



THE EFFECTS OF SEASONS ON WATER QUALITY CHANGES AT WONNAPHA BEACH

Research Team: Mr. Sorachat Naknun, Ms. Nasikan Nithisihawat, Ms. Naphada Boonjan

Project advisor: Ms. Thapanee Oupatham, Ms. Suparat Kromsaeng, Ms. Jantarawan Jantarakong

Introduction

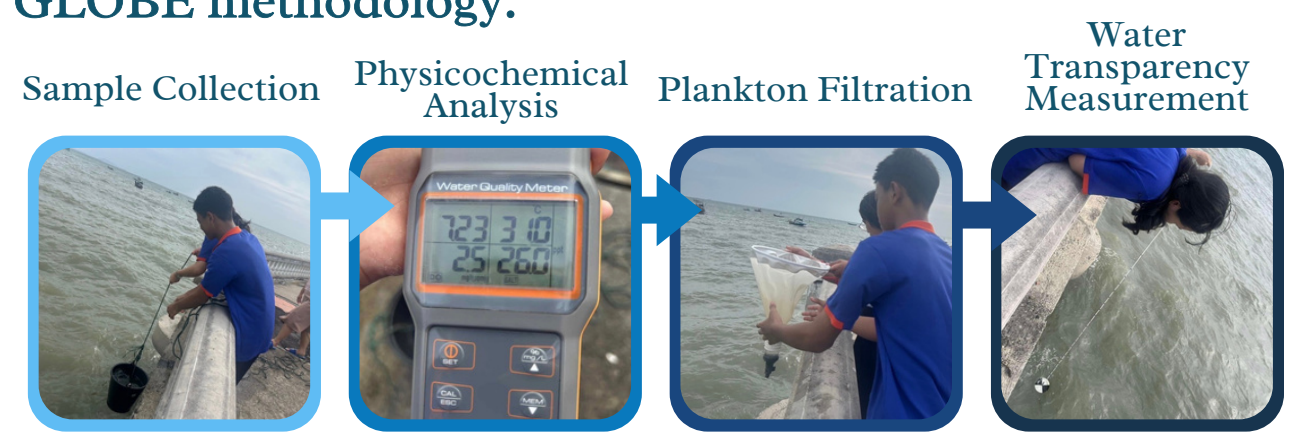
Coastal water quality degradation is a critical environmental issue that directly impacts marine ecosystems and local economies, particularly in areas like Wonnapha Beach where human activities are dense. A major concern is the occurrence of Red Tides (Plankton Blooms), which are triggered by excessive nutrient loading (Eutrophication) from land-based runoff. These blooms significantly reduce dissolved oxygen (DO) levels, harming aquatic life and affecting local fisheries and tourism.

The primary goal of this study is to evaluate the relationship between seasonal variations, specifically rainfall patterns, and seawater quality at Wonnapha Beach. By analyzing the Marine Water Quality Index (MWQI) and physicochemical parameters over a two-year period (2024–2025), this research aims to provide a foundation for effective coastal management and an early warning system for plankton bloom events.

Methodology

This study analyzed the relationship between seasonal rainfall and coastal water quality at Wonnapha Beach (2024–2025). Using data from the Institute of Marine Science, Burapha University, and the Thai Meteorological Department, key parameters including Temperature, Salinity, pH, and Dissolved Oxygen (DO) were monitored monthly. Water quality status was categorized as "Good," "Fair," or "Degraded" based on the Marine Water Quality Index standards from the Pollution Control Department. Statistical analysis was then performed to identify how seasonal precipitation impacts these physicochemical balances and the overall health of the marine ecosystem.

Figure 1: Water Quality Measurement Process based on GLOBE methodology.



Results

The water quality at Wonnapha Beach fluctuated seasonally with rainfall. The MWQI mostly stayed in "Fair" (50–80) to "Good" (>80) levels. However, it dropped to "Degraded" (<50) during extreme rain in April 2024 (47.1) and May 2025 (31.8), which occurred in summer due to climate change-induced storms. Figure 3 shows an inverse correlation where peak rainfall—notably in September 2024 (423.6 mm) during the rainy season—leads to lower MWQI scores. Figure 4 indicates that while pH and temperature remained stable, salinity fell significantly to 20.21–22.0 PSU during heavy rain months, affecting the coastal physicochemical balance.

Figure 2: Relationship between Monthly Rainfall and Marine Water Quality Index (MWQI).

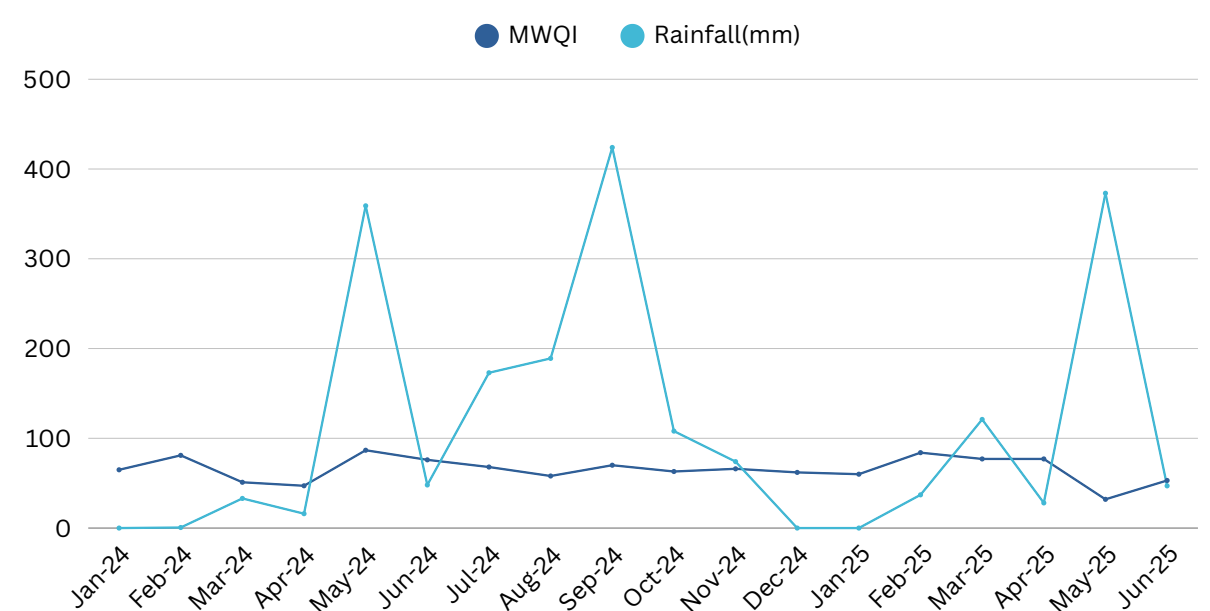
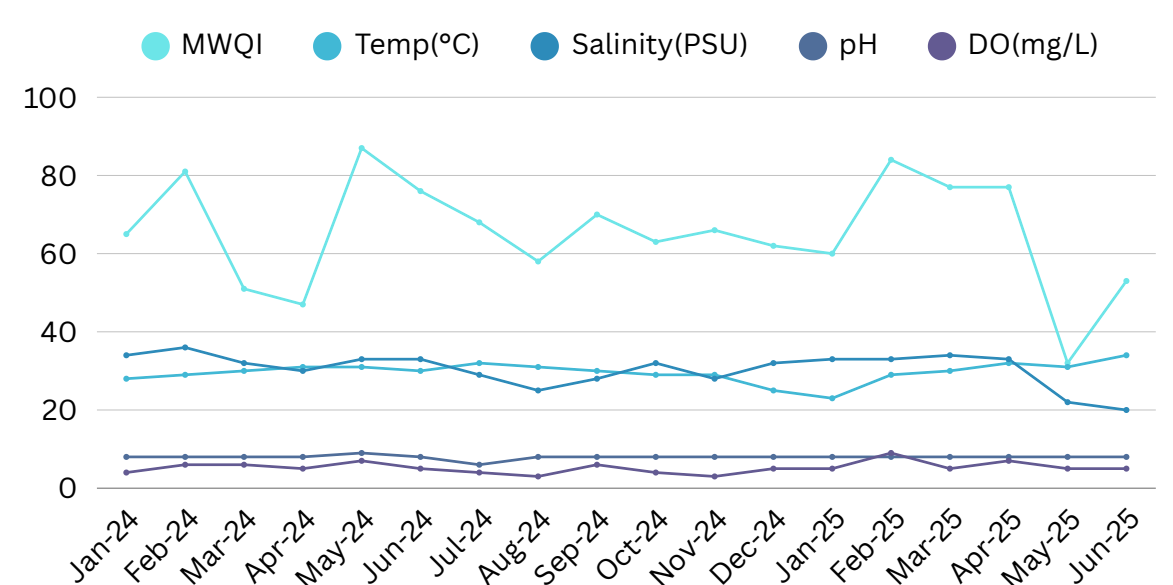


Figure 3: Relationship between Marine Water Quality Index (MWQI) and Physicochemical Parameters.



Conclusion

This study demonstrates that seasonal variations and global climate phenomena, specifically El Niño and La Niña, are the primary drivers of seawater quality at Won Napa Beach, Chon Buri. During the dry season, the marine environment remained stable with high salinity (up to 36.0 PSU) and optimal dissolved oxygen (DO) levels. Conversely, the rainy season, intensified by the La Niña phenomenon in 2025, triggered significant environmental shifts: heavy precipitation led to massive freshwater runoff, causing salinity to plummet to 21.97 PSU and DO to drop to a critical level of 2.0 mg/L. These changes, coupled with the influx of organic waste and sediments from local communities and the Bang Pakong River, resulted in a marked decline in the Marine Water Quality Index (MWQI). The findings underscore that while the coastal ecosystem is seasonally resilient, extreme weather events accelerated by climate change pose a significant threat to its stability, necessitating urgent local waste management and continuous monitoring of coastal discharges.

References

Department of Marine and Coastal Resources. (2021). The phenomenon of sea water color change in the Bang Saen beach area, Chonburi Province. Retrieved June 28, 2025, from <https://www.dmcrc.go.th/detailAll/52023/nws>
Paerl, H. W., Scott, J. T., McCarthy, M. J., Newell, S. E., Gardner, W. S., & Havens, K. E. (2016). Nutrient enrichment and eutrophication in coastal waters. Retrieved June 15, 2025, from <https://link.springer.com/journal/12237>
Pollution Control Department. (2018). Basic knowledge about water quality and eutrophication. Retrieved June 15, 2025, from <https://www.pcd.go.th/knowledge/water-quality-eutrophication>
Pollution Control Department. (2022). Surface water quality standards. Retrieved September 5, 2025, from https://www.pcd.go.th/wp-content/uploads/2022/08/pcdnw-2022-08-23_03-47-16_304672.pdf
Thai Meteorological Department. (2021). Monitoring the El Niño and La Niña phenomena. Retrieved September 3, 2025, from <https://www.tmd.go.th/climate/El-Nino-La-Nina>
Yuenyong, S., Nimsuwan, N., Buranaprathepr, A., Gunboa, V., Jintasaernee, P., Thaipichitburapa, P., & Suriyaphan, J. (2019). Seasonal variations of water quality in the Bangpakong River during 2016–2018. Burapha Science Journal. Retrieved June 15, 2025, from <https://scijournal.buu.ac.th/index.php/sci/article/view/2477>