Day 9 a MI-8 helicopter flight takes us for a bath in the hot springs of the Khodutka River. These are the largest wild hot springs in Kamchatka. The water bubbles out on a section of tundra located just under Khodutka Volcano and forms a small stream. Farther from the source the water slowly cools and you can find the location where the temperature is right for you to take a

swim. And then helicopter whisks us back to the modern comforts of our hotel in Petropavlovsk-Kamchatsky.

Day 10

Optional helicopter trip to the Valley of the Geysers

The helicopter flight to the Valley of Geysers takes about 75 minutes, on either of two routes. The all-weather eastern route heads round the southern and eastern flanks of Avacha, flying at heights of just a few hundred meters above ground if that is necessary to keep below any thick cloud cover. It continues north up a broad valley to the east of the Zhupanovsky volcano; the low flying gives splendid views of the taiga landscape, and this valley is home to many brown bears, who may be easily seen from above. Over a low col, the flight approaches the coast, where a few hunters' cabins lie among the trees; Karymsky and the two Semlyachik volcanoes lie inland to the left. The flight then turns inland up the valley just before the Kikhpinych volcano, and turns into the lush green tributary which is the Valley of Geysers. The western route heads round the western side of the smaller cones of Arik and Aag, which continue the line of volcanoes northwest from Koryaksky. It then heads across the interior tundra, keeping west of Zhupanovsky, on its way to Karymsky. If the eruptions are still of the Strombolian type then one should be seen on the flight past. The active cone is 700m high, and stands inside an old caldera; the even older Dvor caldera is truncated with the higher bowl to the north. Just to the south, Karymsky Lake lies in the Academia Nauk caldera, which erupts less frequently. Northwards, the flight goes over Maly Semlyachik volcano with its spectacular crater lake of green water. Past the inactive Bolshoi Semlyachik, the route veers slightly right for the Valley of Geysers

The cluster of geysers, fumaroles and hot in the Valley of Geysers was only discovered in 1941. They lie above the marginal fractures of the oldest Uzon caldera. The hot water that emerges is largely recirculated rainfall, mixed with some juvenile water from magma. The magmatic heat source is probably the roots of the Uzon volcano, where ground temperatures reach 250°C at about 500m depth beneath the caldera floor. The Geysernaya River has cut its valley into bedded andesite tuff that was deposited in a lake in the first Uzon caldera; the southeastern valley slope is the heavily eroded caldera wall. Some dacite lavas and intrusions occur in the tuff, and all the exposed rocks have been altered hydrothermally. Some slopes have been gullied to leave earth pillars. There are extensive deposits of opaline siliceous geyserite, some built into large banks and terraces below the main vents. The valley's geysers include a few with large but brief periodic eruptions, and many more which produce hot water spouts frequently or almost continuously.

A boardwalk leads to the lip of the valley for a fine overall view. The upper slopes of the valley expose cliffs of pumaceous tuffs, some eroded into earth pillars. The valley floor has a lush green plant cover, except where active banks of geyserite have not yet been colonized. A branch ends at the Bolshoi (Big) and Maly (Small) Geysers. An eruption of Bolshoi throws water about 10m high amid clouds of steam, for about 10 minutes; it erupts on a cycle of about 75 minute. Maly Geyser throws

water out at 45° for about 8m, in eruptions lasting 5 minutes on a 35 minute cycle. The main path descends to a bridge over the Geysernaya River upstream. The river reaches a temperature of 26°C with its geothermal input in the summer; winter snow-melt reduces it to about 16°C. Water from the springs and geysers varies from 35°C to 100°C. Just upstream of the bridge, the Schell (Crack) Geyser erupts briefly every 35 minutes; it was heavily eroded during a typhoon flood in 1981. The Fountain Platform is a great bank of geysers producing copious quantities of steam from numerous vents. It may well be the world's greatest concentration of geysers and fumaroles. On the platform, Malachite Grotto is a nearly permanent spouter erupting from a geysersite cone; the Fountain and New Fountain are connected so that they switch their water spouts every few minutes but combine to provide almost continuous activity. The boardwalk ends before another old bridge. Velikan (Giant) Geyser is on the far bank, inside the bend of the river; it erupts with a cascade of water to heights of about 25m, but only for about a minute, before sending steam jets to far greater heights for another few minutes; its cycle is around 8 hours. A trail on the terrace above the valley floor provides views down onto the Fountain Platform, and also passes various hot pools, blue with suspended clay, and boiling mud pots, red with iron oxides. Lunch is scheduled at the Valley of Geysers lodge

The Uzon depression is bordered to the north and west by steep caldera walls that have survived into the modern landscape. These are essentially features of the second in the series of three caldera collapses; the third (minor) collapse merely deepened the depression west of the heli pad that is now largely marshy ground and lake remnants on a floor of lacustrine sediments. The highest ground is formed by the basaltic cone of Uzon volcano, which stands above the western rim of the caldera. Immediately west of the heli pad, Bannoe Lake has a steam vent beneath it; this erupted in 1989, but is now quiet. The lake is about 30m deep, and its bottom 7m are a pool of liquid sulphur at a temperature of 140°C; large blocks of glassy black sulphur have been extracted by volcanologists. It appears that the sulphur vent is similar to the black smokers of ocean floors. Further west, trails wind across the marshy ground on the caldera floor to a variety of hot springs, boiling lakes and mud pots in the dacite tuff and lake sediments. Various hot springs here have associated sulphur, opal, pyrite and mercury deposits. Most of the colouring at the spring sites is due to temperature-sensitive algae. A trail leads through alder bushes up the Belaya dome; this is formed of slab-jointed dacite porphyry that varies from dark lava and tuff to glassy obsidian and light pumice. Some is hydrothermally altered, with kaolinite, opal, alunite and sulphur. Adjacent to Belaya, there are two small acid lakes with PH of 2. Further north, Lake Dalneye is nearly 1 km across, in a splendid maar crater fringed by a tuff ring of very scoriaceous basalt; it was produced by the modest steam explosions of a phreatic eruption from a vent beneath the lakes and marshes of the caldera floor. Later we'll return by helicopter to Yelisovo, and thence by bus to the Petropavlovsk Hotel.

Day 11

Depart Kamchatka

To Book a on this Holiday please fill in the booking form which you can download from www.greentours.co.uk (also found in the Greentours brochure) and post/fax to Greentours, Leigh Cottage, Gauledge Lane, Longnor, Buxton SK17 0PA, UK. Tel/Fax +44 (0)1298 83563. After booking your place you'll receive a confirmation letter and a detailed information pack will be dispatched twelve weeks prior to departure. Butterfly and bird checklists are available.