

RINGKASAN

Pencemaran logam berat seperti kadmium (Cd) menjadi masalah lingkungan serius karena sifatnya yang toksik dan akumulatif. Sungai Donan merupakan salah satu perairan yang telah tercemar Cd akibat aktivitas antropogenik. Penelitian ini bertujuan untuk mengetahui persentase kesintasan *Diopatra clapedii* terhadap paparan Cd dalam berbagai konsentrasi serta menentukan konsentrasi maksimum yang masih dapat ditoleransi. Penelitian juga menganalisis pengaruh faktor lingkungan (pH, suhu, salinitas) dan kemungkinan efek sinergis logam lain terhadap persentase kesintasan spesies tersebut.

Penelitian dilakukan secara eksperimental menggunakan Rancangan Acak Lengkap (RAL) dengan enam perlakuan konsentrasi Cd (0,55 ppm, 1,84 ppm, 3,13 ppm, 4,42 ppm, 5,71 ppm, dan 7,00 ppm) yang diencerkan dari larutan kerja 7,00 ppm, masing-masing dengan empat ulangan. Parameter yang diamati meliputi konsentrasi Cd pada setiap perlakuan, suhu, pH, dan salinitas, jumlah individu hidup dan mati, serta selisih konsentrasi Cd pada air dan sedimen sebelum dan sesudah perlakuan. Analisis data menggunakan PERMANOVA, serta *multiple regression* untuk hubungan antar variabel dan menentukan konsentrasi maksimum yang dapat ditoleransi oleh *D. clapedii*.

Hasil menunjukkan bahwa peningkatan konsentrasi Cd menurunkan persentase kesintasan *D. clapedii* ($p = 0,0002$). Konsentrasi Cd dalam air lebih tinggi daripada sedimen, yang menunjukkan air sebagai jalur utama paparan. Faktor lingkungan berada dalam kisaran toleransi spesies, namun logam lain seperti Zn, Cu, Pb, dan Cr yang telah ada di media awal diduga memperkuat toksisitas Cd secara sinergis. Konsentrasi Cd 3,16 ppm ditetapkan sebagai batas toleransi maksimum karena masih menghasilkan persentase kesintasan $\geq 50\%$. Hasil tersebut menunjukkan bahwa *D. clapedii* memiliki toleransi terhadap Cd dalam batas tertentu, sehingga berpotensi sebagai spesies indikator dalam studi ekotoksikologi.

Kata Kunci: *D. clapedii*, ekotoksikologi, kadmium, kesintasan, pencemaran lingkungan

SUMMARY

Heavy metal contamination, specifically cadmium, constitutes a significant environmental concern attributable to its toxicological properties and propensity for bioaccumulation. The Donan River represents one of the aquatic ecosystems adversely affected by Cd pollution, primarily as a consequence of anthropogenic activities. This investigation seeks to evaluate the survivability of *Diopatra clapedii* when subjected to various concentrations of Cd and to establish the highest concentration threshold that remains physiologically tolerable. Additionally, the study examines the modulatory effects of environmental variables namely pH, temperature, and salinity as well as the potential synergistic interactions with concomitant heavy metals on the viability of this species.

The experimental framework employed a Completely Randomized Design (CRD) incorporating six graduated Cd treatments (0,55 ppm, 1,84 ppm, 3,13 ppm, 4,42 ppm, 5,71 ppm, dan 7,00 ppm), derived from a 7,00 ppm stock solution, each replicated fourfold. The parameters monitored encompassed Cd concentration across experimental treatments, ambient temperature, pH, salinity, mortality and survival rates, alongside quantification of Cd levels in both water and sediment matrices pre- and post-exposure. Statistical analyses were conducted using PERMANOVA, complemented by multiple regression to elucidate inter-variable associations and determined maximum concentration.

The results indicate that an increase in Cd concentration significantly reduces the survival percentage of *D. clapedii* ($p = 0.0002$). Notably, the Cd concentration in water was higher than in sediment, suggesting that water serves as the primary exposure pathway. Although the environmental factors were within the species' tolerance range, the presence of other metals such as Zn, Cu, Pb, and Cr in the initial medium is suspected to synergistically enhance Cd toxicity. Cd concentration of 3,16 ppm was established as the maximum tolerance limit, as it still yielded a survival percentage of over 50%. These findings suggest that *D. clapedii* exhibits tolerance to Cd within certain limits, rendering it a potential candidate as an indicator species for ecotoxicological studies.

Keywords: *D. clapedii*, ecotoxicology, cadmium, survival, environmental pollution