

DAFTAR PUSTAKA

- Abdi, O., & Kazemi, M. (2015). A review study of biosorption of heavy metals and comparison between different biosorbents. *Journal of materials and environmental science*, 6(5), 1386-1399.
- Afifah, S. H., Apriliana, E., Setiawan, G., & Berawi, K. N. (2024). Antibacterial activity of green tea epigallocatechin gallate (EGCG) on Gram positive and Gram negative bacteria. *Medula*, 14, 2330-2335.
- Ahmed, M. J., Okoye, P. U., Hummadi, E. H., & Hameed, B. H. (2019). High-performance porous biochar from the pyrolysis of natural and renewable seaweed (*Gelidiella acerosa*) and its application for the adsorption of methylene blue. *Bioresource technology*, 278, 159-164. <https://doi.org/10.1016/j.biortech.2019.01.054>
- Arulkumar, A., Nigariga, P., Paramasivam, S., & Rajaram, R. (2019). Metals accumulation in edible marine algae collected from Thondi coast of Palk Bay, Southeastern India. *Chemosphere*, 221, 856-862.
- Badan Pusat Statistik, I. (2017). *Statistik lingkungan hidup Indonesia 2017*. Jakarta: Badan Pusat Statistik Indonesia. <https://doi.org/10.1016/j.chemosphere.2019.01.007>
- Athar, M., Farooq, U., Aslam, M., & Salman, M. (2013). Adsorption of Pb (II) ions onto biomass from *Trifolium resupinatum*: equilibrium and kinetic studies. *Applied Water Science*, 3(3), 665-672. <https://doi.org/10.1007/s13201-013-0115-0>
- Auta, H. S., Emenike, C. U., Jayanthi, B., & Fauziah, S. H. (2018). Growth kinetics and biodeterioration of polypropylene microplastics by *Bacillus* sp. and *Rhodococcus* sp. isolated from mangrove sediment. *Marine pollution bulletin*, 127, 15-21. <https://doi.org/10.1016/j.marpolbul.2017.11.036>
- Azzami, F. M., Trianto, A., & Sabdono, A. (2022). Penapisan Aktivitas Antibakteri Dari Bakteri Asosiasi Spons Terhadap MRSA (Methicilin-resistant *Staphylococcus aureus*). *Journal of Marine Research*, 11(2), 208-216.
- Barka, E. A., Vatsa, P., Sanchez, L., Gaveau-Vaillant, N., Jacquard, C., Klenk, H. P., ... & van Wezel, G. P. (2016). Taxonomy, physiology, and natural products of Actinobacteria. *Microbiology and molecular biology reviews*, 80(1), 1-43. <https://doi.org/10.1128/MMBR.00019-15>
- Bayu, A., & Handayani, T. (2018, December). High-value chemicals from marine macroalgae: opportunities and challenges for marine-based bioenergy development. In IOP Conference Series: Earth and Environmental Science (Vol. 209, No. 1, p. 012046). IOP Publishing.

- Bryan, G. W., & Langston, W. J. (1992). Bioavailability, accumulation and effects of heavy metals in sediments with special reference to United Kingdom estuaries: a review. *Environmental pollution*, 76(2), 89-131. [https://doi.org/10.1016/0269-7491\(92\)90099-V](https://doi.org/10.1016/0269-7491(92)90099-V)
- Cai, J., Lovatelli, A., Aguilar-Manjarrez, J., Cornish, L., Dabbadie, L., Desrochers, A., ... & Yuan, X. (2021). Seaweeds and microalgae: an overview for unlocking their potential in global aquaculture development. *FAO Fisheries and Aquaculture Circular*, (1229).
- Choi, Y., Kim, H. A., Kim, K. W., & Lee, B. T. (2018). Comparative toxicity of silver nanoparticles and silver ions to *Escherichia coli*. *Journal of environmental sciences*, 66, 50-60. <https://doi.org/10.1016/j.jes.2017.04.028>
- Cruz-Lopes, L. P., Macena, M., Esteves, B., & Guiné, R. P. (2021). Ideal pH for the adsorption of metal ions Cr⁶⁺, Ni²⁺, Pb²⁺ in aqueous solution with different adsorbent materials. *Open Agriculture*, 6(1), 115-123. <https://doi.org/10.1515/opag-2021-0225>
- Davey, L., Halperin, S. A., & Lee, S. F. (2016). Thiol-disulfide exchange in gram-positive firmicutes. *Trends in microbiology*, 24(11), 902-915. <https://doi.org/10.1016/j.tim.2016.06.010>
- Devi, B., Goswami, M., Rabha, S., Kalita, S., Sarma, H. P., & Devi, A. (2023). Efficacious sorption capacities for Pb (II) from contaminated water: a comparative study using biowaste and its activated carbon as potential adsorbents. *ACS omega*, 8(17), 15141-15151. <https://doi.org/10.1021/acsomega.3c00142>
- Dewanata, P. A., & Mushlih, M. (2021). Differences in DNA Purity Test Using UV-Vis Spectrophotometer and Nanodrop Spectrophotometer in Type 2 Diabetes Mellitus Patients: Perbedaan Uji Kemurnian DNA Menggunakan Spektrofotometer UV-Vis dan Spektrofotometer Nanodrop pada Pasien Diabetes Melitus Tipe 2. *Indonesian Journal of Innovation Studies*, 15, 10-21070. <https://doi.org/10.21070/ijins.v15i.553>
- Dewata, D., Azhar, M., & Oktavia, B. (2016). Identifikasi Molekuler Gen 16S rRNA Isolat Bakteri Pendegradasi Inulin dari Rizosfer Umbi Dahlia. *Chemistry Journal of State University of Padang*, 5(2), 16-21.
- El-Gendy, M. M. A. A., Ten, N. M., Ibrahim, H. A. E. H., & Abd El-Baky, D. H. (2017). Heavy metals biosorption from aqueous solution by endophytic *Drechslera hawaiiensis* of *Morus alba* L. derived from heavy metals habitats. *Mycobiology*, 45(2), 73-83. <https://doi.org/10.5941/MYCO.2017.45.2.73>

- Erjavec, M. S. (2019). Annealing temperature of 55 C and specificity of primer binding in PCR reactions. In *Synthetic Biology-New Interdisciplinary Science*. IntechOpen.
- Eshmat, M. E., Gunanti, M., dan Boedi, S. R. (2014). Analisis Kandungan Logam Berat Timbal (Pb) dan Cadmium (Cd) Pada Kerang Hijau (*Perna viridis* L.) di Perairan Ngembah Kabupaten Gersik Jawa Timur. *Jurnal Ilmiah Perikanan dan Kealutan*, 6(1), 101-108. <https://doi.org/10.20473/jipk.v6i1.11387>
- Fahrudin, F., Santosa, S., & Sareda, S. (2020). Toleransi Logam Berat Timbal (Pb) pada Bakteri Indigenous dari Air Laut Pelabuhan Paotere, Makassar (Heavy Metal Lead [Pb] Tolerance Of Indigenous Bacteria From Seawater In Paotere Port, Makassar). *Aquatic Science and Management*, 8(1), 8-14. <https://doi.org/10.35800/jasm.8.1.2020.29572>
- Faridah, F., & Anam, S. U. (2022). The influence of students' level ability of reading comprehension on the students' translation ability. *Jurnal PTK dan Pendidikan*, 8(1). <https://doi.org/10.18592/ptk.v8i1.5767>
- Fathollahi, A., Khasteganan, N., Coupe, S. J., & Newman, A. P. (2021). A meta-analysis of metal biosorption by suspended bacteria from three phyla. *Chemosphere*, 268, 129290. <https://doi.org/10.1016/j.chemosphere.2020.129290>
- Febria, F. A., Zulkhairiah, F., Walpajri, F., Putra, A., & Syukriani, L. (2023). Biofilm-Forming Heavy Metal Resistance Bacteria From Bungus Ocean Fisheries Port (PPS) West Sumatra as a Waters Bioremediation Agent. *Pakistan Journal of Biological Sciences: PJBS*, 26(4), 168-176. <https://doi.org/10.3923/pjbs.2023.168.176>
- Gaffar, S., & Sumarlin, S. (2020). Analisis sekuen mtDNA COI Pari totol biru yang didaratkan di tempat pendaratan ikan kota Tarakan. *Jurnal Harpodon Borneo*, 13(2), 80-89. <https://doi.org/10.35334/harpodon.v13i2.1835>
- Goecke, F., Labes, A., Wiese, J., & Imhoff, J. F. (2010). Chemical interactions between marine macroalgae and bacteria. *Marine ecology progress series*, 409, 267-299. <https://doi.org/10.3354/meps08607>
- Gouda, S. A., & Taha, A. (2023). Biosorption of heavy metals as a new alternative method for wastewater treatment: a review. *Egyptian Journal of Aquatic Biology and Fisheries*, 27(2), 135-153. <https://doi.org/10.21608/ejabf.2023.291671>
- Han, H. T., Zhu, H. S., Zhang, J. T., Tan, X. Y., Wu, Y. X., Liu, C., ... & Ye, M. Q. (2025). Efficient Copper Biosorption by *Rosellomorea* sp. ZC255: Strain Characterization, Kinetic–Equilibrium Analysis, and Genomic Perspectives. *Microorganisms*, 13(8), 1839. <https://doi.org/10.3390/microorganisms13081839>

- Haque, M. M., Mosharaf, M. K., Haque, M. A., Tanvir, M. Z. H., & Alam, M. K. (2021). Biofilm formation, production of matrix compounds and biosorption of copper, nickel and lead by different bacterial strains. *Frontiers in Microbiology*, 12, 615113. <https://doi.org/10.3389/fmicb.2021.615113>
- Heins, A., & Harder, J. (2023). Particle-associated bacteria in seawater dominate the colony-forming microbiome on ZoBell marine agar. *FEMS Microbiology Ecology*, 99(1), fiac151. <https://doi.org/10.1093/femsec/fiac151>
- Hidayat, A. S. (2014). Isolasi dan identifikasi bakteri *Vibrio* sp dari ikan Kerapu sunu (*Plectropomus leopardus*). *Teknosains: Media Informasi Sains dan Teknologi*, 8(2), 209-216. <https://doi.org/10.35800/bdp.2.3.2014.5707>
- Hoyle-Gardner, J., Jones, W., Badisa, V. L., Mwashote, B., Ibeanusi, V., Gaines, T., ... & Tucker, L. (2021). Lead metal biosorption and isotherms studies by metal-resistant *Bacillus* strain MRS-2 bacterium. *Journal of basic microbiology*, 61(8), 697-708. <https://doi.org/10.1002/jobm.202100155>
- Hsu, P. C., & Guo, Y. L. (2002). Antioxidant nutrients and lead toxicity. *Toxicology*, 180(1), 33-44. [https://doi.org/10.1016/S0300-483X\(02\)00380-3](https://doi.org/10.1016/S0300-483X(02)00380-3)
- Huang, L., Wu, C., Gao, H., Xu, C., Dai, M., Huang, L., ... & Cheng, G. (2022). Bacterial multidrug efflux pumps at the frontline of antimicrobial resistance: an overview. *Antibiotics*, 11(4), 520. <https://doi.org/10.3390/antibiotics11040520>
- Humaryanto & Hanina. (2022). Comparison of Three Method of DNA Extraction for Methicillin Resistant *Staphylococcus Aureus* (MRSA). *Jambi Medical Journal*, 10 (4), 551-556.
- Irawati, W., Lamonta, A. L., Zendrato, C. D. K., Pangemanan, T. L., Ruga, D. F., Adhigandewa, N. T., & Fideli, G. D. (2025). Isolasi, karakterisasi, dan uji resistensi bakteri dari Sungai Matras, Bangka, Indonesia terhadap timbal dan tembaga. *Jurnal Biologi Udayana*, 29(2), 118-128. <https://doi.org/10.24843/JBIOUNUD.2025.v29.i02.p01>
- Irmawati, Y., Renngur, P. N. H., Della Rahayaan, F., & Latar, N. L. (2023). Bakteri Pada Rumput Laut *Kappaphycus alvarezii* Di Perairan Kampus Polikant, Desa Sathean. *Journal of Scientech Research and Development*, 5(1), 627-633. <https://doi.org/10.56670/jsrd.v5i1.192>
- Kanamarlapudi, S. L. R. K., Chintalpudi, V. K., & Muddada, S. (2018). Application of biosorption for removal of heavy metals from wastewater. In *Biosorption*. IntechOpen. <https://doi.org/10.5772/intechopen.77315>

- Kerfeld, C. A., & Scott, K. M. (2011). Using BLAST to teach “E-value-tionary” concepts. *PLoS biology*, 9(2), e1001014. <https://doi.org/10.1371/journal.pbio.1001014>
- Khashei, S., Etemadifar, Z., & Rahmani, H. R. (2018). Immobilization of *Pseudomonas putida* PT in resistant matrices to environmental stresses: a strategy for continuous removal of heavy metals under extreme conditions. *Annals of Microbiology*, 68(12), 931-942. <https://doi.org/10.1007/s13213-018-1402-7>
- Krulwich, T. A., Sachs, G., & Padan, E. (2011). Molecular aspects of bacterial pH sensing and homeostasis. *Nature Reviews Microbiology*, 9(5), 330-343. <https://doi.org/10.1038/nrmicro2549>
- Kumar, K.S.; Dahms, H.U.; Won, E.J.; Lee, J.S. and Shin, K.H. (2015). Microalgae - a promising tool for heavy metal remediation. *Ecotoxicol. Environ. Saf.*, 113: 329-352. <https://doi.org/10.1016/j.ecoenv.2014.12.019>
- Kumar, S., Stecher, G., Li, M., Knyaz, C., & Tamura, K. (2018). MEGA X: molecular evolutionary genetics analysis across computing platforms. *Molecular biology and evolution*, 35(6), 1547-1549. <https://doi.org/10.1093/molbev/msy096>
- Kusuma A. (2022). Optimalisasi Ekstraksi DNA dan PCR Untuk Identifikasi Molekuler Pada 4 Jenis Kerang Lunak Berbeda. *Jurnal Enggano*, 7(2), 175-182. <https://doi.org/10.31186/jenggano.7.2.175-18>
- Lei, D. Y., Liu, Z., Peng, Y. H., Liao, S. B., & Xu, H. (2014). Biosorption of copper, lead and nickel on immobilized *Bacillus coagulans* using experimental design methodologies. *Annals of microbiology*, 64(3), 1371-1384. <https://doi.org/10.1007/s13213-013-0782-y>
- Li, X., Li, D., Yan, Z., & Ao, Y. (2018). Adsorption of cadmium by live and dead biomass of plant growth-promoting rhizobacteria. *RSC advances*, 8(58), 33523-33533. <https://doi.org/10.1039/C8RA06758A>
- Lintang, R. (2020). Isolasi Bakteri yang Bersimbion dengan *Ascidian Herdmania momus* yang Memiliki Aktivitas Antibakteri. *Jurnal Pesisir dan Laut Tropis*.
- Lopez, A., Lazaro, N., Priego, J. M., & Marques, A. M. (2000). Effect of pH on the biosorption of nickel and other heavy metals by *Pseudomonas fluorescens* 4F39. *Journal of Industrial Microbiology and biotechnology*, 24(2), 146-151. <https://doi.org/10.1038/sj.jim.2900793>
- Lucena-Aguilar, G., Sánchez-López, A. M., Barberán-Aceituno, C., Carrillo-Ávila, J. A., López-Guerrero, J. A., & Aguilar-Quesada, R. (2016). DNA source selection for downstream applications based on DNA quality indicators analysis. *Biopreservation and biobanking*, 14(4), 264-270.

- Mun, N. K., Mokhtar, Shoparwe, N. F., & Shukor, H. (2021, May). Biosorption of copper ions from aqueous solution using *Kappaphycus striatum*. In *IOP Conference Series: Earth and Environmental Science* (Vol. 765, No. 1, p. 012033). IOP Publishing. <https://doi.org/10.1088/1755-1315/765/1/012033>
- Munisamy, S., Nirooparaj, B., & Asoka, J. M. (2024). Commercial farming of *Kappaphycus alvarezii* in Sri Lanka: current developments and opportunity for becoming a major carrageenophyte producer. In *Tropical Phyconomy Coalition Development: Focus on Eucheumatoid Seaweeds* (pp. 161-174). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-47806-2_13
- Munisamy, S., Rajan, T. S., Eswaran, K., Seth, A., & Hurtado, A. Q. (2023). Application of brown seaweed-derived agro biostimulant to the commercial farming of the red seaweed *Kappaphycus alvarezii* in India: Growth enhancement and production of quality raw material. *Algal Research*, 71, 103041. <https://doi.org/10.1016/j.algal.2023.103041>
- Nadeem, R., Manzoor, Q., Iqbal, M., & Nisar, J. (2016). Biosorption of Pb (II) onto immobilized and native *Mangifera indica* waste biomass. *Journal of Industrial and Engineering Chemistry*, 35, 185-194. <https://doi.org/10.1016/j.jiec.2015.12.030>
- Newell, P. D., Fricker, A. D., Roco, C. A., Chandrangsu, P., & Merkel, S. M. (2013). A small-group activity introducing the use and interpretation of BLAST. *Journal of microbiology & biology education*, 14(2), 238-243. <https://doi.org/10.1128/jmbe.v14i2.637>
- Nicolaus, B., Poli, A., Di Donato, P., Romano, I., Laezza, G., Gioiello, A., ... & Dumontet, S. (2016). Pb²⁺ effects on growth, lipids, and protein and DNA profiles of the thermophilic bacterium *Thermus thermophilus*. *Microorganisms*, 4(4), 45. <https://doi.org/10.3390/microorganisms4040045>
- Nnaji, N. D., Anyanwu, C. U., Miri, T., & Onyeaka, H. (2024). Mechanisms of heavy metal tolerance in bacteria: A review. *Sustainability*, 16(24), 11124. <https://doi.org/10.3390/su162411124>
- Nuban, A. A., Andayani, U., Safitri, A., & Matematika, F. (2021). Biosorpsi Timbal (Pb) pada larutan menggunakan *Aspergillus niger* amobil teknologi hijau untuk penghilangan logam berat. *The Indonesian Green Technology Journal*, 10(1), 1-7.
- Nunes, A., Gelli, V. C., Azevedo, G. Z., de Souza Dutra, F., Schneider, A. R., Oliveira, E. R., ... & Lima, G. P. P. (2025). Characterization of seaweed, aqueous extract, and residue from *Kappaphycus alvarezii* cultivated in Brazil for potential industrial applications. *Journal of Food Composition and Analysis*, 145, 107780. <https://doi.org/10.1016/j.jfca.2025.107780>

- Nurhidayati, S., Faturrahman, F., & Ghazali, M. (2015). Deteksi bakteri patogen yang berasosiasi dengan *Kappaphycus alvarezii* (Doty) bergejala penyakit ice-ice. *Jurnal Sains Teknologi & Lingkungan*, 1(2). <https://doi.org/10.29303/jstl.v1i2.53>
- Ofomaja, A. E., & Ho, Y. S. (2007). Effect of pH on cadmium biosorption by coconut copra meal. *Journal of Hazardous Materials*, 139(2), 356-362. <https://doi.org/10.1016/j.jhazmat.2006.06.039>
- Ojha, K. K., Mishra, S., & Singh, V. K. (2022). Computational molecular phylogeny: concepts and applications. *Bioinformatics*, 67-89. <https://doi.org/10.1016/B978-0-323-89775-4.00025-0>
- Özcan, A. S., Erdem, B., & Özcan, A. (2005). Adsorption of Acid Blue 193 from aqueous solutions onto BTMA-bentonite. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 266(1-3), 73-81. <https://doi.org/10.1016/j.colsurfa.2005.06.001>
- Pagnucco, G., Overfield, D., Chamlee, Y., Shuler, C., Kassem, A., Opara, S., ... & Tiquia-Arashiro, S. M. (2023). Metal tolerance and biosorption capacities of bacterial strains isolated from an urban watershed. *Frontiers in Microbiology*, 14, 1278886. <https://doi.org/10.3389/fmicb.2023.1278886>
- Paray, A. A., Singh, M., Mir, M. A., & Kaur, A. (2023). Gram staining: a brief review. *International Journal of Research and Review*, 10(9), 336-341. <https://doi.org/10.52403/ijrr.20230934>
- Parenrengi, A., & Sulaeman, S. (2007). MENGENAL RUMPUT LAUT, *Kappaphycus alvarezii*. *Media Akuakultur*, 2(1), 142-146.
- Parmar, P., Shukla, A., Goswami, D., Gaur, S., Patel, B., & Saraf, M. (2020a). Comprehensive depiction of novel heavy metal tolerant and EPS producing bioluminescent *Vibrio* PBR1 and *V. rotiferianus* PBL1 confined from marine organisms. *Microbiological Research*, 238, 126526. <https://doi.org/10.1016/j.micres.2020.126526>
- Parmar, P., Shukla, A., Goswami, D., Patel, B., & Saraf, M. (2020b). Optimization of cadmium and lead biosorption onto marine *Vibrio* PBR1 employing a Box-Behnken design. *Chemical Engineering Journal Advances*, 4, 100043. <https://doi.org/10.1016/j.cej.2020.100043>
- Perdana, J. (2012). *Uji Resistensi Dan Uji Biodegradasi Logam Berat (Pb, Zn, Dan Hg) Oleh Isolat Bakteri Lumpur Pantai Kenjeran* (Doctoral dissertation, UNIVERSITAS AIRLANGGA).
- Poernomo, A. T., Nisa, S. K., & Aliyah, Z. S. (2020). Effects of carbon and nitrogen sources on the antibacterial activity of *Bacillus tequilensis* BSM-F symbiotic with *Halichondria panicea* sponge from the Cabbiya Coast,

- Madura, Indonesia. *Pharmaciana*, 10(2), 125-134.
<https://doi.org/10.12928/pharmaciana.v10i2.14984>
- Pratiwi, D. Y. (2020). Dampak pencemaran logam berat terhadap sumber daya perikanan dan kesehatan manusia. *Jurnal Akuatek*, 1(1), 59-65.
- Praveen, R. S., & Vijayaraghavan, K. (2015). Optimization of Cu (II), Ni (II), Cd (II) and Pb (II) biosorption by red marine alga *Kappaphycus alvarezii*. *Desalination and Water Treatment*, 55(7), 1816-1824.
<https://doi.org/10.1080/19443994.2014.927334>
- Priyadarshane, M., & Das, S. (2021). Biosorption and removal of toxic heavy metals by metal tolerating bacteria for bioremediation of metal contamination: A comprehensive review. *Journal of Environmental Chemical Engineering*, 9(1), 104686.
<https://doi.org/10.1016/j.jece.2020.104686>
- Purba, D., Warouw, V., Rompas, R. M., Sumilat, D. A., Kreckhoff, R. L., & Ginting, E. L. (2020). Analisis komunitas bakteri pada sampah plastik. *Jurnal Ilmiah Platax*, 8(2), 188-195.
- Putri, L. S. E., & Syafiqa, E. (2019). The adsorption of heavy metals from industrial wastewater using *sargassum crassifolium*. *GEOMATE Journal*, 17(59), 21-27. <https://doi.org/10.21660/2019.59.4603>
- Rakhasiya, B., Munisamy, S., Mathew, D. E., Tothadi, S., Yadav, A., & Mantri, V. A. (2023). Potential utility of industrially unwanted constituent under the framework of waste to wealth: Edible salt from commercial marine red seaweed *Kappaphycus alvarezii* (Doty) LM Liao. *Bioresource Technology Reports*, 23, 101529.
<https://doi.org/10.1016/j.biteb.2023.101529>
- Ramrakhiani, L., Ghosh, S., & Majumdar, S. (2016). Surface modification of naturally available biomass for enhancement of heavy metal removal efficiency, upscaling prospects, and management aspects of spent biosorbents: a review. *Applied biochemistry and biotechnology*, 180(1), 41-78. <https://doi.org/10.1007/s12010-016-2083-y>
- Ramstedt, M., Leone, L., Persson, P., & Shchukarev, A. (2014). Cell wall composition of *Bacillus subtilis* changes as a function of pH and Zn²⁺ exposure: insights from cryo-XPS measurements. *Langmuir*, 30(15), 4367-4374. <https://doi.org/10.1021/la5002573>
- Reysenbach, A. L., Giver, L. J., Wickham, G. S., & Pace, N. R. (1992). Differential amplification of rRNA genes by polymerase chain reaction. *Applied and Environmental Microbiology*, 58(10), 3417-3418.
<https://doi.org/10.1128/aem.58.10.3417-3418.1992>

- Rezki, C. T., Petrus, S., dan Sri, Y. W. (2013). Studi Sebaran Logam Berat Pb (Timbal) Pada Sedimen Dasar Perairan Pantai Slamaran Kota Pekalongan. *Jurnal Oseanografi*, 2(1), 9-17.
- Rizki, N., Maslukah, L., Sugianto, D. N., Zainuri, M., Ismanto, A., & Wirasatriya, A. (2020). Distribusi Spasial Kualitas Perairan di Perairan Kawasan Taman Nasional Karimunjawa. *Indonesian Journal of Oceanography*, 2(3), 302-305. <https://doi.org/10.14710/ijoce.v2i3.8779>
- Rizkiana, L., Karina, S., & Nurfadillah. (2017). Analisis timbal (pb) pada sedimen dan air laut di kawasan pelabuhan nelayan gampong Deah Glumpang kota Banda Aceh. *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah*. 2 (1), 89-96.
- Rizzatti, G., Lopetuso, L. R., Gibiino, G., Binda, C., & Gasbarrini, A. J. B. R. I. (2017). Proteobacteria: a common factor in human diseases. *BioMed research international*, 2017(1), 9351507. <https://doi.org/10.1155/2017/9351507>
- Rodríguez, C. E., & Quesada, A. (2006). Nickel biosorption by *Acinetobacter baumannii* and *Pseudomonas aeruginosa* isolated from industrial wastewater. *Brazilian Journal of Microbiology*, 37, 465-467.
- Rupert, R., Rodrigues, K. F., Chong, H. L. H., & Yong, W. T. L. (2022). Dataset of 16S ribosomal DNA sequences of bacteria isolated from marine red algae *Kappaphycus alvarezii*. *Data in Brief*, 40, 107784. <https://doi.org/10.1016/j.dib.2021.107784>
- Salido, M., Soto, M., & Seoane, S. (2024). Seaweed: Nutritional and gastronomic perspective. A review. *Algal Research*, 77, 103357. <https://doi.org/10.1016/j.algal.2023.103357>
- Saputri, A., Khairuddin, K., & Yamin, M. (2023). Analysis of Cadmium (Cd) Heavy Metal Content in Mosambique Tilapia Fish (*Oreochromis mossambicus*) Derived from Rawa Taliwang Lake to Enrich Ecotoxicology Lecture Material in 2022. *Jurnal Biologi Tropis*, 23(2), 390-397. <https://doi.org/10.29303/jbt.v23i2.4845>
- Saraswati, S. A., & Darmasetiyawana, I. M. S. (2016). Identifikasi Bakteri pada Rumput Laut *Euchema spinosum* yang terserang penyakit Ice-ice di Perairan Pantai Kutuh. *Journal of Marine and Aquatic Sciences*, 2(1), 11-15. <https://doi.org/10.24843/jmas.2016.v2.i01.11-15>
- Sari, F., Widyorini, N., & Sabdaningsih, A. (2021). Isolasi dan Identifikasi dengan Gen 16S Rrna dari Bakteri Asosiasi Spons Kelas Demospongiae di Perairan Tulamben Bali. *Jurnal Pasir Laut*, 5(2), 110-118. <https://doi.org/10.14710/jpl.2021.49558>
- Sarma, P. J., Kumar, R., & Pakshirajan, K. (2015). Batch and Continuous Removal of Copper and Lead from Aqueous Solution using Cheaply Available

Agricultural Waste Materials. *International Journal of Environmental Research*, 9(2).

- Satya, A., Harimawan, A., Haryani, G. S., Johir, M., Hasan, A., Vigneswaran, S., Ngo, H. H. & Setiadi, T. (2020). Batch Study of Cadmium Biosorption by Carbon Dioxide Enriched *Aphanothece* sp. *Dried Biomass*. *Water*; 12; 264. <https://doi.org/10.3390/w12010264>
- Seiler, C., & Berendonk, T. U. (2012). Heavy metal driven co-selection of antibiotic resistance in soil and water bodies impacted by agriculture and aquaculture. *Frontiers in microbiology*, 3, 399. <https://doi.org/10.3389/fmicb.2012.00399>
- Selvakumar, A., & Rangabhashiyam, S. (2019). Biosorption of Rhodamine B onto novel biosorbents from *Kappaphycus alvarezii*, *Gracilaria salicornia* and *Gracilaria edulis*. *Environmental Pollution*, 255, 113291. <https://doi.org/10.1016/j.envpol.2019.113291>
- Setyawati, R., & Zubaidah, S. (2021). Optimasi konsentrasi primer dan suhu annealing dalam mendeteksi gen leptin pada sapi peranakan ongole (PO) menggunakan polymerase chain reaction (PCR). *Indonesian Journal of Laboratory*, 4(1), 36-40. <https://doi.org/10.22146/ijl.v4i1.65550>
- Shao, W., Li, M., Teng, Z., Qiu, B., Huo, Y., & Zhang, K. (2019). Effects of Pb (II) and Cr (VI) stress on phosphate-solubilizing bacteria (*Bacillus* sp. Strain MRP-3): oxidative stress and bioaccumulation potential. *International Journal of Environmental Research and Public Health*, 16(12), 2172. <https://doi.org/10.3390/ijerph16122172>
- Shim, S. M., Kim, J. H., Jung, S. E., Kim, D. J., Oh, J. H., Han, B. G., & Jeon, J. P. (2010). Multilaboratory assessment of variations in spectrophotometry-based DNA quantity and purity indexes. *Biopreservation and Biobanking*, 8(4), 187-192. <https://doi.org/10.1089/bio.2010.0016>
- Sophian, A., Purwaningsih, R., Muindar, Igrisa, E. P. J., & Amirullah, M. L. (2021). Analysis of purity and concentration of DNA extracted from intron patho gene-spin extraction on crab processed food product samples. <https://doi.org/10.13057/biotek/c180103>
- Sukoco, H., Suriansyah, S., Salmin, S., Cahyani, A. P., Andanawari, S., Akbarrizki, M., & Siswanto, F. M. (2024). Desain Primer In Silico Untuk Analisis Ekspresi Gen Osteopontin (OPN) Sebagai Penanda Kesuburan Pada Kambing Jantan (*Capra hircus*). *Jurnal Biotek*, 12(2), 129-143. <https://doi.org/10.24252/jb.v12i2.49469>
- Susilowati, I. (2013). Prospek pengelolaan sumber daya perikanan Berbasis ekosistem: studi empiris di karimunjawa. *Jurnal Ekonomi Pembangunan: Kajian Masalah Ekonomi dan Pembangunan*, 14(1), 16-37. <https://doi.org/10.23917/jep.v14i1.148>

- Taha, A., Hussien, W., & Gouda, S. A. (2023). Bioremediation of heavy metals in wastewaters: a concise review. *Egypt J Aquat Biol Fish*, 27(1), 143-166. <https://doi.org/10.21608/ejabf.2023.284415>
- Tee, M. Z., Yong, Y. S., Rodrigues, K. F., & Yong, W. T. L. (2015). Growth rate analysis and protein identification of *Kappaphycus alvarezii* (Rhodophyta, Gigartinales) under pH induced stress culture. *Aquaculture Reports*, 2, 112-116. <https://doi.org/10.1016/j.aqrep.2015.09.001>
- Teitzel, G. M., & Parsek, M. R. (2003). Heavy metal resistance of biofilm and planktonic *Pseudomonas aeruginosa*. *Applied and environmental microbiology*, 69(4), 2313-2320. <https://doi.org/10.1128/AEM.69.4.2313-2320.2003>
- Tilaar, S., Wullur, S., & Angkouw, E. (2023). Analysis of particle content in *Kappaphycus Alvarezii* seaweed in the waters of Arakan village using scan electron Microscopy–Energy dispersive X-ray spectroscopy (SEM-EDX). <https://doi.org/10.35800/jip.v12i1.51565>
- Trigiano, R. N., & Gray, D. J. (2016). *Plant tissue culture, development, and biotechnology*. CRC Press. <https://doi.org/10.1201/9781439896143>
- Tuwo, A., Samawi, M. F., Aprianto, R., & Tresnati, J. (2020, September). Feasibility study of seaweed farming *Kappaphycus alvarezii* in Sub-District North Pulau Laut and Sub-District East Pulau Laut Kota baru Regency, South Borneo, Indonesia. In *IOP Conference Series: Earth and Environmental Science* (Vol. 564, No. 1, p. 012026). IOP Publishing. <https://doi.org/10.1088/1755-1315/564/1/012026>
- Valdany, F. A., Ihsan, Y. N., Yuliadi, L. P., & Purba, N. P. (2022). The condition of acidity, phosphate, and nitrate in Indonesian Waters. *Omni-Akuatika*, 18(2), 90-98. <https://doi.org/10.20884/1.oa.2022.18.2.912>
- Vega, A., Delgado, N., & Handford, M. (2022). Increasing heavy metal tolerance by the exogenous application of organic acids. *International Journal of Molecular Sciences*, 23(10), 5438. <https://doi.org/10.3390/ijms23105438>
- Verstraeten, S. V., Aimo, L., & Oteiza, P. I. (2008). Aluminium and lead: molecular mechanisms of brain toxicity. *Archives of toxicology*, 82(11), 789-802. <https://doi.org/10.1007/s00204-008-0345-3>
- Vijayaraghavan, K. and Balasubramanian, R. (2015). Is biosorption suitable for decontamination of metal-bearing wastewaters? A critical review on the state-of-the-art of biosorption processes and future directions. *J. Environ. Manage.*, 160: 283–296. <https://doi.org/10.1016/j.jenvman.2015.06.030>
- Vijayaraghavan, K., & Yun, Y. S. (2008). Bacterial biosorbents and biosorption. *Biotechnology advances*, 26(3), 266-291. <https://doi.org/10.1016/j.biotechadv.2008.02.002>

- Volesky, B., & Holan, Z. R. (1995). Biosorption of heavy metals. *Biotechnology progress*, 11(3), 235-250. <https://doi.org/10.1021/bp00033a001>
- Walsh, P. S., Metzger, D. A., & Higuchi, R. (2013). Chelex 100 as a Medium for Simple Extraction of DNA for PCR-Based Typing from Forensic Material. *BioTechniques*, 54(3), 134–139. <https://doi.org/10.2144/000114018>
- Wang, J., & Chen, C. (2006). Biosorption of heavy metals by *Saccharomyces cerevisiae*: a review. *Biotechnology advances*, 24(5), 427-451. <https://doi.org/10.1016/j.biotechadv.2006.03.001>
- Wang, J., & Chen, C. (2009). Biosorbents for heavy metals removal and their future. *Biotechnology Advances*, 27(2), 195-226. <https://doi.org/10.1016/j.biotechadv.2008.11.002>
- Wantania, L. L., Wullur, S., Ginting, E. L., Mantiri, D. M., Undap, S. L., Sumilat, D. A., & Gerung, G. S. (2019). Isolation and amplification of 16S rRNA gen of associated microbial isolates in red algae *Kappaphycus alvarezii* from Belang, Southeast Minahasa Regency, North Sulawesi. *Jurnal Ilmiah Platax*, 7(1), 220-226. <https://doi.org/10.35800/jip.7.1.2019.22808>
- Weisburg, W. G., Barns, S. M., Pelletier, D. A., & Lane, D. J. (1991). 16S ribosomal DNA amplification for phylogenetic study. *Journal of bacteriology*, 173(2), 697-703. <https://doi.org/10.1128/jb.173.2.697-703.1991>
- Xian, M., Wang, K., Lou, H., Wang, Y., Zhang, L., & Wang, C. (2019). Short-term haze exposure predisposes healthy volunteers to nasal inflammation. *Allergy, Asthma & Immunology Research*, 11(5), 632-643. <https://doi.org/10.4168/aa.2019.11.5.632>
- Yusfaddillah, A., Dwi Saputri, R., Edelwis, T. W., & Pardi, H. (2023, December). Heavy metal pollution in Indonesian waters. In *BIO Web of Conferences* (Vol. 79, p. 04001). EDP Sciences. <https://doi.org/10.1051/bioconf/20237904001>
- Yusuf, M. (2013). Kondisi terumbu karang dan potensi ikan di perairan Taman Nasional Karimunjawa, Kabupaten Jepara. *Buletin Oseanografi Marina*, 2(2), 54-60.
- Zheng, X. Y., Shen, Y. H., Wang, X. Y., & Wang, T. S. (2018). Effect of pH on uranium (VI) biosorption and biomineralization by *Saccharomyces cerevisiae*. *Chemosphere*, 203, 109-116. <https://doi.org/10.1016/j.chemosphere.2018.03.165>