

ABSTRAK

SEBARAN HORIZONTAL *TRACE ELEMENTS* (^{75}As DAN ^{111}Cd) PADA SEDIMEN LAUT DALAM: STUDI KASUS DI SELAT MAKASSAR DAN LAUT BALI

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Sedimen laut dalam berperan sebagai arsip geokimia yang merekam proses lingkungan dan potensi akumulasi *trace elements* akibat interaksi faktor alami maupun aktivitas antropogenik. Selat Makassar hingga Laut Bali merupakan kawasan oseanografi strategis karena dilalui Arus Lintas Indonesia (Arlindo) serta dipengaruhi masukan material daratan, aktivitas pelayaran, dan dinamika laut dalam, namun kajian mengenai distribusi *trace elements* pada sedimen laut dalam tropis Indonesia masih terbatas. Penelitian bertujuan untuk menganalisis konsentrasi *trace elements* ^{75}As dan ^{111}Cd pada sedimen laut dalam serta mengevaluasi tingkat kontaminasi dan indikasi sumber alaminya maupun antropogeniknya. Sampel sedimen diperoleh dari lima stasiun pengamatan dalam ekspedisi GEOMARIN III menggunakan kapal riset Badan Geologi, Kementerian Energi dan Sumber Daya Mineral (ESDM) Republik Indonesia. Preparasi sampel dilakukan melalui proses destruksi basah, dan analisis kandungan unsur dilakukan menggunakan *Inductively Coupled Plasma–Mass Spectrometry* (ICP-MS) berdasarkan EPA Method 6020A. Karakteristik fisik sedimen dianalisis menggunakan *Dynamic Light Scattering* (DLS), sementara tingkat kontaminasi dievaluasi melalui *Contamination Factor* (CF) dan *Pollution Load Index* (PLI) dan *Enrichment Factor* (EF), serta didukung analisis statistik. Hasil penelitian menunjukkan konsentrasi ^{75}As berkisar 0,08–0,53 mg/kg dan ^{111}Cd 0,001–0,012 mg/kg, yang tergolong rendah dan berada di bawah nilai rata-rata global. Nilai CF dan PLI pada seluruh stasiun < 1 dan masuk kategori tidak tercemar hingga tercemar rendah. Nilai EF mengindikasikan dominasi sumber alami dengan pengayaan antropogenik ringan hingga sedang, terutama di wilayah Delta Mahakam dan sekitar Pulau Kangean. Secara keseluruhan, sedimen laut dalam di wilayah penelitian berada pada kondisi geokimia relatif stabil dengan pengaruh antropogenik yang terbatas.

Kata Kunci: Arus Lintas Indonesia (Arlindo), Sedimen Laut Dalam, *Trace Element*

ABSTRAK

HORIZONTAL DISTRIBUTION OF TRACE ELEMENTS (^{75}As AND ^{111}Cd) IN DEEP SEA SEDIMENTS: A CASE STUDY IN THE MAKASSAR STRAIT AND THE BALI SEA

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Deep-sea sediments serve as geochemical recording environmental dynamics and trace element accumulation driven by natural and anthropogenic processes. The Makassar Strait to the Bali Sea is an oceanographically strategic region influenced by the Indonesian Throughflow (Arlindo), terrestrial inputs, shipping activities, and deep-sea dynamics, yet studies on trace element distribution in Indonesian tropical deep-sea sediments remain limited. This study was investigated the concentrations of ^{75}As and ^{111}Cd in deep-sea sediments and evaluate the level of contamination and indications of natural and anthropogenic sources. Sediment samples were collected from five observation stations during the GEOMARIN III Expedition using a research vessel from the Geological Agency, Ministry of Energy and Mineral Resources of the Republic of Indonesia. Sample preparation was carried out through wet destruction, while element concentration analysis was performed using Inductively Coupled Plasma–Mass Spectrometry (ICP-MS) based on EPA Method 6020A. The physical characteristics of the sediments were analyzed using Dynamic Light Scattering (DLS). The level of contamination was evaluated through the Contamination Factor (CF), Pollution Load Index (PLI), and Enrichment Factor (EF), supported by statistical analysis. Results show that ^{75}As ranged from 0.08 to 0.53 mg/kg and ^{111}Cd from 0.001 to 0.012 mg/kg, which is low and below the global average. The CF and PLI values at all stations were < 1, indicating unpolluted to low-polluted categories. The EF values indicated the dominance of natural sources with light to moderate anthropogenic enrichment, especially in the Mahakam Delta and around Kangean Island. Overall, deep-sea sediments in the study area were exhibits relatively stable geochemical condition with limited anthropogenic influence.

Keywords: Deep Sea Sediments, Indonesian Throughflow (ITF), Trace Elements