

Brought to you by [INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA](#)

Scopus

[Back](#)

IMPACTS OF EL NIÑO AND MONSOONAL INTERACTIONS ON RIVER WATER QUALITY AND CAGE AQUACULTURE IN THE PAHANG RIVER, MALAYSIA

[Water Conservation and Management](#) • Article • 2025 •

DOI: 10.26480/wcm.04.2025.731.738

[Razali, Muhamad Izzuan](#)^a; [Ramly, Rimatulhana](#)^b; [Abdullah, Azila](#)^b;[Hadi, Muhammad Syafiq Izzuddin Abdul](#)^b; [Nawi, Mohd Firdaus](#)^c ; [+3 authors](#)

^a Aquatic Health Research Laboratory, Institute of Oceanography and Maritime Studies (INOCEM), Kulliyah of Science, International Islamic University Malaysia, Bandar Indera Mahkota, Pahang, Kuantan, 25200, Malaysia

[Show all information](#)

0

Citations

[Full text](#) [Export](#) [Save to list](#)[Document](#)[Impact](#)[Cited by \(0\)](#)[References \(58\)](#)[Similar documents](#)

Abstract

El Niño-induced warming in the central and eastern Pacific often triggers droughts and deteriorates freshwater quality across Southeast Asia, including Malaysia. This study aims to evaluate the impacts of El Niño and Northeast Monsoon dynamics on river water quality and their implications for freshwater cage aquaculture in the Pahang River. Specifically, it examines three 2023 climatic phases: (1) the Northeast Monsoon (January–March), (2) the El Niño period (April–October), and (3) their combined period (November–December). Monthly sampling across multiple sites (n = 96) was conducted to assess key water quality parameters. During the Northeast Monsoon (Jan–Mar 2023), all

measured parameters remained within optimal ranges for freshwater fish, except phosphate levels (0.22 ± 0.11 mg/L). During the El Niño phase (Apr–Oct 2023), mean river temperature rose by $3\text{ }^{\circ}\text{C}$ ($28 \pm 1\text{ }^{\circ}\text{C}$) with unionized ammonia at 0.013 ± 0.01 mg/L. The combined El Niño–Northeast Monsoon period (Nov–Dec 2023) demonstrated significant degradation in water quality: total suspended solids reached a maximum of 151.5 ± 93.2 mg/L, and ammonia concentrations increased to 1.08 ± 0.49 mg/L, while temperature fluctuated between $26\text{ }^{\circ}\text{C}$ and $30\text{ }^{\circ}\text{C}$. These alterations adversely affect fish health by reducing dissolved oxygen levels and elevating nitrogen toxicity. The results highlight the considerable challenges that El Niño poses to the sustainability of aquaculture operations in the Pahang River. The implementation of effective mitigation strategies is imperative to protect the aquaculture sector in the region from climate-induced impacts. © 2025, Zibeline International Publishing Sdn. Bhd.. All rights reserved.

Author keywords

Cage aquaculture; Climate Change; El Niño; Northeast Monsoon; Pahang River Water Quality

Indexed keywords

Regional Index

Malaysia; Pahang; Pahang River; West Malaysia

GEOBASE Subject Index

aquaculture system; cage culture; El Nino; monsoon; river water; spatiotemporal analysis; temperature effect; water quality

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Development Fund		
Department of Fisheries		
Ministry of Agriculture and Food Security		

Funding text

Financial support for this work was provided by grant 40170502 from the Development Fund, Department of Fisheries (under 12th Malaysia Plan), Ministry of Agriculture and Food Security (MAFS), Malaysia.

Corresponding authors

Corresponding
author

R. Ramly

Affiliation

National Fish Health Research Centre (NaFisH), Fisheries Research Institute,
Department of Fisheries Malaysia, Penang, Batu Maung, 11960, Malaysia

Corresponding
author

M.F. Nawi

Affiliation

Faculty of Veterinary Medicine, Universitas Airlangga, Jl. Mulyorejo, Kec.
Mulyorejo, East Java, Surabaya, 60115, Indonesia

Email address

firdausn@iium.edu.my

© Copyright 2026 Elsevier B.V., All rights reserved.

Abstract

Author keywords

Indexed keywords

Funding details

Corresponding authors

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)[Privacy matters](#)

Language

[日本語版を表示する](#)[查看简体中文版本](#)[查看繁體中文版本](#)[Просмотр версии на русском языке](#)

Customer Service

[Help](#)[Tutorials](#)[Contact us](#)

ELSEVIER

[Terms and conditions](#) ↗ [Privacy policy](#) ↗ [Cookies settings](#)

All content on this site: Copyright © 2026 [Elsevier B.V.](#) ↗, its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

