**CENTER OF THE CENTER: Calumpang Peninsula (Lat 13.718, Long 120.905)**
**NATURE'S CONSPIRACY**

by

**Manny Bate**
A resident of the Center of the Center

To be a part of the Center of the Center has been on top of my bucket list as a scuba diver. With persistence, the aspiration has been achieved. With each passing year as I witness the changing of the seasons and experience the natural cycles and surprises that make the Calumpang Peninsula special, I cannot help but be convinced that the Center of the Center of marine biodiversity coincides with the center of the center of natural hazards. These recurring natural events, extreme ones included, nurture the Peninsula's marine ecosystem and influence its functions and evolution.

As I kept vigil for Typhoon Quinta and Typhoon Rolly the week after, I cannot help but recall apprehensively the extreme events that I have experienced in Calumpang Peninsula. A few years ago, a lazy summer afternoon was suddenly jolted out of stupor by a major shaker. Aftershocks followed but of lesser magnitude, too weak to cause physical damage but perceptible enough to fray the nerves of the locals and tourists alike. Early 2020, Taal Volcano opened the year with magnificent but frightful light and sound show. Terrifying bolts of lightning flashed across the darkened skies as foreboding grey ashfall smothered everything on the ground, choked creeks, and streams.


Aside from these occasional main events, the peninsula copes with predictable seasonal specials of extreme Habagat deluge followed by scorching summers. Every year, the peninsula finds itself at the crosshairs of one or two typhoons from the Pacific as they move to the west like the couple of Quinta (International Code Name: Molave) and Rolly (International Code Name: Goni). Like the rest that preceded them, they carved a path of ruined properties, wildly thrashed trees, landslide scars, and swaths of the debris flow that led to the bay feeding long plumes of silt. Yet, the marine ecosystem of Calumpang Peninsula thrives and flourishes amidst nature's turmoil. There is no other way to explain that but accept the fact that the natural hazards are among the reasons for its being. Its marine ecosystem is honed by nature's rhapsody of quiescence with interludes of upheaval and turbulence. A look at the brief natural history of Verde Island Passage during the last geologic epoch to the present times should be enough to convince the readers of the soundness of my proposition, or at the very least sow a seed of curiosity in their minds.

**Calumpang Peninsula: Center of the Center of the Center**

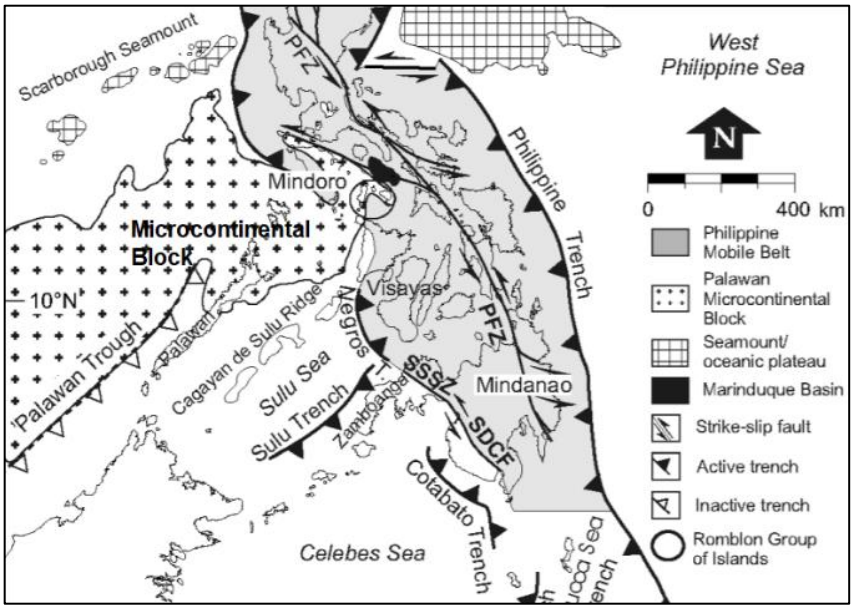
Calumpang Peninsula sits smack right in the middle of the Verde Island Passage, the body of water between Batangas and Mindoro, marked by Marinduque at its southeastern end, and by Lubang Island at its northwestern end. The Verde Island passage has been determined as the Center of the Center of global marine biodiversity (Carpenter and Springer, 2005)[1]

(Map courtesy of marinduquegov.blogspot.com)
The Verde Island Passage bound by Batangas, Mindoro, Marinduque and Lubang Island

The global center of marine biodiversity is the contiguous region formed by the Philippines, Malaysia, Indonesia, Papua New Guinea, Timor Leste, and the Solomon Islands. This region is called the Coral Triangle and within the triangle, the marine biodiversity of Verde Island Passage stands out according to marine scientists.

**Geology, Building Block of Biodiversity**

- Freeride on drifting tectonic plates, merging and isolation



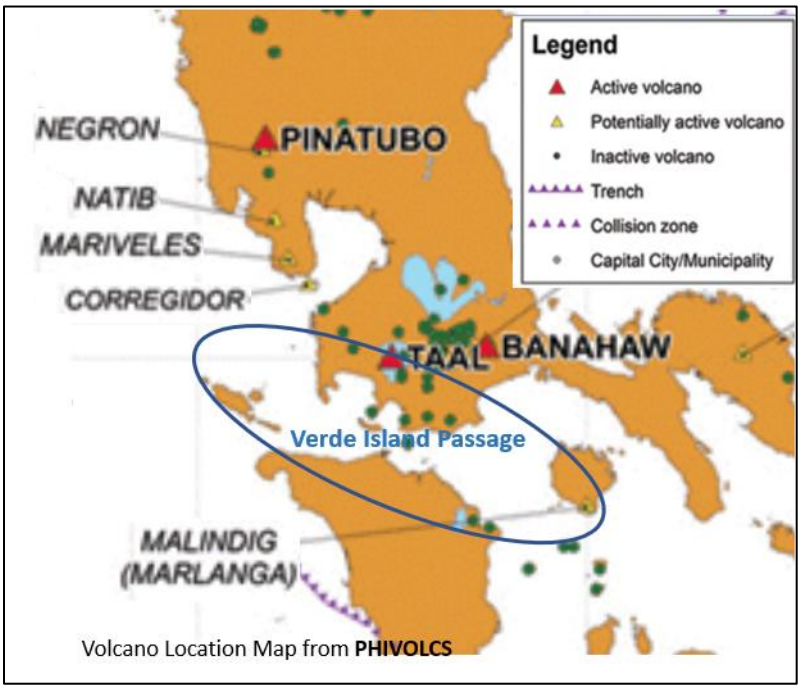

It is beyond doubt that the leading conspirator for biodiversity is geology. The collision of the 3 mega tectonic plates, Eurasian, Pacific, and Australian is seen by marine scientists as the harbinger of marine biodiversity in the region of Indonesia, Malaysia, and the Philippine archipelago (Carpenter and Springer, 2005). The drifting plates isolated the hitchhikers and the collision allowed the merging of the different fauna. In the region of western Luzon and the Verde Island Passage, this tectonic episode is represented by the arrival and collision with the Philippine archipelago of the sliver of a continental block rifted from mainland Asia sometime the Miocene as estimated by some geologists (see map excerpted from Yumul, et al. 2005)[2]. This micro-continental block

[1] Carpenter, K. E., and Springer, V.G. 2005. The center of the center of marine shore fish biodiversity: the Philippine Islands. Environmental Biology of Fishes (2005) 72: 467–480. Springer

[2] Yumul, G.P. Dimalanta, C.B. and Tamayo, R.A Jr. 2005. Indenter-tectonics in the Philippines: Example from the Palawan Microcontinental Block – Philippine Mobile Belt Collision. Resource Geology, vol. 55, no. 3, 189–198, 2005

incidentally is the only continental crust in the Philippines and underlies Palawan, parts of Mindoro, and northwestern Panay.

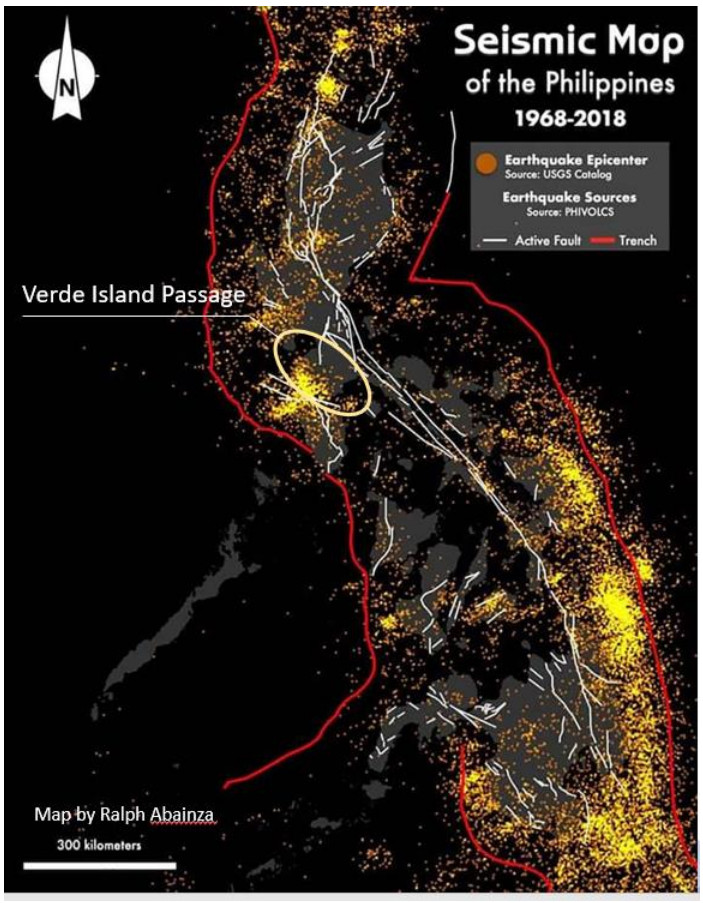
- The volcanoes of Verde Island Passage – Its warmth gives and takes life




Bear in mind that the drifting and convergence of these tectonic plates is not an independent and isolated event. Neither is it solely a surficial rearrangement of continents and islands. It is a complex process that goes deeper than the crust and beyond the continents. It is accompanied by the rifting of the lithosphere, the collision of tectonic plates, the thrusting of the denser plate into the crustal rift, and deep into the mantle where the leading edge of the swallowed plate is consumed and turned into magma. The magma is then forced to rise into the earth's surface as lava that breathes life into volcanoes. This is the origin of volcanoes and volcanic belts of western Luzon including the active, dormant, or inactive volcanoes of Bataan, Pampanga (e.g. Pinatubo) Batangas, Cavite, Laguna, Quezon. (see volcano location map). The whole of Calumpang Peninsula including the islands of Maricaban, Caban, Sombrero, and Verde is made up of volcanic rocks. Mount Panay in Gulugod Baboy is an inactive stratovolcano in the Calumpang Peninsula. In Verde Island, Mount Dagit-dagitan, an andesitic volcano was probably active till the late Pleistocene. The Batangas-Verde region is interpreted to have originated from a caldera eruption, a catastrophic event. The occasional eruptions of Taal Volcano with episodes of violent expulsion of volcanic ashes and gasses is a constant reminder of the region's restive state, geologically, that is. The spasmodic eruptions of these volcanoes have profound impacts on marine and terrestrial ecosystems, such as extirpation, alteration, and creation of new habitats as displayed by the catastrophic eruption of Mount Pinatubo in 1991. The eruption wiped out existing ecosystems but in turn created new ones, sort of renewing life. Within the Verde Island Passage, a similarly catastrophic eruption took place in the historic past, the prolonged eruption of Taal Volcano in 1754. The most significant environmental impact of this volcanic eruption is the conversion of a marine embayment into a freshwater lake and the evolution of marine fauna to freshwater species, i.e., the freshwater herring ('tawilis', the only freshwater herring in the world) and one of the two known freshwater sea snakes. The closure of the Taal Lake by the massive eruption in 1754 caused the alteration of habitat, probably widespread extirpation, and evolution and adaptation within the lake. But what about outside, within Balayan Bay itself, what were the ecological consequences of the eruption? The suspected pre-historic eruption of the Batangas Bay caldera could have been a cataclysmic event that caused widespread destruction and profound alteration of the marine ecology and terrestrial landforms. One obvious contribution of volcanism in the Calumpang

Peninsula is the extrusion of volcanic rocks that shaped the Calumpang Peninsula and provided a stable substrate for corals to hang on to and flourish.

The magma beneath Calumpang Peninsula has gifted the peninsula a mighty resource, an almost infinite source of heat and energy. The groundwater that encounters the hot rocks are heated and flows out as warm and hot springs. The geologic phenomenon that earned a barangay its name, Barangay Mainit. A submarine groundwater discharge (SDG) study in the peninsula discovered underwater hydrothermal springs that discharge not only hot or warm water, but acidic as well which researchers say is influencing the evolution and function of the diverse ecosystem (Cardenas, et al. 2020)[3]. The presence of thermal areas in Verde Island Passage is not confined to Calumpang Peninsula. Hot springs are also present in Naujan, Mindoro and signs of hydrothermal activity are similarly present in Verde Island. Surely this geologic process has its impacts on the marine ecosystem of the Verde Island Passage.




- The Earthquakes – Shaken well now and then

Like love and marriage, horse and carriage, earthquakes and volcanoes are inseparable in a tectonic environment like the Philippines'. The earthquake epicenters (1968 to 2018) map of the Philippines show that Verde Island Passage is among the earthquake-prone areas in the Philippine archipelago. Earthquakes are a daily occurrence in the archipelago, but most are imperceptible. I have witnessed the recent major shake-up in the Calumpang Peninsula that occurred in April 2017. The event was accompanied by bizarre unfamiliar loud and frightening noise as the earth shook violently. Bewildered tourists and locals dashed out into the safety of open spaces. In nature, it is known that some animal species can sense imminent earthquakes and can move away. But underwater, how does an earthquake affect the marine ecosystem? One hazard associated with an earthquake that is known to be destructive to a shallow marine ecosystem is a tsunami. But so far, the Peninsula has been spared from this hazard. The few photos shared by divers who were underwater when the major shake occurred showed a phenomenon that looks like a sand boil. Are the shaking and sand boil releasing nutrients from the substrate? So much remain unknown.

[3] Cardenas, M.B. Rodolfo, R.S. Lapus, M.R. Cabria, H.B. Fullon, J. Gpjunco, G.R. Breecker, D.O. Cantarero, D.M. Evaristo, J. Siringan, F.P. and Zhang, T. 2020. Submarine Groundwater and Vent Discharge in a Volcanic Area Associated with Coastal Acidification. https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2019GL085730

- Pleistocene Ice Ages – Repeated rise and fall of habitats

The Pleistocene Epoch, the geological period of oscillating sea level is another global geologic event with a profound effect on the terrestrial and marine habitats worldwide, including the Calumpang Peninsula. The retreat of sea level exposed broad areas, connected islands, and continents. In the Philippine archipelago, the retreat created large landmasses, closed ocean channels, and isolated the inland seas of the Sulu Sea, Bohol Sea, and the Sibuyan Sea. But as gleaned from the Pleistocene map of the Philippines created by the Wildlife Conservation Society of the Philippines, no significant change in the shoreline of the Verde Island Passage is evident during the extreme low glacial sea level. Could this mean it escaped the worst consequence of sea-level retreat, i.e. widespread loss of habitat?


The severe range of the fluctuation of sea levels during the Pleistocene caused the loss, migration, and creation of habitats. The end of the Pleistocene chill drowned vast tracks of low-lying lands, the largest of which is suspected to be the broad fertile plains that bordered the Asian mainland, now known as the Sunda Shelf. This event wiped out terrestrial habitats but caused expansion, migration, and the creation of new marine habitats. The repeated fluctuation of sea level during this epoch must have driven a frenzy of adaptation among the organisms as habitats are lost, altered, and created. Those that survived were strengthened and enhanced the species diversity. While those left high and dry by the combination of retreating sea and tectonic uplift perished much like the coralline limestone draped around the lower elevations of the Calumpang Peninsula. These were once thriving coral colonies but are now part of the terrestrial ecosystem.

The ocean circulation during the Pleistocene Ice Age must have also favored the Verde Island Passage. While the rest of the inland seas of the archipelago were locked up during the lowest glacial sea level, the western Luzon seaboard remained within the influence of the ocean circulation laden with life in search of refuge. The Verde Island Passage remained open during the Pleistocene Ice Age and was one of the few open channels that allowed circulation into inland seas (e.g. Sulu Sea, Bohol Sea). These circumstances must have significantly influenced the functions and evolution of the marine ecosystems of the Verde Island Passage.

**My Conclusions**

The seasonal drenching of the peninsula during the Habagat season, the occasional landslides triggered by earthquakes and typhoons surely smothers the nearshore communities, but beneficially it carry nutrients that nourished the marine life. A coral patch here and there is ravaged but surprisingly bounces back to life. What is it with the Center of the Center that makes it so resilient? Coral bleaching has ravaged coral reefs near and far with some communities unable to recover, but not the reefs of the Center of the Center which continues to thrive.

Is it a mere coincidence that Verde Island Passage is the only place in the archipelago where such nature's conspiracy exists? I suppose it will be a while before this conspiracy is fully unraveled. In the meantime, I need to batten down the hatches and dig in and dig deep in this coveted CENTER OF THE CENTER to relish the sunny days after the storm.