

## **The Andaman Sea Rocks**

By Collin Piprell

**The Andaman Sea offers many advantages to visitors, not least among these a variety of world-class cruising grounds, their scenic, often fascinating, islands and coastlines owing much to a sometimes cataclysmic geological history. What follows is a simplified version of that story.**

“Tectonic activity”? Before December 2004, the expression meant little or nothing to most people. But tectonic plate movement has been world news over the past several months.

Last Boxing Day — about 40 kilometres beneath the sea bottom not far west of northern Sumatra and running north under the Andaman-Nicobar islands and beyond — colossal pieces of the earth’s crust, subjected to unimaginable pressures countered by friction between these blocks, were trying to slide past one another along a 1,200-kilometre fault line. When the slip finally came, it set off the world’s biggest earthquake in 40 years, measuring more than 9.0 on the Richter scale — violent enough, reportedly, to make the Earth wobble on its axis. The devastating power of the subsequent tsunami was related to the magnitude of the quake and to the fact that this — typically for earthquakes occurring along subduction zones — involved a vertical displacement of the sea bottom. Basically, two continents are shoving up against each other, with the India tectonic plate pushing under the Burma plate along what scientists refer to as the Andaman Thrust. In this case, the Burma plate was lifted by 10-30 metres, heaving up a massive column of seawater.

The resulting human catastrophe was one of the new century’s most newsworthy events. From the perspective of geological history, however, it was no big deal. Convergence of the Eurasian, Indian-Australian, and Pacific tectonic plates — enormous pieces of the Earth’s crust floating on the hotter, more fluid mantle below — have together, over many millions of years, shaped much of the Southern Asian landscape. The

associated folding, uplifting, faulting and volcanic activity has produced the region's hills and mountains — including its islands, which are, after all, only partially submerged hills and mountains.

Two distinctively different varieties of island characterize the Andaman Sea, each of them scenically striking in its own way. Granitic intrusions run in series roughly parallel to the more dramatic limestone karst formations, with the Mergui Archipelago part of this north-south pattern running from southern China down through Thailand, including Phuket/Koh Phi Phi, to Koh Tarutao National Park and beyond into Malaysia.

### **Limestone towers and ramparts**

Among the most compelling images of tropical Asian seas are sheer limestone cliffs rising, sometimes, hundreds of metres from the sea, holed with caves and fringed with jungle. The islands of Phang Nga Bay and Koh Phi Phi are among the best-known of these spectacular areas. But other examples are found in Thailand, as well as in Burma, Vietnam and Malaysia. (If the fantastic landscapes in China's southern Yunnan and Kwangsi provinces were to be flooded by the sea they would look very much like Phang Nga.)

Various forces have shaped the limestone island groups of Thailand and Burma, for example, from a massive sedimentary platform deposited 350-450 million years ago. Over the aeons a ceaseless rain of marine precipitates, much of it consisting of the shells of planktonic sea creatures, gradually came to deposit enough calcium carbonate that the pressure of its own weight formed a bed of limestone hundreds of metres thick. But this was only the beginning of the story. After more millions of years, movements in the Earth's crust began to exert titanic pressures, and the limestone, being inelastic, didn't bend or fold — instead, great blocks sheered away from one another, some of them thrusting up while others sank beneath the surface. By now, the features that strike wonder into the mind of the modern visitor were taking shape.

Nature still had the finishing touches to put to her masterpiece, however, and for this she called upon a series of ice ages. Over even more millions of years the ice caps expanded and contracted, alternately taking up and releasing enormous quantities of

seawater so that sea levels rose and fell by more than 150 metres. At different periods in geological history, then, wind and wave and current were to add their work to shaping these splendid natural monuments. Rainwater, meanwhile, in combination with decaying organic matter, was producing acids that dissolved the limestone to create caves, many of which exit high on the cliffs.

### **Giant beach pebbles**

The granitic island groups began as intrusions of hot magma that rose through weak spots in the Earth's crust hundreds of million years ago, working their way through thick layers of sedimentary rock laid down at least 100 million years earlier still. As the granite intrusions cooled, they cracked up into blocks. Weathered by the elements over the aeons, the resulting islands crumbled at their edges like great chunks of hard sugar candy, wind and sea polishing smooth the granular fragments. (Nevertheless, the granite is much harder and more resistant to chemical erosion than is limestone, so the many "caves" are really only passageways between boulders.) Especially when sea levels were higher than they are now, these boulders were scoured by wave and sand, rounded and polished like beach pebbles until now these piles of curious stones, some of them as big as houses, lie as though collected and later abandoned in careless heaps by some ancient race of beachcombing giants.

And this is what lends these islands much of their attraction for visitors. Today, their shores are characterized by white coral-sand coves separated from one another by piles of huge boulders. Underwater, more boulders just like these spill in jumbled piles down beneath the surface of the sea to 35m and beyond, and a similar topography is encrusted with algae and corals, the many caves and archways providing passages for an incredible number and variety of fish. On surface, back from the white-sand beaches, rainforest is home to a wide assortment of birds and other animals.

### **Other types of island geology**

But there's more to the story, especially, perhaps, in the Mergui Archipelago. The 19th-century *Gazetteer of Burma* described the island group this way:

... these are mostly mountainous islands, stretching from Tavoy Island south beyond the limits of British territory. ... Those amongst them which are not bare rocks are clothed with dense vegetation ... The most westerly are composed of granite and porphyry, those nearer the mainland of sandstone, grauwache and conglomerate.

There's amazing geological variety. Aside from the hilly, heavily forested granite islands with rocky coastlines, and the steep-sided, forest-fringed limestone towers, most common just south of St. Matthew's Island, you cruise past islands called South Hump, Cat and Kitten, SE Hump, NW Hump, Naked Its, and Joe Island. "Naked Its", given its shape, is evidently a typo on the charts, while Joe Island isn't just any Joe island — it's a tortured little brown rock dragon; the wrong shape and colour, it doesn't fit in with the others. Nine Pins, meanwhile, a group of comical pinnacles with forest tops, sit on a flat stone platform. Two Tree Island, another funny formation, presents a low table of metamorphosed limestone. The tilted sedimentary rock lying just above that perforated with caves, and the whole island is covered with dense grass, from half-inch to knee deep, growing on what looks like baked fledgling mudstone. A bit of bamboo grows up from among the tufts of grass, and there are flowering shrubs on top; a patch of trees perches on the island's north face.

Many islands also have dark grey or black rock formations that sometimes seems to writhe along the shoreline. Granitic intrusions some hundreds of millions of years ago contributed to deformation and metamorphizing of sedimentary deposits, perhaps mudstone or shale, formed under pressure from fine clay sometimes mixed with sand or volcanic dust. The harder, metamorphosed rock is the result of relatively recent, typically mountain-building forces folding, compressing and heating the sedimentary stone. This helps to explain those islands that comprise hard, sometimes strangely shaped, slate-like formations. Low tide often reveals ramparts of this rock, stratified and tilted, often twisted and deformed, with big faults providing deep surge-channels that typically provide the only easy access to series of delightful little beaches.

### **Natural playgrounds**

But it's the granite and limestone geologies that provide most of the conditions for enjoying a whole range of marine and land recreations.

The granite boulders on the western shores of the Similan Islands — or around the series of pinnacles and islets that run along the north-south 50-metre isobath lying 15-20 miles west of the Mergui Archipelago — offer wonderfully scenic shorelines that mirror the exotic bottom topography so favoured by scuba divers from around the world. The boulders tumble from surface to beneath the sea, where they present fantastic submarine panoramas overgrown with corals and algae, background to hundreds of species of fish and scuba divers who swim among the crevasses, canyons, and cave-like swim-throughs.

Limestone islands such as those found in Phang Nga Bay and Krabi, on the other hand, are riddled with caves and collapsed cave systems (*hongs*) that are perfect for sea-kayaking penetrations. At the same time, breached hongs — where their high walls have collapsed to reveal the “rooms” within — make perfect anchorages for recreational boats. Other attractions include soaring rockfaces perfect for recreational climbers and caves for spelunkers. Please note, however: on some islands local people also scale the sheer rockfaces and soaring caverns, but they're doing it for profit rather than fun. They're collecting the swiftlet nests that command such enormous prices from aficionados of birds-nest soup. One of these — the so-called Viking Cave on Koh Phi Phi Le — is a regular feature of daytrips from Phuket and Phi Phi Don. More often throughout the region, however, the concessionaires don't welcome outsiders — too often these are people intent on stealing nests — so cruising boats should proceed with due caution.

Overall, however, sailors, snorkellers, divers, climbers and beachcombing sunworshippers alike would be hard put to find a better part of the world to explore, and in large part they have the diverse island and coastal geography to thank for this.

## CUTLINES

From a geophysical perspective, what's big news for people is only business as usual.

Although the limestone and granitic landscapes have evolved differently, in each case movements in the earth's crust — together with the erosive forces of wind, sea, rain and

organic acids— have created ideal natural conditions for a whole range of land and sea recreations.

These piles of curious stones, some of them as big as houses, lie as though collected and later abandoned in careless heaps by some ancient race of beachcombing giants.

#### CAPTION MATERIAL

One major regional tectonic system presents a series of long blocks, granite at their core, that has intruded into limestone and sandstone already folded and faulted by movements in the Earth's crust.

On the west side of the Similan Islands, currents have kept the granite formations clear of sand; on the coral-covered sandy slopes of the east side, the boulders have been largely buried.

Koh Phi Phi, only a few hours sail from Phuket, is among the most beautiful island groups in the world.

Phang Nga Bay, with its 40 spectacular islands set in over 400 square kilometres of shallow, milky-green water, is a sailor's paradise.

If the fantastic landscapes of Yunnan and Kwangsi were to be flooded by the sea they would look very much like Phang Nga Bay.

Among the attractions for visitors to Phang Nga and Krabi are caves where local people scale sheer rock-faces and soaring caverns to collect the nests that command such enormous prices from aficionados of birds-nest soup. One of these — the so-called Viking Cave on Koh Phi Phi Le — is a regular feature of daytrips from Phuket and Phi Phi Don.

The hidden worlds of the “hongs” are accessible only by means of tough and stable inflatable canoes through sea caves at low tide.