

KONDISI EKOSISTEM KAWASAN BUYAN TAMBLINGAN BALI BERDASARKAN ASPEK EKOTOKSIKOLOGIS DAN EKOLOGIS

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Abstrak

Penelitian ini mempelajari degradasi kawasan konservasi Buyan Tamblingan melalui pendekatan ekologi dengan mempelajari potensi dan dampak pencemaran terhadap bioakumulasi logam tembaga (Cu) dan kadmium (Cd) dalam otot dan hati ikan Nila (*Oreochromis niloticus*), struktur dan komposisi vegetasi hutan riparian pembatas serta kemelimpahan perifiton danau Buyan dan Tamblingan. Bioakumulasi logam berat dianalisis dengan *Atomic Absorbance Spectrophotometer* (AAS) pada pemaparan hari ke-0, 15 dan 30. Struktur dan komposisi vegetasi dianalisis *kuadrat plot method design* dalam 5 plot berukuran 20 m x 20 m pada masing-masing 5 *belt transect* sejajar garis hutan. Kemelimpahan komunitas perifiton di cuplik dari plat artifisial pada 3 stasiun dengan ulangan temporal di kedua danau. Hasil penelitian menunjukkan bahwa bioakumulasi tembaga (Cu) berkisar antara $2,04 \times 10^{-3} \mu\text{mol g}^{-1}$ hingga $45,92 \times 10^{-3} \mu\text{mol g}^{-1}$ dalam otot dan $9,34 \times 10^{-3} \mu\text{mol g}^{-1}$ hingga $22,18 \times 10^{-3} \mu\text{mol g}^{-1}$ dalam hati sedangkan kadmium (Cd) berkisar antara $0 \mu\text{mol g}^{-1}$ hingga $2,79 \times 10^{-3} \mu\text{mol g}^{-1}$ dalam otot dan $0,07 \times 10^{-3} \mu\text{mol g}^{-1}$ hingga $2,89 \times 10^{-3} \mu\text{mol g}^{-1}$ dalam hati. Fluktuasi akumulasi logam dalam otot dan hati terjadi karena respon mekanisme internal melalui metabolisme logam exogenous. Hasil penelitian menunjukkan bahwa kandungan tembaga (Cu) diatas ambang batas sedangkan kandungan kadmium (Cd) dibawah ambang batas maksimal yang ditetapkan pemerintah di kedua danau. Struktur vertikal dan horizontal hutan mencapai puncak pertumbuhan pada wilayah yang berbatasan dengan danau Tamblingan dan pertumbuhan minimum pada wilayah yang berbatasan dengan danau Buyan. Hutan tersusun atas 30 spesies dengan 15 spesies pembeda. Indeks similaritas Sørensen berkisar antara 26,67% hingga 81,48% berdasarkan kehadiran dan 15,74% hingga 75,54 berdasarkan *weighted by cover* pada wilayah kajian. Indeks diversitas *inversed Simpson's* berkisar antara 0,091-0,150 dan Shannon's -Weiner berkisar antara 2,135 hingga 2,601. Perbedaan ini karena tingkat usikan di wilayah danau Buyan lebih tinggi yakni pembukaan lahan untuk agroindustri. Komunitas perifiton diidentifikasi sebanyak 3 fungsional group yakni *chlorophyta* (*green algae*), *cyanobacteria* (*blue green algae*) dan *diatom*. Densitas *Chlorophyta* berkisar antara 136,58 hingga 364,28 spesies per cm^2 sedangkan *Cyanobacteria* berkisar antara 51,70 hingga 211,95 spesies per cm^2 dan *Diatom* berkisar antara 1054,20 hingga 2025,7 spesies per cm^2 . Densitas perifiton setiap fungsional group lebih tinggi di danau Tamblingan karena kesesuaian kondisi lingkungan.

Kata kunci: Tembaga (Cu); Kadmium (Cd); Oreochromis niloticus; Vegetasi dan Perifiton.

ECOSYSTEM CONDITION OF BUYAN-TAMBLINGAN LANDSCAPE IN BALI BASED ON ECOTOXICOLOGICAL AND ECOLOGICAL ASPECT

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Abstract

This research aimed to study the degradation of Buyan Tamblingan conservation landscape using ecological approach by investigating the potential and impact of pollution in ecological linkages from bioaccumulation of heavy metals such as copper (Cu) and cadmium (Cd) in muscle and liver of Nile Tilapia (*Oreochromis niloticus*), structure and composition of riparian lakeside forest between lake of Buyan and Tamblingan and also periphyton communities. Bioaccumulation of heavy metals was analyzed by *Atomic Absorbance Spectrophotometer (AAS)* in 0, 15 and 30 days of exposure. Analysis for the structure and composition of vegetation utilized *quadrat plot method design* in 20 m x 20 m plot 5 of each 5 *belt transect* in the line of lakeside forest. The density of periphyton communities analyzed temporal scale from artificial plate in 3 stations of each lake. The result showed that the bioaccumulation of copper (Cu) range from $2,04 \times 10^{-3} \mu\text{mol g}^{-1}$ to $45,92 \times 10^{-3} \mu\text{mol g}^{-1}$ in muscle and $9,34 \times 10^{-3} \mu\text{mol g}^{-1}$ to $22,18 \times 10^{-3} \mu\text{mol g}^{-1}$ in liver. Cadmium (Cd) bioaccumulation range from $0 \mu\text{mol g}^{-1}$ to $2,79 \times 10^{-3} \mu\text{mol g}^{-1}$ in muscle and $0,07 \times 10^{-3} \mu\text{mol g}^{-1}$ to $2,89 \times 10^{-3} \mu\text{mol g}^{-1}$ in liver. Fluctuation of heavy metals accumulation in muscle and liver is due to internal mechanism respond by exogenous metals metabolism in Nile Tilapia. This result describe that copper (Cu) concentration are higher and cadmium (Cd) concentration are lower in comparison with Indonesia government policy in both lake. Vertical and horizontal structure of vegetation greatest growth in study area of Tamblingan lake border and the lowest growth in study area of Buyan lake border. The forest composes of 30 species of tree, with 15 of them are *host species*. Sorensen similarity index range from 26,67% to 81,48% based on density and 15,74% to 75,54 based on *weighted by cover* in all study area. Simpson diversity index range from 0,091-0,150 and Shannon-Weiner index from 2,135 to 2,601 in all study area. These circumstances are due to the differences of environmental disturbance. Buyan has higher disturbance such as deforestation for industry and tourism. The periphyton communities discovered in 3 functional group such as *chlorophyta (green algae)*, *cyanobacteria (blue green algae)* and *diatom*. *Chlorophyta* density range from 136,58 to 364,28 species per cm^2 , *Cyanobacteria* from 51,70 to 211,95 species per cm^2 and *Diatom* from 1054,20 to 2025,7 species per cm^2 . Periphyton density of each functional group are higher in Tamblingan due to environmental suitability.

Keywords: Copper (Cu); Cadmium (Cd); Oreochromis niloticus; Vegetation and Periphyton.

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